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How I Became IS: Understanding the Major Decision

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ABSTRACT

For over a decade, the IS discipline has been struggling to increase student enrollment. The enrollment problem is exacerbated by the fact that females/minorities are graduating college in increasing numbers and the IS discipline has historically attracted white males. This study assesses the effectiveness of the many enrollment interventions recommended in the IS literature by reporting on how and why students, who have been exposed to a plethora of enrollment interventions during their college career, become IS majors. Addressing the differences between white males and females/minorities, this study provides rich and contextual insight to the IS enrollment literature and finds that IS programs need to emphasize that students do not need a technical background to become IS majors and to promote IS as a second choice for students struggling in degree programs like computer science that do require a technical background. IS programs seeking to implement enrollment interventions into their curriculum will benefit from this study.

Keywords: major choice, intervention, enrollment, and minority

INTRODUCTION

Technology fields like IS are struggling to attract more students to fulfill current and future job market demands (Koch and Venkararaman 2011). While the US Bureau of Labor Statistics lists jobs requiring an IS degree as some of the fastest growing between now and 2018 (United_States 2010-2011), Figure 1 shows that the number of bachelor degrees in computing related disciplines like IS continues to decline, and are especially unpopular among females. Thus, there is a problem with growing demand for graduates in IS related disciplines and declining numbers of graduates for those positions. With the majority of college graduates in all disciplines now female (Figure 2) and minority students constituting a greater proportion of these graduates (Figure 3), the IS field needs to find ways to attract this growing pool of graduates in order to meet future demand for employees.

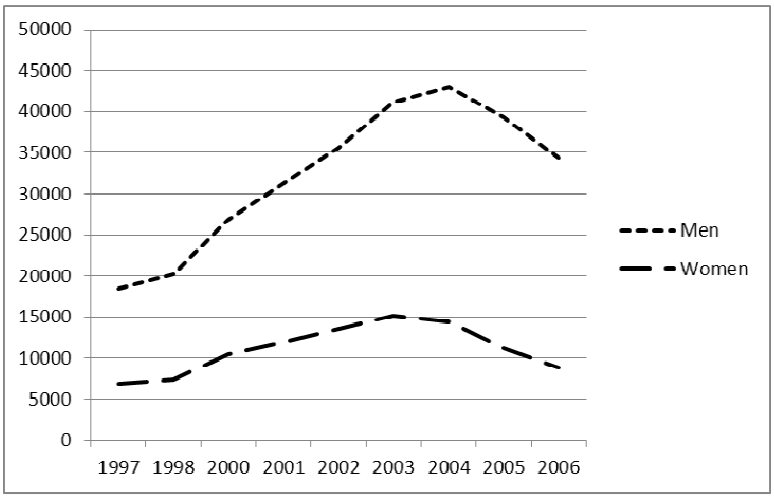

Figure 1. Bachelor Degrees in Computing-Related Disciplines by Gender 1997-2006 (National_Science_Foundation 2009)

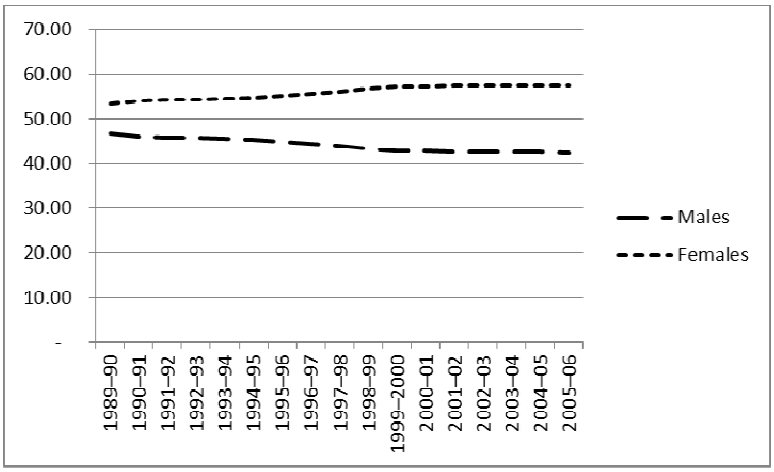

Figure 2. Percent of Bachelor's Degrees by Gender; All Disciplines (US Department of Education 2007)

