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Choosing Management Information Systems as a Major: Understanding the smiFactors for MIS

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Abstract:

Given declining management information systems (MIS) enrollments at our university, we seek to understand our students' selection of a major. Prior studies have found that students choose a major based on a number of factors, with subject matter interest consistently being most important. We contribute to the literature by developing a deeper understanding of what is meant by subject matter interest, which we refer to as smiFactors, for MIS as a major and career. Based on a qualitative analysis of open-ended survey questions completed by undergraduate business students, we confirm a number of smiFactors for MIS gleaned from recent studies and identify three new ones. We also relate our findings to broad categories of vocational interests. Of the newly identified smiFactors, one—linking business and technology—is unique to MIS, whereas the other two—practical application of course work and daily variety—apply to MIS as well as other majors and careers. Our findings provide a more complete foundation for helping students make an informed choice of MIS as a major. We use our findings and an extension of the Theory of Planned Behavior (TPB) to identify four types of intervention for increasing MIS enrollments.

Keywords: IS enrollment, major selection, interest in MIS, student recruitment, vocational interest, MIS career, MIS major

I. BACKGROUND AND PURPOSE

Accounting major: *I believe Management Information Systems is a great major with many opportunities for those who are passionate about the subject and excel in it. However, I personally do not care for the subject.*

Marketing and MIS major: *The main thing I am hoping for is a job that pays enough where I can make a dent in my student loans while I still really like my job.*

Do we understand what students mean when they say that they "do not care for the subject" or "I really like my job"? Most prior research does not help us understand subject matter interest (which we refer to as smiFactors) for MIS, which would lead students to choose or avoid MIS as a major. Prior research [e.g., Walstrom et al., 2008; Zhang, 2007; Ahuja et al., 2006; Simons et al., 2003; Kim et al., 2002; Lowe and Simons, 1997; Galotti and Kozberg, 1987] indicates that students choose a major based on a number of important factors, e.g.,

- Interest in the major/career
- Success at doing the work (i.e., competence or self-efficacy)
- Job availability and career prospects
- Financial income
- Influence of others, including family and professors
- Curriculum requirements

As Zhang [2007, p. 449] notes, "having a genuine interest in a field consistently has been found to be one of the most important, if not the most important factor affecting students' choice of majors." For example, Walstrom et al. [2008, p. 50] report that students' "interest in the subject matter ranked higher in importance than any other factor in determining their selection of a major." They also report on reasons students did not choose management information systems (MIS) as a major: "By far, the most common responses were that it 'wasn't what they wanted to do' and the 'subject matter was not of interest.'" Kuechler, McLeod, and Simkin [2009, p. 463] provide another example, noting that "'genuine interest' in the subject was the most salient factor affecting the decision to major in IS."

Given declining MIS enrollments at our university, we seek to understand the specific factors affecting our students' selection of a major. As noted above, prior research has identified a number of influential factors affecting students' choice of a major. However, little research has focused on developing a deeper understanding of the most important factor, genuine interest in the subject matter of MIS or the opposite, lack of interest. Our purpose, therefore, is to provide a more complete understanding of subject matter interest (or lack of interest), i.e., an understanding of smiFactors. Besides helping us, our study contributes to the literature by providing further explanation of what it means to "really like my job" or "not care for the subject." Besides identifying smiFactors, we build on our theoretical framework and empirical results to present a typology of four interventions that should help educators as they consider how to address declining MIS enrollments.

II. RESEARCH MODEL

A number of researchers have gone beyond identifying a list of factors and have used a theoretical model to guide their investigations of why students choose a major. For example, Akbulut et al. [2008] use social cognitive career theory [Lent, Brown, and Hackett, 1994], Zhang [2007] uses the theory of reasoned action (TRA) [Ajzen and Fishbein, 1980], and Cohen and Hanno [1993] use the theory of planned behavior (TPB) [Ajzen, 1991]. In the information systems literature TPB and its predecessor, TRA, are the foundation theories for a long line of research focused on understanding workers' use of technology [Davis, Bagozzi, and Warshaw, 1989; Taylor and Todd, 1995; Venkatesh and Davis, 2000; Kim and Malhotra, 2005]. Given the widespread acceptance of TPB within the information systems literature and its applicability to investigating the behavior of choosing a major, we adopt an extension of TPB as the broad theoretical framework to guide this study. In the base model attitude toward major, subjective norm, and perceived behavioral control lead to intention to choose a major; perceived behavioral control and intention to choose a major lead to choice of a major. Our extension consists of factors leading to attitude toward major. See Figure 1.
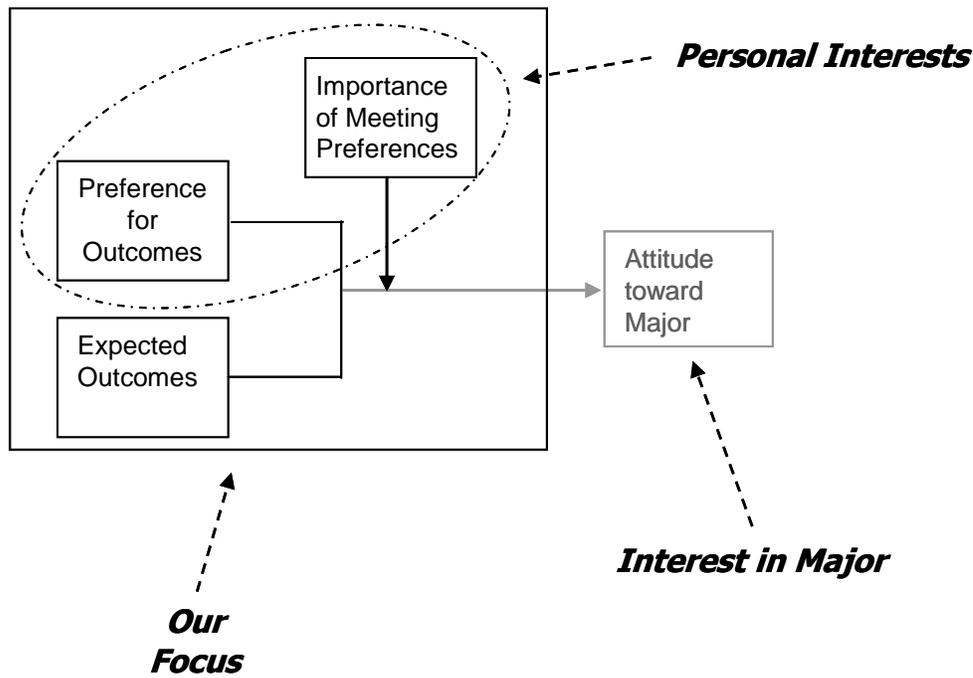
Figure 1. Extension to TPB Model Guiding Our Research

Although the whole TPB model should help us understand students' choice of a major in MIS, our primary focus for this article is within the set of factors leading to attitude toward major. This set of factors represents fit between a person and the person's perceived environment [Edwards, 1996; Kristof, 1996; Edwards and Rothbard, 1999; and Kristof-Brown et al., 2005]. Personal interests reflect values that a person seeks to obtain from the environment, such as job security or social interaction. Preference for outcomes represents the level of one's personal interests, e.g., a preference for a high level of job security or a preference for a moderate level of social interaction. Importance of meeting specific preferences represents the relative strength of those personal interests. The more important it is to satisfy the preference or the stronger the interest, the more influence a specific value or personal interest has on attitude toward major. Expected outcomes represent what the individual believes the environment will provide relative to corresponding personal interests. Examples of expected outcomes resulting from an MIS major and career would be beliefs that job security will be high and that social interaction will be low. Expected outcomes associated with more important interests will have a greater effect on attitude toward a major than expected outcomes that are less important. The moderating effect of importance has been discussed in other studies of values and attitudes [e.g., Kristof, 1996; McFarlin and Rice, 1992; Locke, 1976].

Interest in the subject matter is a subset of personal interests. Our qualitative research, based on open-ended questions, explores the meaning of "interest in the subject matter" within the segment of the extension to the TPB model shown in the boxed area of Figure 1. Our primary focus is on understanding what students believe they would "really like" or "not care for" in the coursework or job activities of an MIS major or career, i.e., smiFactors. As suggested by prior research, our results identify pay and job prospects as expected or valued outcomes that affect attitude toward an MIS major; more to the point of this study, though, our results also add to prior research by identifying preferences or outcomes, i.e., smiFactors, that illuminate interest (or lack of interest) in MIS subject matter as students pursue a degree and beyond.

Vocational Interests

Studies of vocational interests [e.g., Arnold, 2004; Tracey, 2002; Holland, 1996] provide broad insights for the primary focus of our study. The dominant theory of vocational interests is Holland's [1996] theory that a person will thrive in a work environment that provides opportunities, activities, tasks, and roles that are congruent with that person's competencies, interests, and self-beliefs. Holland's six ideal types of individuals—Realistic, Investigative, Artistic, Social, Enterprising, and Conventional (RIASEC)—have different vocational interests that are satisfied by corresponding ideal types of work environments (see Tables 1 and 2 in Holland, 1996). To illustrate how widely used these types are, the U.S. Department of Labor [2009] has assigned a three-letter RIASEC code of ICR (Investigative, Conventional, Realistic) to the work environment/occupation of computer systems analysts (also see Barak and Cohen, 2002).

Holland's [1996] theory of person–environment fit identifies the six broad RIASEC types or categories that may be used to describe preferences and corresponding outcomes associated with a major and career in MIS. However, none of the studies we have reviewed has related the RIASEC categories to smiFactors for MIS, i.e., student interest in the subject matter of MIS. Interpreting responses of students to open-ended questions about their interest in MIS may be informed by prior research that has identified vocational interests, including the RIASEC types, Prediger's [1982] two bipolar work task dimensions of people/things and data/ideas underlying the RIASEC types, and Tracey and Rounds [1996] addition of prestige as a third dimension. Although these types and dimensions may inform interpretation of open-ended responses, they are not necessarily exhaustive. For example, Tracey [2002] notes types not identical with RIASEC (e.g., basic interest areas of Social Facilitating, Managing, Business Detail, Data Processing, Mechanical, Nature/Outdoors, Artistic, and Helping) and variations on the prestige dimension (e.g., status, occupational level, level of training, level of difficulty and responsibility). Thus, our findings may reinforce prior work, or they may suggest new insights or finer-grained categories of interest that advance our understanding of smiFactors for MIS.

Further Illuminating the Meaning of Subject Matter Interest for MIS

Only a few studies have been published in the literatures on choice of a college major or vocational interests that specifically illuminate the meaning of interest in the subject matter of MIS. Such studies go beyond identifying what we already know about factors that affect interest in the major. Factors that we already know include interest in the subject matter or work in general, success at doing the work, job availability and career prospects, and financial income. Findings that do not go beyond these already known important preferences and outcomes may contribute to understanding students' choice of a major, but they do not further illuminate our understanding of the boxed part of Figure 1 that includes smiFactors for MIS, i.e., what the MIS major supplies that makes the work or content of the field interesting, which is the primary focus of this study.

One of the most informative studies was conducted by Scott, Fuller, MacIndoe, and Joshi [2009]. They studied factors influencing the choice of major of undergraduate business students with specific questions on the students' choice to major (or not) in MIS. They report perceived characteristics of the MIS profession, including job scope and career path diversity, the technical nature of information systems (IS) jobs, and the fact that many students did not know much about MIS. Beyond already known important outcomes—general interest in the work, self-efficacy, job availability and career prospects, and financial income—the following reported characteristics represent categories of important preferences and expected outcomes of majoring in MIS, i.e., smiFactors for MIS, that should help us better understand interest (or lack thereof) associated with the subject matter of MIS: having interest in computers and technology (e.g., having technical/computer knowledge or skills, liking computers and technology, keeping up with new technology), using interpersonal and communication skills (or limited use of such skills from sitting in front of a computer), having a nerdy/geeky image, using managerial skills, using problem solving skills, and satisfying a desire to travel.

Given the limited knowledge of MIS by many students, their expectations of outcomes differ. The majority of first and second year students in the Scott et al. [2009] study have limited or no knowledge of MIS but expect that sitting in front of the computer is an outcome associated with the MIS profession. As noted in that study [p. 23], "students with little or no knowledge of MIS tend to perceive MIS as more narrowly focused than students who had some experience or knowledge of the major." Limited or invalid knowledge regarding outcomes could lead to an uninformed or misinformed interest (or lack thereof) in MIS.

Another informative study was conducted by Downey, McGaughey, and Roach [2009]. They studied differences in influences on choice of a major between computer science (CS) and MIS majors. They found that the greatest influences on both—beyond interesting work, high career earnings, and high starting salary—were interest in computers and challenging work. The greatest differences were on interest in business organizations, opportunity to manage people, and a liking for interacting with people. All of these items were more important for MIS majors than CS majors. In addition, MIS majors rated prestige associated with IT as somewhat influential and more so than CS majors. Challenging work, interest in business organizations, and prestige associated with IT are influences that represent additional important preferences and outcomes beyond those in Scott et al. [2009].

Additional Studies

A few other studies have contributed to our understanding beyond Scott et al. [2009] and Downey et al. [2009]. Noel, Michaels, and Levas [2003] found, among other things, that MIS majors had the following character traits—creative, venturesome, uninhibited, and imaginative—indicating a preference for creativity. Similar to Downey et al. [2009], they also found that MIS majors preferred working with other people and valued personal contact. Ahuja et al. [2006] report that helping others is an important factor in choosing a major in the IT field for a limited number of students. Women in applied IT majors, including information systems, expressed more interest in this factor than men.