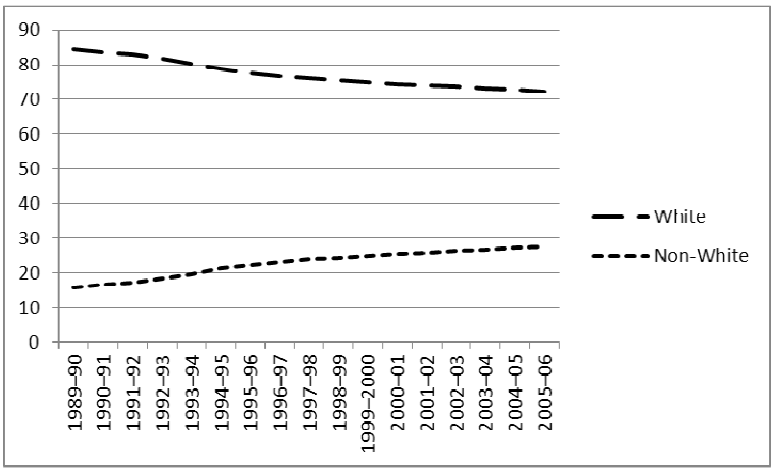

Figure 3. Percentage of Bachelor's Degrees by Ethnicity; All Disciplines (US Department of Education 2007)

To address the IS enrollment crisis, researchers have been investigating factors influencing students' decisions to major in IS (e.g., Downey et al. 2009; Lee and Lee 2006; Scott et al. 2009; Walstrom et al. 2008). These studies primarily survey undergraduates using the Theory of Reasoned Action or the Theory of Planned Behavior to determine factors influencing their decision to choose IS or another major (Heinze and Hu 2009; Trower et al. 1995). A few studies in this stream investigate factors attracting or impeding minorities' (Lent et al. 2008) and young females' choice to major in a computing discipline (Adya and Kaiser 2005; Beyer 2008; Grant et al. 2007).

Based on these findings, many studies suggest interventions for increasing IS enrollment (e.g., Granger et al. 2007a; Scott et al. 2009), including placing good teachers in the introductory IS classes, communicating opportunities in the major like high salary and job opportunities, and exposing students to IS professionals (Granger et al. 2007a; Looney and Akbulut 2007; Scott et al. 2009). While several IS programs have implemented all or some of these interventions and report positive effects on enrollment (Firth et al. 2008; Koch et al. 2010), we know little about which interventions are the most effective and even less about how females/minorities respond to the interventions compared to white males. The purpose of this paper is to close these gaps in the literature by interviewing and surveying students who have been exposed to a plethora of IS enrollment interventions during their college career. Our specific research questions are:

- How do students make the decision to major in IS?
- What factors are the most relevant to a student's decision to major in IS?
- What enrollment interventions are the most effective?

Based on gender and race comparisons, findings from this study will add insight into the most effective IS enrollment interventions and suggest strategies for increasing diversity in the IS field.

This paper is organized as follows. The paper explains the research method and the model of career choice that evolved from student journals and interviews. Findings from a survey of students are then presented and answers to the research questions are given. Based on the findings, the discussion suggests enrollment strategies for both increasing the number of IS majors and increasing diversity within the major.

RESEARCH METHOD

To answer our research questions, we conducted a case study of an undergraduate IS program at a 4-year private institution. The program had implemented many IS enrollment interventions since 2007. Therefore, participants in the study were exposed to these interventions through most of their college career and could probably provide good insight into which interventions were the most effective in their choice of major.

We followed a multi-method, phased research approach. Table 1 shows the three data gathering techniques employed and participant demographics. The journal participants were IS majors who completed the journal reflections as part of their enrollment in our IS leadership program. Our interview participants consisted of students pursuing an undergraduate degree in a computing field. The journal and survey respondents were IS majors. The journal reflections and interviews helped us delve into the highly personal and context dependent process of how and why each student chose the IS major (Walsham 1995). The survey allowed us to reach more students and assess our understanding developed from the interviews.