Other studies have reported results that reinforce specific findings from the studies summarized above. In a survey of undergraduate business students in an introductory IS course, Akbulut and Looney [2007] report expected outcomes for an IS major of peer admiration and a sense of pride, which are consistent with the prestige associated with IT in Downey et al. [2009] and the prestige dimension of vocational interests. Akbulut et al. [2008] include a similar prestige item, "I will feel more powerful," in their survey of expected outcomes. In measuring interest in an IS major Akbulut, Looney, and Motwani [2008] elaborate on a statement of general interest in an IS major by including four more specific statements of interest: in the kind of courses in an IS major, the challenges that IS majors face, the type of work that people in IS majors do, and the problems that IS majors tackle. Interest in challenges is consistent with challenging work in Downey et al. [2009]. Interest in problems is consistent with using problem solving skills in Scott et al. [2009]. Lent et al. [2008] measure outcomes that "could result from earning a degree in a computing discipline" and ask participants to indicate their interest in performing activities that they refer to as "common to the computing disciplines." One of the outcomes they list is "potential to supervise others," which is consistent with using managerial skills in Scott et al. [2009], and opportunity to manage people in Downey et al. [2009]. Of the few activities that they list, "solving computer software problems" is consistent with using problem solving skills in Downey et al. [2009]. It is also consistent with having interest in computers and technology in Scott et al. [2009], as is another of Lent et al.'s [2008] items: "learning new computer applications." Although these two items might be what students mean when they say that MIS is interesting, we interpret Lent et al.'s [2008] research with caution, since these items were adapted from instruments used with engineering majors and the computing disciplines were not limited to MIS.

Table 1: Bases of Interest in MIS Major from Prior Studies

1. Job/Career prospects, including salary
    Job scope
    Job availability and career prospects
    Financial income

2. Self-efficacy beliefs

3. Subject matter interest for MIS, i.e., smiFactors
    Using problem solving skills
    Having challenging work
    Being creative
    Using interpersonal and communication skills
    Helping others
    Satisfying an interest in business organizations
    Using managerial skills
    Satisfying an interest in computers and technology
    Having prestige associated with IT
    Satisfying a desire to travel

Summary and Motivation for Our Study

Investigating smiFactors for MIS could provide a valuable link between the literatures on vocational interests, choice of a major in general, and interest in MIS specifically. Table 1 summarizes the bases of interest in MIS, i.e., preferences and expected outcomes, from prior studies reviewed above. The preferences and expected outcomes are grouped into three broad categories: (1) job/career prospects, including salary, (2) self-efficacy beliefs, and (3) subject matter interest for MIS, i.e., smiFactors. These categories represent our current understanding of the meaning of "interest in MIS."

The first two categories have been found in many studies, as has a general statement of interest in the content or activities associated with any major or career. The third category, though, represents the findings of a limited number of studies that provide a starting point for our understanding of what is meant by the general statement of interest in the content or activities of an MIS major or career. In our empirical study, we expect to confirm the first two categories and contribute to the literature by confirming or supplementing the studies that led to the summary of the third category in Table 1. Indeed, Scott et al. [2009] suggest that confirmatory research with students from another university should be conducted, given that their study was conducted with business students (n = 31) at a single university; Downey et al. [2009], who compared CS and MIS students, suggest studying other business students. Our study of business students at our university builds on these suggestions.

III. METHODOLOGY

Sample

Voluntary participants were solicited via e-mail from all School of Business Administration (SBA) undergraduate students at our university (population = 1,973). A $10 addition to the student's account, which could be used on or near campus, was offered as an incentive for participants. Of those who volunteered, we invited about half to participate. Given our purpose and qualitative approach, the sample size (n = 50 usable responses) provides a large number of case studies with a rich set of responses.

Procedure

We used a number of open-ended survey questions (see Appendix) to understand the meaning of a student's interest or lack of interest in the subject matter of a major, particularly MIS. Survey responses were content analyzed to identify interests. Interests could be stated as preferences or outcomes or as values, likes, or dislikes. They could be stated as items that students expected to obtain or achieve, or they could be activities that they expected to experience.

We focused our initial analysis on the development of an open-ended list of categories to summarize the students' responses around four key questions: "What makes a major/career interesting?" "What makes a major/career uninteresting?" "Why did you pick MIS as your major?" and "What outcomes do you expect from choosing MIS as a major?" This analysis was conducted independently by each of the four researchers, using students' responses to corresponding questions in the survey as primary data. (See questions 3, 4, 2, and 5 in the Appendix, respectively.) In addition, responses to the following questions for non-MIS majors also served as primary data (see questions 6 and 7 in the Appendix): "What is your opinion of Management Information Systems as a major?" "What is your opinion of Management Information Systems as a career?" Each researcher developed a list of categories based on this data which he believed fully and concisely captured the range of responses provided by the students.

We then met to jointly discuss our separate lists of categories to consolidate them into a single list of categories. To illustrate consolidation, consider the following categories: Self-efficacy was initially identified as a category based on responses specifying what makes a major/career interesting, e.g., "I've always wanted to be great at my career, so it is natural that I would incline toward a major that I'm good at." A similar category (Too difficult/lack skill/talent) was initially identified based on responses specifying what makes a major/career uninteresting, e.g., "I do not possess the organization and detailed skills necessary." We merged these categories into the category of self-efficacy.

Based on our discussion, we reached a consensus set of categories, which we use as the basis for our subsequent analysis. Using the categories, rather than the frequency of their occurrence, is consistent with our stated objective of developing an understanding of the bases of interest or lack of interest in MIS.

IV. RESULTS AND DISCUSSION

Findings

Categories of interest associated with an MIS major are presented and defined in Table 2. We have grouped some responses into categories commonly found in previous studies: job and career prospects, including salary, and self-efficacy beliefs. We recognize that self-efficacy has conceptual similarities to perceived behavioral control in the theory of planned behavior [Pavlou and Armitage, 2006; Conner and Armitage, 1998]. Nevertheless, self-efficacy also emerges as a category in the responses to questions on what makes a major interesting or uninteresting. In addition, other researchers have referred to self-efficacy as a related component of interest. To illustrate, Shiefele [1999] defines personal interest as a dispositional motivational characteristic and also refers to self-efficacy as a dispositional motivational characteristic. Luttrell, Callen, Allen, Wood, Deeds, and Richard [2010] include scales on interest and personal cost in a four-factor Mathematical Value Inventory (MVI). The personal cost scale, which is reverse scored, making it similar to self-efficacy, includes items such as "I have to study much harder for math than for other courses" and "Solving math problems is too difficult for me." The reported correlation for the interest and the reverse-scored personal cost components of the factor analyzed items comprising all four scales in the MVI is .52.

We have grouped responses other than job and career prospects and self-efficacy into categories representing subject matter interest, i.e., smiFactors. Some categories are specific to MIS within a business school. Others apply to not only MIS but also non-MIS majors. Excerpts from a number of cases illustrate the categories.

Table 2: Categories of Interest in MIS Major Emerging from Our Study*	
Category	**Definition**
Job/Career prospects, including salary • Variety of jobs/career paths • Job availability • Employment security • Advancement opportunities • Salary	 • Job options as one starts and moves through a career • Likely success at finding a job upon graduation • Risk of job loss • Prospects of advancing over career • Annual, monthly, or hourly pay
Self-efficacy beliefs	Belief in one's ability to succeed in major and career
smiFactors Interest in subject matter-specific to MIS (within business school) • Technical focus • Link business and technology** Interest in subject matter—not specific just to MIS • Practical application of course work** • Challenge/Problem solving • Creativity • Social interaction • Helping others • Importance/Utility to business • Image/Reputation • Change—perceived daily variety**	 • Emphasis on technical/computer knowledge • Using information technology to solve business problems or exploit business opportunities • Applying course work in a practical setting • Solving challenging problems • Using creativity • Interacting with people • Making a positive difference in others' work • Providing value to business • Experiencing respect • Experiencing variety in everyday activities

*	All categories represent interests, i.e., preferences, importance of meeting those preferences, and corresponding expected outcomes. (See Figure 1.)
**	Interest in subject matter not represented in Table 1.

Job/Career Prospects, Including Salary

Students generally acknowledged that MIS has solid prospects for one's job, career, and salary. However, some questions were raised about employment security and potential for advancement. Student responses are illustrated in the quotes below.

Variety of jobs/career paths
- "I think with this major there are many career paths"

Job availability
- "I know careers are available in MIS"
- "People who are in MIS are in high demand in the career world."

Employment security
- "[M]any companies have started to outsource a lot of this work."
- "[T]here will always be great jobs available though they may be dwindling with outsourcing to places such as India."

Advancement opportunities
- "There are many career opportunities for this major but maybe not a lot of opportunities to advance within companies."

Salary
- "I understand that they pay high salaries."
- "[T]hey are well paid because it is tough and perceived as somewhat unpopular."

Self-Efficacy Beliefs

A number of students responded that they wanted to major in something they could do well in and learn the skills they needed to succeed. Some noted that MIS would be difficult for them.

- "I do not know much about MIS. It sounds kind of complicated and intimidating."
- "It seems very difficult."

smiFactors—Interest in Subject Matter—Specific to MIS (within business school)

Beyond interests in job/career prospects, including salary, and self-efficacy beliefs, i.e., interests that have been found in many prior studies, responses included two smiFactors specific to MIS as a business major. The first, technical focus of the major (without linking technology with business), is one that could be the focus of other majors beyond the business school, e.g., computer science. Some students were interested in MIS because of its focus on technology, whereas others were not interested because of this focus.

Technical focus
- "It seems like this major would have a lot to do with computers, and I am not a huge fan of computers."
- "[I]t seems very technology oriented."

The second of these two smiFactors, linking business and technology, is an essential characteristic of MIS. For example, our materials explaining what MIS is include this description of what MIS professionals do: "What MIS professionals DO involves solving business problems or exploiting business opportunities using information technology (IT)."

Link business and technology
- "It is a very good major if you like business and enjoy working with technology."
- "MIS deals heavily with computers and business, both of which appeal to me. I want a job where I have to deal with people every day and computers at the same time in a business environment. So the choice is a perfect fit for me."

smiFactors—Interest in Subject Matter—Not Specific Just to MIS

Even though the categories presented below are based on responses about MIS, these categories also occur in other majors in business. For example, consider social interaction. Working with people is an expected outcome of other majors as well as MIS. A number of students responded that MIS is highly technology focused and not people focused. They usually mentioned these factors in a negative context. These students perceive the MIS major to be best suited for people who "sit behind a desk and code" all day, contrary to our understanding of the realities of MIS careers. A contrasting view of expected social interaction associated with MIS also exists as reflected in the perception that there is "a lot of interaction with people."

Practical application of course work
- "[A]pply what we learn in the classroom to real life situations."

Challenge/Problem solving
- "The main thing that is interesting is the idea of coming up with some plan that would help the company and figuring out what needs to be improved and how that can be accomplished."
- "I love MIS because I am a problem solver. I … welcome a challenge."

Creativity
- "[O]pportunities to think outside the box."

Social interaction
- "It is a career where you sit behind your desk for forty hours a week. No interactions with other people."
- "[T]here is a lot of interaction with people—which I have always enjoyed."

Helping others
- "I'm not sure if I would want to make a career out of informational systems. I would want my career to be much more involved. I would want my career to help people. I think MIS would just keep me behind the scenes."

Importance/Utility to business
- "I think that it is an integral part to any medium or large business' success."
- "It is very much needed in business."

Image/Reputation
- "MIS is an impressive field [that] is constantly evolving. It seems like a foreign world to me, but I respect their knowledge."
- "I think it is a very talent[ed], very useful major! … People may say it is 'nerdy,' but these people are extremely talented."

Change
- "I have a tendency to get bored easily. The field of MIS is one that is constantly changing—there is never one 'right' answer; there are right answers for that moment in time, but tomorrow it could be something completely different, and that's what I find so intriguing. There is always something new to learn, and apply."
- "Too volatile to change and, therefore, students only receive time-constrained education, which is quickly out-of-date."

Discussion of smiFactors for MIS

As indicated above, some categories of responses, including job prospects and self-efficacy beliefs, are consistent with prior research. Our research also includes additional categories that represent smiFactors. Some are consistent with the few studies on MIS summarized in the third category of Table 1; some add to that set. Within a business school curriculum, only two categories, link business and technology and focus on technology, are specific to MIS. Based on the theory of planned behavior, it is essential for researchers and academicians responsible for MIS programs to understand student perceptions of not only these two categories but also the other categories representing interests in the subject matter, as well as the previously identified categories of job prospects and self-efficacy beliefs. Since our primary contribution to the literature is the confirmation of smiFactors and identification of new ones, we focus the discussion that follows on the smiFactors in Table 2.

Table 3 shows the smiFactors for MIS that emerged from our study, corresponding categories from prior studies of MIS students, and the corresponding six RIASEC types plus prestige from the literature on vocational interests. Examination of Table 3 shows that our study confirms several categories of interest, but does not confirm one category, satisfying a desire to travel, which is found in prior studies of MIS and not clearly associated with a vocational interest category. Furthermore, our study does not confirm one category—using managerial skills—that is found in prior studies of MIS and within the Enterprising category of vocational interests.

Table 3: smiFactors for MIS from Our Study and Others		
Our Study	**Prior Studies of MIS**	**Vocational Interests***
Practical application of course work		*Realistic*
Challenge/Problem solving	• Using problem solving skills • Having challenging work	*Investigative*
Creativity	Being creative	Artistic
• Social interaction • Helping others	• Using interpersonal and communication skills • Helping others	Social
Importance/Utility to business	• Satisfying an interest in business organizations	Enterprising
	• Using managerial skills	
Focus on technology	Satisfying an interest in computers and technology	*Conventional*
Image/Reputation	Having prestige associated with IT	Prestige
Categories Additional to Vocational Interests		
Change—perceived daily variety		
Link business and technology		
	Satisfying a desire to travel	

* The U.S. Department of Labor [2009] uses the RIASEC categories in italics to describe the work environment and interests of computer systems analysts.