Phase	**Phase 1: Journal Reflections**	**Phase 2: Structured Interviews**	**Phase 3: Survey of IS Students**
Data Collection	Students submitted journals where they provided in depth answers to questions about how the chose the IS major	45 minute semi-structured interviews	Responses to 25 short-answer and Likert-scale questions
Date	1/2010	2/2010	5/2010
No of participants	7	22	65 (66% response rate)
Average Age			21.5
Freshmen/Sophomores			15 (23.1%)
Juniors			14 (21.5%)
Seniors			36 (55.4%)
Gender			
Male	3	6	50
Female	4	16	15
Ethnicity			
African American or Black	1	9	7
Asian		5	5
White or Caucasian	5	6	48
Hispanic or Latino	1	2	3
Other			2

Table 1: Research Phases and Participant Demographics

Data analysis was carried out by iterating between the empirical data, the theoretical lens, relevant literature, and the emerging process model (Eisenhardt 1989). We originally used open and focused coding to organize the journal and interview data in QSR N8 (Strauss and Corbin 1998). From the emerging data, we noticed that students become interested in

the IS major when a person or event sparks a sense of IS self-efficacy (i.e., a feeling that one is succeeding in the IS discipline or is good at IS). From there, students enter a decision making process that involved self-evaluation, defining outcome expectations, and addressing concerns. This process and these tentative categories solidified when we consulted the career choice literature and developed an understanding of social cognitive career theory[1] (Lent et al. 1994; Lent and Brown 1996). To tie the different elements of how students select the IS major with the IS enrollment interventions suggested in the literature, we developed an IS enrollment intervention framework (see Figure 5).

To subject our framework to challenges and insight from multiple perspectives, we shared these emerging interpretations with leaders in our IS student organization and members of USAA's and ConocoPhillips' IS recruiting teams. Using the framework we analyzed the interview and survey data yet again to identify empirical support for the various constructs in our framework and to begin answering our research questions.

CASE STUDY: IS ENROLLMENT INTERVENTIONS

Like IS programs nationwide, enrollment in our program fell steadily following the dot-com boom; by Fall of 2006, enrollment had reached an all-time low. There was a general lack of energy in the program, potential employers were not involved with the program, and we were attracting poor quality students. Inspired by the ideas shared at the 2006 ICIS Department Head's Breakfast and faced with fears of program merger; we began implementing interventions in 2007. The initial intervention was a large recruiting event that highlighted opportunities available to IS majors. After executing this event in March 2007, enrollment increase by over 200%. We then solidified our enrollment philosophy to include recruiting, retaining, and placing students. Table 2 highlights the enrollment interventions we have implemented.

RECRUITING INTERVENTIONS: highlights the positive aspects of pursuing a career in IS, primarily to pre-business students enrolled in introductory IS classes.
Information sessions to educate students, parents, and advisers on the opportunities in IS. • Presentations in pre-business classes • IS summit (recruiting event with dinner, awards, and prizes) • University information sessions for high school students • Annual "state of IS careers" address for advisers
Marketing material: posters, news coverage, electronic media, social media groups for IS majors, and brochures
Relational events: Focus on building relationships with underclassmen to make them aware of IS. This involves: • Booth at Business Majors Expo • Nominating an IS major for Homecoming Queen • Hosting a tailgate party
Scholarships
RETENTION/PLACEMENT INTERVENTIONS: focuses on making our IS majors very satisfied customers. We maintain the technical rigor of our program and provide social and career programs outside of the classroom.
Events: career development dinners, career panels, and end of semester parties
Mentoring: • Mentoring students as they participate in recruiting, interviewing, and evaluating job offers • Monthly newsletter about employment opportunities, career help, and IS events
Opportunities: competitions like Microsoft's Imagine Cup Competition, leadership awards, leadership class, and an active student organization
Relationship Building: Building relationships with potential employers so that they will recruit on our campus.