Our study identifies three categories of interest not found in the prior studies of MIS students we reviewed. Practical application of course work emerged as one of those categories. Two categories that emerged were not found in prior studies of either MIS or vocational interests: (1) change—perceived daily variety and (2) link business and technology. The discussion of the broad outcome category of change below leads to our refining this category to focus on the specific change aspect of perceived daily variety. The second of these two outcome categories—link business and technology—is a unique outcome associated with the MIS major, particularly as perceived by students in a business school. It extends two other interests—focus on technology and importance/utility to business—through explicit recognition of the linking of the two. We discuss this interest category more completely below.

Practical Application of Course Work

Although it was not reported in prior studies of MIS, this interest is consistent with the Realistic category of vocational interests. Holland [1996] notes that realistic occupations, which fit individuals having realistic interests, involve concrete, practical activity. Extending that practical focus to college students, we found that applying course work in practical settings outside the classroom made the MIS and other majors interesting to students.

Change

The challenge/problem-solving aspects of change, which requires MIS majors to constantly learn and investigate new things, are represented in our responses. Personal interest in addressing challenges or solving problems is consistent with the RIASEC Investigative category, as noted above. This aspect of change is represented in another category, viz., Challenge/Problem solving.

Our responses also indicate there is a perception that volatile change makes an MIS major's knowledge quickly obsolete. The perceived risk of obsolescence associated with majoring in MIS could be considered a financial risk, since obsolescence could limit employment and, thus, income. The financial risk aspect of change is represented in the job and career prospects categories.

To some extent, personal interest in variety, another aspect of change inherent in our responses, could be considered contrary to the RIASEC Conventional category, which has such descriptors as orderly, predictable, and routine. Holland [1996] notes that the Artistic category avoids routines; thus, to some extent variety could be considered an outcome of interest consistent with the Artistic category. An outcome of greater variety in a job and career would satisfy a preference for variety. An assumption that all students have an interest in variety is consistent with the job design literature that recommends greater variety in a job to yield greater intrinsic motivation and satisfaction [Armstrong, 1999]. Those who have higher growth need strength are likely to have even greater interest in a major with greater variety [Loher et al., 1985]. This line of reasoning suggests that a major perceived to have repetitiveness or little variety is likely to have little interest. Thus, even if interest in variety is highest for the Artistic category and lowest for the Conventional category, the perception of repetitiveness or low variety in a job or career could be associated with low interest, regardless of RIASEC category.

One of the job and career prospect categories, Variety of jobs/career paths, addresses the long-term nature of variety throughout a career, but it does not address the short-term nature of daily variety or its opposite, repetitiveness, which is related to boredom, as indicated in this response about a major: "actually practicing it could be boring and repetitive." Based on the reasoning above, lack of daily variety helps explain what students mean when they say that a major or career is not interesting. Thus, we suggest that this aspect of change, perceived daily variety, is a valuable extension to understanding interest or lack of interest in the subject matter of a major.

Although this aspect of change is similar to job scope (i.e., the variety of skills, tasks or jobs performed), the discussion above suggests that it differs from job and career prospects, where we had originally placed job scope. We further suggest that perceived daily variety provides a clarifying extension to the description of job scope [Scott et al., 2009], which should be used in future research.

Link Business and Technology

Linking business and technology is the quintessential characteristic of the MIS major. Downey, McMurtrey, and Zeltmann [2008] recommend that the MIS curriculum provide a core foundation in both business and IT. Those working on developing a revised model curriculum for IS undergraduates [Topi et al., 2008] specify four main categories of knowledge and skills that are in the core of the IS discipline, including the following: identifying and designing opportunities for IT-enabled organizational improvement. This category focuses on the ways an organization can develop its capabilities using information technology. Among others, these include: (a) ensuring alignment between IT strategy and organizational strategy and (b) improving organizational processes with information technology solutions. The model curriculum also specifies that IS graduates need knowledge and skills related to the domain in which the core knowledge and skills can be applied. The most common domain is business. George et al. [2005] recommend changing the introductory IS course content so that it focuses more on why the technology is valuable to an organization rather than on what the technology is or how it works. Included in their recommendation are topics on how information systems influence organizational competitiveness and how various types of information systems support operational, managerial, and executive-level processes.

Linking business and technology is a focus of our MIS major that is consistent with the reality of an MIS career. In a brainstorming session in April 2009, members of our MIS Advisory Board helped us identify ways to recruit students to our program and the information systems profession. Subsequently, we asked members to rank the ideas generated in that brainstorming session. The results show that one of the most highly ranked items is to emphasize business–technology problem solving.

Not only is this linking of business and technology the focus of MIS majors, it is an important issue for those that hire them. In the most recently published survey of most important issues for IT executives who are members of the Society for Information Management (SIM), IT and business alignment and building business skills in IT are the top two issues [Luftman, Kempaiah, and Rigoni, 2009]. Indeed, Luftman and Kempaiah [2007] note that aligning IT and business has been a pervasive issue for decades.

Four Types of Interventions

Studies motivated by the decline in MIS enrollments [e.g., Downey et al., 2009; Scott et al., 2009; Akbulut et al., 2008; Walstrom et al., 2008; Granger et al., 2007; Looney and Akbulut, 2007; Zhang, 2007; Lee and Lee, 2006; George et al., 2005] offer numerous suggestions for addressing the decline. For example, previous researchers have suggested various ways to increase knowledge of MIS (since lack of knowledge about MIS has been a frequent finding). To illustrate, students and their parents (who have been found to influence students' choice of a major) could be educated on the variety of opportunities in IT, job availability, and salary via posting such content on the Web, distributing it in brochures, and e-mailing promotional materials.