Table 2. Enrollment Interventions

[1] Additional detail regarding the theory, method, and findings is available from the authors. This was eliminated from this paper to meet AMCIS' space limitations.

Figure 4 shows the effects the interventions have had on IS enrollment. While all of our interventions were derived from suggestions in the IS enrollment literature, the literature is silent on which interventions are the most effective for increasing enrollment.

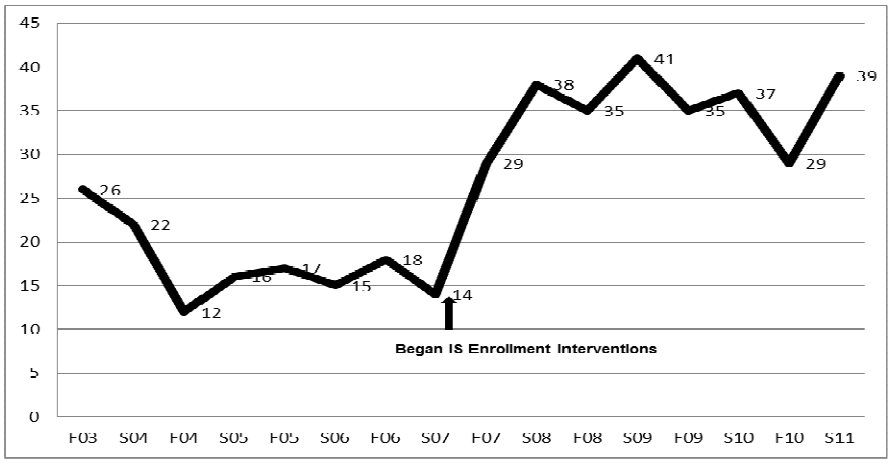

Figure 4: IS Enrollment-Students Taking first Class in the IS Major

DISCUSSION

The purpose of this case study was to answer three research questions. We will now address each research question in turn.

Research Question 1: How do students choose the IS Major?

Based on our qualitative data analysis, Figure 5 shows how students choose to major in IS. The figure suggests that feelings of self-efficacy (box 1) in an IS area peaks a student's interest about pursuing an IS major (box 2). Once this initial interest is formed, students will take actions to assess interest. These actions include seeking information (box 2a) to evaluate their ability to be successful in the major (box 2b) and to address their concerns about the major (box 2c). Students are likely to choose the IS major (box 3) if they find information that leads them to expect positive outcomes (box 4).

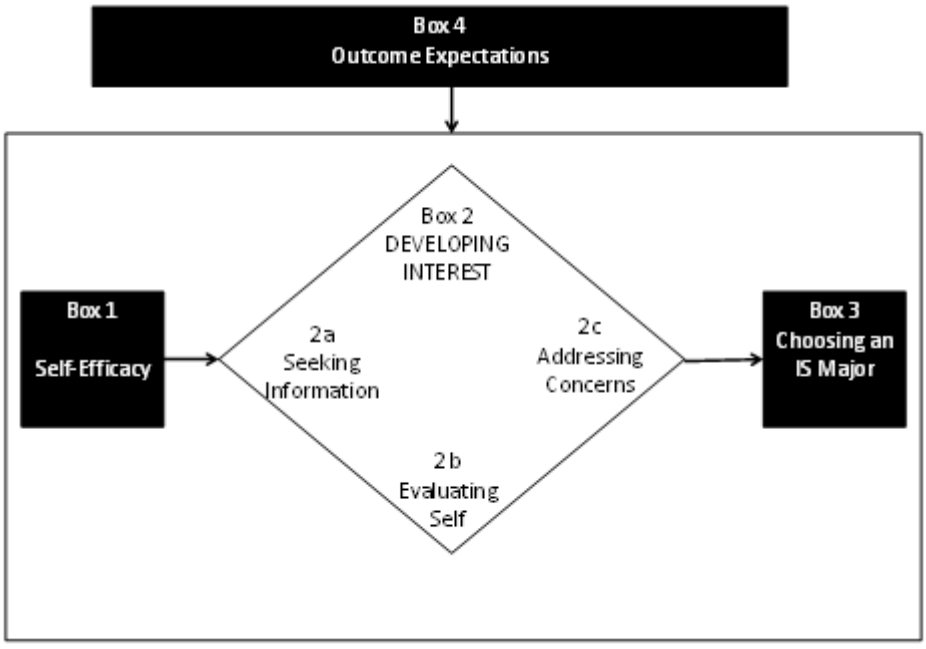

Figure 5: How Students Choose the IS Major

Research Question 2: What factors are the most relevant to a student's decision to major in IS?

Using Figure 5 above as a framework, this section discusses the most salient factors in a student's choice of the IS major. To better understand how to attract underrepresented groups into the IS field, we divide the analysis between white males and females/minorities.

Self-Efficacy (Box 1)

Self-efficacy can be increased by succeeding in an endeavor, observing others who are similar to you succeed, and social persuasion (Bandura 1994, Lent et al. 1994). The following quote from Chasidy, an African American female, shows how increased self-efficacy led her to major in IS.

> I first learned about IS from my professor [a Hispanic female]. I was doing well in the class and my professor commented that I had an analytical perspective on things and would do well in the IS major. I then went to the Summit, met some recent graduates, and got really excited about all the opportunities in IS. I talked to my parents about changing from pre-dent and they said if I have a passion for IT I can go far in the field.

Like Chasidy, our survey data indicates that many of our students chose the IS major because they were successful in the introductory class and their professor encouraged them to choose the major. These results indicate that IS professors have a strong influence on their students and should encourage outstanding students to consider the IS major. Females and minorities reported that IS professors highly influenced their decision to major in IS whereas white males reported that friends and acquaintances who were IS or CS majors influenced their decision.

Seeking Information (Box 2a)

Once a student becomes interested in the IS major, they begin seeking information. Our results show that the primary information source for both males and females/minorities is the web. Professor presentations followed in importance for white males. Females/minorities gathered their information from in-class lectures by young IS professionals and friends in the IS major. Other important information sources included brochures, posters, presentations by potential employers, and events.

The number one event for both groups was the IS Summit, an evening dinner and information session required for all students in our introductory IS class. During the Summit, students have the opportunity to meet current students and faculty members, and to hear brief presentations from recent graduates of our program and from recruiters.

Evaluating Self (Box 2b)

Prior to choosing the IS major, students evaluate their potential success by comparing their personal inventory of traits to the traits they think a successful IS major needs to possess. We found that both groups rated highly these traits that they thought IS majors need: learning about technology, using technology, and learning new things. In addition, both white males and females/minorities indicated that job availability and high salaries were critical in their decision to choose the IS major (high salaries were significantly more important to the white males – rated securing a high paying job 2nd, whereas it was only 14th for the females/minorities).

In addition, neither group indicates high confidence in math, science, or computer skills. To attract majors, our program emphasizes that students *do not need a background in IS* to excel. Furthermore, we have built relationships with the school of computer science and engineering and university advisors to promote the IS major as an alternative for students who are struggling in majors that require a technical background. A top IS major, who secured a $70,000 job upon graduating with her IS degree, said:

> I started out in pre-med and quickly realized that wasn't for me. It was so competitive and my grades were terrible. I then considered accounting but I chose IS after my IS 3305 class. After the IS intervention project, I was hooked and convinced that I wanted to do something like that the rest of my life. I didn't know the major existed until that class.

Addressing Concerns (Box 2c)

Before choosing the IS major, students address the concerns they have about majoring in IS major. Contrary to the literature (Dick et al. 2007; Granger et al. 2007b) which identifies job availability, outsourcing, and depressed salaries—lack of

technical skill confidence and the difficulty of the major topped the list for these students. The top concerns were: I couldn't program, I didn't know what to expect, and I wouldn't be technical enough. Other highly rated concerns included: I wouldn't be able to keep up with everyone else, the people in this field would be nerdy, the major would be too difficult for me, and the major would take too much time.