We add to the wealth of suggestions on coping with enrollment issues by building on our empirical findings and theoretical model. Our empirical results confirmed and identified interest categories that more fully explain student interest in the subject matter of MIS. We suggest below how to use our findings and the theoretical model of Figure 1 to address enrollment issues. Specifically, we discuss four types of interventions and related research that would be appropriate for educators and researchers to consider.
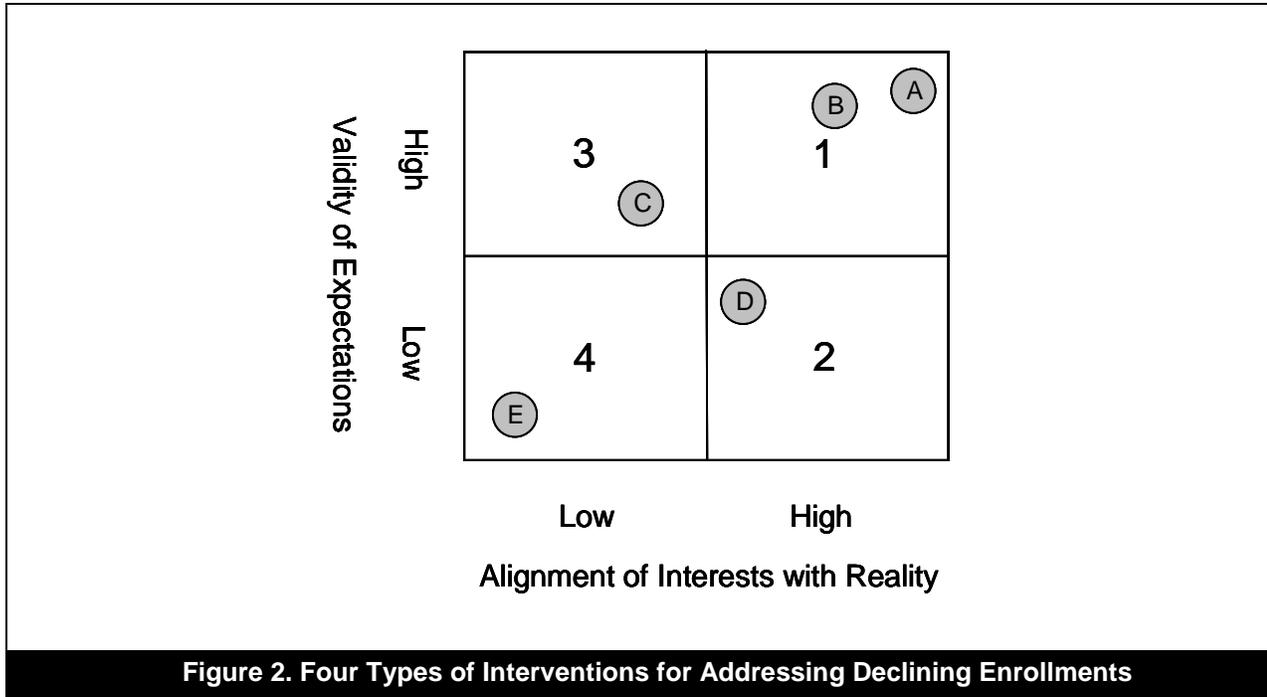

Figure 2. Four Types of Interventions for Addressing Declining Enrollments

Recall from the theoretical model in Figure 1 that interest in the major is determined by the fit between important preferences (or personal interests) and expected outcomes. Using these two elements, Figure 2 presents a framework for classifying interventions into the four types. The horizontal axis represents how well a student's personal interests (or important preferences) are aligned with actual outcomes associated with a major. The vertical axis represents how closely actual outcomes match a student's expectations of outcomes associated with a major. The relative positioning of various majors for a student is shown in the lettered circles. In the upper right-hand quadrant, student preferences are highly aligned with reality and student expectations of outcomes are highly valid. More than one major (represented by A and B) may provide such a fit for a student, with Major A providing a better fit as shown. Therefore, a student may not major in MIS (B) even if it is a good fit because some other major (A) may be a better fit. Table 4 provides an overview of the four types of interventions associated with these four quadrants as applied to the MIS major.

Quadrant 1 students have valid information about the major that is well-matched with their preferences. Type 1 interventions are located here and should focus on addressing reasons that these students are not majoring in MIS. These reasons could include perception of a better alignment with another major, the existence of powerful referents (such as parents, friends, etc.) that discourage majoring in MIS, or the high switching costs to change majors (e.g., delayed graduation date). Some Type 1 interventions could focus on increasing or reinforcing awareness that the student's interests have a high degree of fit with MIS. Other interventions could include communicating directly with powerful referents or altering the curriculum to address the cost of switching without disadvantaging the student.

Table 4: Four Types of Interventions			
Type (Quadrant)	**Student Attributes**	**Why Not MIS Major?**	**How to Address?**
1	Ideal MIS student: • Correct expectations about outcomes of MIS major and career • Important preferences matched by reality of MIS major and career *Primary Target*	• Student believes another major is a better fit • Tough to switch powerful referents (e.g., parents) who do not encourage (or even discourage) MIS as a major • High switching costs	• Provide counseling to reaffirm fit • Raise visibility of MIS and emphasize smiFactors (which may raise the student's self-perception of the importance of these factors) • Educate powerful referents • Reduce switching costs; e.g. accommodate switched majors by upperclass students (which may require prior curricular change)
2	Latent MIS major • Incorrect (or lack of) understanding of MIS major and career • Important preferences matched by reality of MIS major and career *Easiest Conversion*	• Student does not know what MIS involves • Student's lack of understanding of the reality of MIS masks matching interest	• Disseminate correct information about the field • Illustrate excellent fit on smiFactors (e.g., in introductory-level class)
3	Challenging MIS convert • Correct expectations about outcomes of MIS major and career • Important preferences not aligned with MIS *Not Interested*	• Student understands what an MIS major and career involves but is not interested in it	• Career counseling to increase awareness of smiFactors • Alter the student's preferences to increase interest in smiFactors for MIS • Accept that student may not be good fit for major
4	Most challenging MIS convert • Incorrect (or lack of) understanding of MIS major and career • Important preferences not aligned with MIS *Poor Fit*	• Student does not know what MIS involves and would not be interested in it	• Disseminate correct information about the field, and alter the student's preferences to increase interest in smiFactors for MIS • Accept that student may not be good fit for major

A career counseling program that helps students reaffirm that their smiFactors are aligned with MIS and confirms that they have valid expectations of the outcomes of a major and career in MIS would be an example of a Type 1 intervention. Table 5 includes statements about interests, including smiFactors, that we suggest represent the reality of an MIS major and career. Our knowledge of the field suggests that the outcomes in Table 5 are consistent with the reality of an MIS major and career. Other researchers may wish to confirm that. In the meantime, educators seeking to address enrollment issues and willing to accept the outcomes in Table 5 as reality could use those to design a Type 1 intervention that helps students recognize that their smiFactors are aligned with MIS. Consider the student with this understanding of interests and expected outcomes for an MIS major:

MIS seems like a good major to study if interested in developing technological and computer skills and applying those skills to business.

Building on Table 5, if this student's important preferences include helping others in business succeed through developing creative solutions to challenging problems by linking business and technology, then this student's

Table 5: Reality of MIS Major and Career	
Interest Category	**Actual outcomes:** Our experience leads us to believe that those in an MIS major or career would agree or strongly agree with these statements about themselves or their field.

Job/Career prospects, including salary
    Variety of jobs/career paths
    Job availability
    Employment security
    Advancement opportunities
    Salary
	My job/career prospects are positive.
	[Note that agreement with this statement or statements about specific prospects will vary with economic conditions.]

Self-efficacy beliefs	I have the ability to succeed in this field. [We believe that those who do not agree with this statement are likely to avoid or leave the field.]

smiFactors
    Interest in subject matter-specific to MIS (within business school)
        Technical focus
        Link business and technology
    Interest in subject matter—not specific just to MIS
        Practical application of course work
        Challenge/Problem solving
        Creativity
        Social interaction
        Helping others
        Importance/Utility to business
        Image/Reputation
        Change—perceived daily variety
	
	I have a focus on technology
	I link business and technology
	
	I have opportunities to apply course work*
	I regularly solve challenging problems
	I regularly use creativity in solving problems
	I regularly interact with others
	What I do helps others succeed**
	My work is essential for business success
	I am well regarded by others where I work
	What I do varies from day to day

*   This statement is more appropriate for students and those who were recently students than for those working in an MIS career for some time.
**   This statement is more appropriate for those working in an MIS career than for MIS students.

smiFactors would be aligned with the reality of an MIS major and career. Helping this and other such students strengthen their awareness that their interests are aligned with MIS should attract students who will find that MIS is a "good major to study."