The following quote from our top IS major in 2010 reflects the concerns many of our students (both males and females) expressed before choosing the major:

> I had a stereotype for people who did this major. It was people who were tech savvy from the beginning, kids who had grown up coding. When I got in here and realized that it was a mix, that there are other people like me who didn't grow up knowing about computers, I felt a lot better. I am really competitive I don't like to do things that I am not good at. I was worried that if it didn't come to me eventually I would be stuck with this major. I really want to be good at what I do. I didn't want to bite off more than I could chew.

To attract more students to the IS field, IS programs should take action to show students what the IS field is really about. Currently, we have corporate recruiters and recent IS graduates make presentations about IS careers in introductory classes. We also assign projects that represent the type of work that IS professionals do. Many of our classes assign an IS intervention project, where students identify a business problem and recommend technology to address the problem. Other classes provide exposure to programming concepts like Excel and Word macros, Access database VBA scripting, SAP, and SQL.

Outcome Expectations (Box 4)

Over the years, our IS enrollment interventions have highlighted many positive attributes of the IS field. Our survey indicates that the number one characteristic of the IS field that appealed to females/minorities, and the third overall factor for white males, is that the field combines both business and technology. The number one factor for white males – there are jobs available in the field – is only ranked 7th for females/minorities, and one of the two factors in this list where the means differ at the .05 level. Other factors that ranked high for both groups include: long-term employment opportunities, opportunities to work with technology, good pay, many career opportunities, and opportunities to continuously learn.

It appears that the most effective messages for marketing the IS majors to students, in particular to females/minorities, emphasize the combination of technology and business, the variety of career options available, and the fact that employers will need people in this field in the future (job fairs and recruiter presentations could address both of these factors).

The survey shows that females/minorities rank project manager as their top career while white males rank consulting as their top career choice (systems analyst was the second choice for both groups). These preferences are consistent with the findings earlier that females/minorities desire jobs that provide a mix of technology and business skills. It is important to frequently emphasize that majoring in IS does not just prepare a student for a technical position but one that will utilize both their technical and business skills to solve business problems.

Research Question 3: What enrollment interventions are the most effective?

Based on the insights from our data and the first two research questions, this section provides suggestions on the most effective IS enrollment interventions.

First, IS programs need to design the introductory IS class so that students experience *self-efficacy*. This includes staffing the course with instructors that the students perceive as successful and similar to them; designing assignments that are challenging, yet possible for students to master and that demonstrate what our field is really about (going well beyond topics of Microsoft Office literacy); and creating opportunities to encourage students to explore the IS major. Professors can create these opportunities by talking with students one-on-one about majoring in IS, and inviting recent, successful IS graduates to speak about the opportunities in the IS field. Recruiting events focused on hundreds of students are not as effective as personal classroom presentations and one-on-one meetings.

Second, since students relied primarily on web *information* and the department's website to learn about the IS major, we suggest forming an AIS committee to encourage better web resources about IS careers. Some functions of the committee might include identifying and awarding IS programs with the best departmental website and creating a universal website that provides information about IS careers. The website's target audience should be college students interested in pursuing a degree in IS. Programs could then link to and refer prospective majors to the site.

Third, to attract majors, IS programs need to emphasize that IS majors do not need a *technical background* to begin our major. Our survey showed that students' belief that they must possess programming skills coming into the major is a considerable impediment to majoring in IS. Furthermore, IS programs should partner with related programs (i.e., computer science, engineering) that do require some technical knowledge to succeed in the program. The students who are struggling in those fields because their academic background is lacking often do very well as IS majors.

Fourth, the IS field needs to stay abreast of *student concerns* about the major and the most appealing characteristics of the major. For years, our enrollment interventions addressed what we thought the students were concerned about (i.e., job availability, outsourcing, depressed salaries, and being a nerd) (Granger et al. 2007b; Heinze and Hu 2009). However, our study suggests that job availability attracts students to the major yet they have to overcome their primary concerns about the major being too hard and their lack of technical abilities.

Most importantly, IS programs need to build career development activities into their *curriculum*. Most of the proposed interventions center around ensuring that IS majors secure jobs with prestigious companies and having these IS majors serve as ambassadors for the IS profession. Several curriculum changes are necessary to ensure this happens. To ensure the majors secure jobs, IS programs need to incorporate career development activities into the course requirements. The introduction to IS class needs to dedicate a day to IS careers, where young IS professionals talk about their careers in the IS field. Internship programs need to be developed or strengthened so that students have the opportunity to experience what the IS field is really like. Finally, IS departments need to put a faculty member in charge of career development by allowing the faculty to teach a course where these activities can be experienced. IS programs might consider making this part of the internship course or creating an IS leadership course where the faculty and students work on projects that assist with career development.

IMPLICATIONS

In addition to providing some practical steps programs can take to increase IS enrollment, this study enriches the IS enrollment literature in several ways. First, our study moves beyond prior research identifying the IS enrollment crisis (Granger et al. 2007b) and investigating factors affecting students' decision to major in IS (Downey et al. 2009; Lee and Lee 2006; Trower et al. 1995; Walstrom et al. 2008) by utilizing in depth, longitudinal research methods to understand how *current IS majors,* exposed to a variety of enrollment interventions, chose the IS major and the factors that most influenced their decision. Second, this study provides suggestions on effective enrollment interventions. Adding credence to studies suggesting that placing the best teachers in the introductory to IS class will increase enrollment (Firth et al. 2008; George et al. 2005), we found that large IS recruiting events (Koch and Kayworth 2007; Scott et al. 2009) are not as effective as a teacher encouraging his/her students to consider the IS major (Akbulut et al. 2008; Looney and Akbulut 2007).

Finally, while an entire body of literature investigates females in the IS field, very few studies investigate minorities. See Lent et al. (2008) for a notable exception. Our study is one of the first to investigate how and why females/minorities choose to major in IS. Furthermore, our research suggests that IS programs might be better off focusing on attracting students in general rather than explicitly trying to attract females/minorities. Adding credence to Beyer's (2008) study which found that female IS majors were more similar to male IS majors than female non-IS majors, our study found close similarities between females/minorities and white males in almost every area.

These contributions need to be considered in light of this study's limitations. First, the survey did not rely on or modify an existing validated instrument (Straub 1989). We found that most of the valid instruments used in IS enrollment studies were primarily designed to test the relationships between variables in a model. Since our goal was to assess the effectiveness of various enrollment interventions, we instead relied on journal reflections, interviews, and the literature to design the survey. We did however assess the survey's face validity and pilot test it with seven IS majors.

Second, the results are not necessarily generalizable across groups of students from other universities since our sample was drawn from a single university where a wide variety of interventions had already been tried. Nevertheless, we chose this setting for theoretical sampling reasons; the students in this study had been exposed to a large number of IS enrollment interventions during their college career and we wanted to assess the effectiveness of these interventions. Clearly this research is preliminary and future studies should develop and validate an instrument to assess the effectiveness of IS enrollment interventions across multiple universities.

CONCLUSION

This research provides some valuable empirical insight to guide efforts aimed at expanding the pipeline of IS majors. Relying on multiple methods to investigate students who had been exposed to a plethora of IS enrollment interventions, the research identifies how students choose the IS major, the factors most relevant to their decision, and the enrollment interventions that are most effective. Our empirical data indicated that self-efficacy related to IS leads students to assess their interest in the IS field, and based on a positive interest assessments choose the IS major. Contrary to previous research (Heinze and Hu 2009) we found that male and female students relied on similar information, considered similar factors in their self-assessment, and had similar concerns about the major. Based on this, we offer suggestions for designing effective enrollment interventions and suggest incorporating career development into IS curriculum. We hope this research motivates IS programs to take action to address the enrollment crisis. This is definitely needed, the world currently has a record number of unemployed college graduates (Coy 2011; Suzuki 2010) yet job prospects for IS majors remain bright (United_States 2010-2011).

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