Quadrant 2 students have preferences that are aligned with the actual outcomes of an MIS major and career, but they do not expect that majoring in MIS will lead to such outcomes. For these students, a Type 2 intervention would be most appropriate. Such an intervention focuses on changing a student's knowledge or expectations about the outcomes associated with an MIS major or career primarily by providing valid information. For instance, a student's important preferences may include helping others in business succeed through developing creative solutions to challenging problems by linking business and technology. However, this student does not believe that he or she would be involved in such activities in an MIS major or career. The goal of a Type 2 intervention would be to have the student accept that an MIS major and career would satisfy his or her preferences. Such an intervention could apply to students with little knowledge of MIS as well as those with incorrect perceptions. Results from research cited above, as well as our own empirical results, tell us that many students are uninformed or misinformed about the outcomes associated with an MIS major and career. To illustrate the latter, we noticed that most responses that mentioned social interaction expected MIS majors and careers to have little social interaction. Our belief is that the perceptions of many students on this and other outcomes are not consistent with the work of business systems analysts with whom we are familiar. Besides educating students on the variety of opportunities in IT, job availability, and salary, as suggested in prior work, an important contribution of our research is to suggest that a Type 2 intervention should also focus on addressing incomplete or invalid information about smiFactors.

For students in Quadrant 2, Type 2 interventions that debunk the myths and misunderstandings which they have about MIS would move them to Quadrant I, where Type 1 interventions would then be appropriate. An example of a Type 2 intervention would be one that dispels the myths that MIS majors are "techno-geeks" who do not interact with other people and that all MIS jobs are being outsourced. Through changing their perceptions of MIS, we are more likely to encourage these students to major in MIS. Another example of a medium for providing this information is the

introductory level MIS course, through which students can learn more about the expected outcomes of a career in MIS.

A Type 3 intervention is appropriate when the student's preferences do not match the reality of an MIS major and career. Consequently, a Type 3 intervention focuses on making affective changes, i.e., changing important preferences.

Students in Quadrant 3 have valid information about the characteristics of the MIS major. However, their preferences do not align well with the career outcomes available to the MIS major. For instance, the opening quote of the paper, by the accounting major, indicates a valid understanding of MIS as having many opportunities, but a lack of fit on smiFactors. To address these students, interventions could focus on altering the student's self-perception of the importance of each factor, thereby moving the student to Quadrant I. For some students, a career counseling program that helps them identify their important smiFactors (perhaps through the use of batteries of tests) may serve to highlight factors that are congruent with the reality of an MIS major and career. For instance, a psychological test may reveal a service orientation that fits the smiFactor of helping others. Students for whom such realization occurs perhaps were simply unaware of latent interests that mesh well with MIS.

An example of a Type 3 intervention at our university is a one-credit-hour course which exposes the students to MIS career opportunities at a number of companies in the vicinity of the university through site visits and conversations with MIS professionals. Some of these site visits include experiential exercises that can serve as a vehicle for altering self-perceptions of smiFactors. For instance, students' experience with a simulated business analysis activity onsite may develop a preference (or create awareness of a latent preference or increase the importance of a preference) for problem solving. The required introductory-level MIS course, which all business majors are required to complete, could also serve as a Type 3 intervention. Suggestions to change the introductory MIS course include recommendations to change the content as well as the person delivering the course [e.g., George et al., 2005]. Presumably, these changes will attract more MIS majors. A mechanism for attraction is to raise students' interest in the subject matter. Students whose interests may not have originally included a desire to link business and technology may learn that their other smiFactors, e.g., creative problem solving and helping others, can be met in a major and career that does link business and technology. In addition, they may learn to value linking business and technology through the course's focus on why technology is valuable to an organization.

Quadrant 4 students are missing valid information and lacking fit with smiFactors for MIS. For these students, correcting the validity of the information is paramount, followed by addressing the importance of the various preferences and associated outcomes. Thus, a Type 4 intervention focuses on making both affective and cognitive changes, i.e., it focuses on changing both student preferences (and the importance of those preferences) and the insufficient or inaccurate information (i.e., expectations of outcomes) the student may have about an MIS major and career. In practice, a Type 4 intervention is likely to be a sequence or a synergistic combination of Type 2 and Type 3 interventions.

There is some risk in spending resources to target students in Quadrants 3 or 4, as the apparent misalignment between reality and their interests implies that even valid information may not be sufficient to stimulate nascent interest regarding an MIS major and career. It is also possible that students in these quadrants would be less effective as MIS students. For these students, it is likely that other majors and careers are more closely aligned with their interests and abilities. As such, we would expect that effort and resources spent in their recruitment to be far less productive than efforts to recruit students from Quadrants 1 or 2.

Future Research

We recognize that our sample limits the generalizations that can be made since it consists of undergraduate business students at a single university in the Midwest U.S. However, the results confirm all but two smiFactors for MIS (viz., interest in travel and using managerial skills) found in a limited set of prior studies related to interest in MIS. In addition, we have identified three additional smiFactors for MIS, i.e., practical application of course work, daily variety, and linking business and technology. Thus, our results provide a richer understanding of the preferences and outcomes involved when a student says that the subject matter of MIS is interesting or uninteresting. Replicating our confirmation of interests and our finding of the additional interests associated with the subject matter of MIS would be one direction for future research.

Alternatively, future researchers may cautiously rely on our findings to provide them with a more complete set of interest categories than those summarized from prior research. For students to be interested in choosing MIS as a major, outcomes must satisfy important preferences. The categories confirmed from prior research and those newly identified in our study define a domain of interests associated with an MIS major or career. They provide a foundation for understanding what students mean when they say that they are interested (or not) in MIS broadly.

More to the point of this study, the smiFactors provide a more complete foundation for understanding what they mean when they say they are interested (or not) in the subject matter or specific work content of an MIS major and career. Rather than conducting additional research to discover relevant categories of interest, others may use our categories to conduct research or attempt interventions with individual students or larger samples.

What types of intervention are more effective and efficient at increasing MIS majors with interests aligned with reality and valid expectations?

Future research could address this question by using our findings, the model we presented in Figure 1, and the kinds of interventions suggested by Figure 2 and Table 4. If lack of interest in MIS is fully developed and virtually unchangeable, such that Type 3 and 4 interventions are ineffective, we are limited to attracting students whose interests (i.e., preferences and importance of satisfying those preferences) are aligned with the reality of an MIS major and career before any intervention, i.e., students in Quadrants 1 and 2 in Figure 2. If interests are not fully developed but are still forming and malleable, we have an opportunity to attract a wider set of students, i.e., those students also in Quadrants 3 and 4.

Given our observation of students trying to decide on a major, we would argue that both cognitions (i.e., expectations of outcomes) and affect (i.e., preferences and importance of those preferences) are changeable, particularly in students who have yet to decide on or declare a major, as well as the many students who change majors. Thus, all four types of intervention should be effective at influencing student interest in the MIS major. We suggest that interventions would be most effective and efficient with undecided students, including those who have declared a major but are not sure that it is right for them. Within this population we suggest further that those students in Quadrant 1 with interests aligned with the MIS major would be easiest to recruit. Finally, we suggest that the next easiest group to recruit would be students in Quadrant 2 with interests aligned with the MIS major. Thus, we propose that Type 1 interventions are most effective and efficient, Type 2 interventions next most effective and efficient, and Types 3 and 4 interventions lower in effectiveness and efficiency. To attempt to increase MIS majors and evaluate the effectiveness and efficiency of interventions designed to do that, educators and researchers must design and implement interventions and the research to evaluate the effects of the interventions.

Designing an intervention that leads to more MIS majors, as noted in the discussion of the four types of intervention, requires developing in students (1) important preferences that align with the reality of an MIS major and career and/or (2) expectations that their important preferences will be satisfied by an MIS major and career. Rommes et al. [2007] note: "Adolescents are in the process of developing an image of the kind of person they are and would like to be, and the kind of activities that fit with that image .... This self-image of who the adolescent perceives him/herself to be (or would like to be) is compared with the adolescent's perception of an occupation—a perception that is often (at least partially) stereotypical." Based on this explanation, expected outcomes of an MIS major and career, in conjunction with the student's self-image, i.e., preferences for outcomes and importance of meeting those preferences, lead to the student's interest in the MIS major.

Inaccurate or insufficient information is a major reason that an individual would rule out, or not consider seriously, many occupations that might well fit with the individual's self image [Eccles, 1987]. Future research could be designed to examine the effect of efforts to change cognitions by providing better information on the various outcomes associated with an MIS major and career, i.e., Type 2 and Type 4 interventions. This research needs to extend the model in Figure 1 to identify factors leading to expectations of outcomes. For example, other factors in the TPB model, particularly subjective norms and perceived behavioral control, could suggest factors influencing expected outcomes. To illustrate, powerful referents (e.g., parents) may exert subjective norms, which influence intention to choose a major, but they may also influence student expectations of outcomes.

Future research could also examine the effect of attempts at affective change, i.e., Type 3 and Type 4 interventions that attempt to change student preferences and the importance of those preferences. Designing this research would involve extending the model in Figure 1 to identify factors leading to personal interests, i.e., factors leading to preferences and importance of meeting preferences. Dik and Hansen [2008], which could be used as a resource when designing such research, refer to a number of theories that explain interest. Other factors in the TPB model, particularly subjective norm and perceived behavioral control, may also suggest factors influencing preferences and importance of satisfying preferences.

To complete the suggestions for future research on the effectiveness and efficiency of interventions, research could examine the effect of attempts to change or reinforce student interest in MIS compared with other majors. Type 1 interventions clearly focus here, but interventions in the other quadrants of Figure 2 could also include such attempts. The focus of this research includes addressing not only cognitive understanding of and affective

orientation toward MIS, but also cognitive and affective comparisons of MIS with other majors. This research may examine interventions that first attempt to move students to Quadrant 1 and then attempt to change or reinforce student interest in MIS compared with other majors.

One other direction for future research that has the potential to influence many individuals seeking to understand the reality of an MIS career is related to the RIASEC categories used to describe MIS. An implication from Table 5 is that MIS graduates serving as systems analysts have a work environment that satisfies a broader set of interests than the three RIASEC categories (Realistic, Investigative, and Conventional) used by the U.S. Department of Labor to describe computer systems analysts. As indicated above, we would expect research to confirm the outcomes in Table 5. Since our findings indicate similarities with and finer-grained specification of the categories used in studies of vocational interests, our findings could be used to guide the development of future research focused on addressing the validity of the description of reality for MIS graduates used by the U.S. Department of Labor.

V. CONCLUSION

Our research has focused on developing a more complete understanding of the most influential factors affecting choice of an MIS major, i.e., understanding smiFactors for MIS. We have identified a specific smiFactor for an MIS major and career: linking business and technology. We have also identified two smiFactors that apply to MIS and other majors: perceived daily variety and practical application of course work. Furthermore, we have confirmed a number of smiFactors identified in a few prior studies with a limited set of MIS and non-MIS students: challenge/problem solving, creativity, social interaction, helping others, importance/utility to business, focus on technology, and image/reputation. Finally, we have related these finer-grained interests to broader vocational interests; e.g., practical application of course work is a specific example of an interest that is consistent with the broader Realistic category of vocational interests.

Our primary contribution to the wealth of suggestions for addressing declining MIS enrollments found in prior research is that the smiFactors we identified and confirmed should be used to help students more fully understand their interest in the subject matter of MIS. We have used the interests found in our empirical analysis to suggest the outcomes associated with those interests in an MIS major and career, i.e., the reality of an MIS major and career. We suggest that this reality for MIS graduates includes helping others in business succeed through developing creative solutions to challenging problems by linking business and technology.

Furthermore, we have gone beyond previous suggestions for addressing declining enrollments by categorizing interventions designed to increase MIS majors into four types: (1) confirm, reinforce, or raise the awareness of student interest in MIS in comparison with other majors, (2) develop valid student cognitions regarding the outcomes resulting from an MIS major and career, (3) align important student preferences with the reality of an MIS major and career, and (4) both align student preferences with the reality of an MIS major and career and develop valid student cognitions regarding the outcomes resulting from an MIS major and career. Educators should consider which interventions to pursue. We suggest that Type 1 and 2 interventions will be most effective and efficient, particularly with students who are not sure of the major that is right for them. To appeal to a wider population of students, educators should also consider Type 3 and Type 4 interventions.

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Editor's Note: The following reference list contains hyperlinks to World Wide Web pages. Readers who have the ability to access the Web directly from their word processor or are reading the paper on the Web, can gain direct access to these linked references. Readers are warned, however, that:
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APPENDIX: SURVEY QUESTIONS

1. What major(s) have you chosen? (If you know one or more majors that you will declare but have not yet done so, include those.)

2. Why did you choose your particular major(s)? If you have not yet decided on a major, describe what is going through your mind, and what you think would help you decide.

3. What makes your chosen major(s) interesting to you? (If you have multiple majors, please discuss each major individually.)

4. Think of a major that you are the least interested in. What is that major and what makes it less interesting to you?

5. What are the most important outcomes or results you believe you will obtain from your major(s) and your career?

6. What is your opinion of Management Information Systems as a major?

7. What is your opinion of Management Information Systems as a career?

Similar additional questions were also asked about another major to avoid identifying MIS as the area of most interest. MIS majors were asked about a different major in place of questions 6−7 above.

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