

Connecting the Dots: Strategies to Recruit Computer Information Systems Students

Steven Leon
leonsm@appstate.edu

Jason Xiong
xiongjj@appstate.edu

Department of CIS and SCM
Appalachian State University
Boone, NC 28608 USA

Abstract

Business school students in Computer Information Systems (CIS) majors are empowered to meet the demands of Information Technology with both technical skills and business expertise. Competition from other college majors makes recruiting CIS majors in business schools challenging. This research improves the effectiveness of CIS recruitment programs by utilizing multinomial logistic regression (MNL) methodology. Data from an online survey with 145 respondents was analyzed to explore the factors that influence a student's choice of major, when the student chooses a major, and when a career field is chosen. Guided by Theory of Planned Behavior, the results of this research suggest that student's attitude, subjective norms, and perceived behavioral control each influence the choice of major, and when the college major and career field are chosen. Effective CIS recruitment strategies are developed and presented based on the insights obtained from this study. Limitations and future research are also provided.

Keywords: Computer Information Systems, CIS Recruitment, College Major, Pedagogical Research, STEM Education, Theory of Planned Behavior.

1. INTRODUCTION

The number of students who major in Information Systems (IS) has been cyclical since its inception as a college major in the mid-1970s. Businesses started to appreciate the importance of information systems when the ethernet was introduced in 1973, which resulted in more students majoring in IS. Strong enrollments in IS degrees was also seen in the mid to late 1990s as the emergence of the internet and B2C e-commerce services gained traction. The NSDAQ Composite index spiked in the late 1990s when many investors invested in any company that resembled a dot-com company. This resulted in a need for IS/IT talent. Interest in IT related majors peaked and then sharply declined in 2000-2002

time period when the dot-com bubble burst. A similar pattern was observed when the financial crisis of 2007-2008 occurred. After the dot-com bubble burst and the global financial crisis occurred, IT opportunities tanked, thus students majoring in IS/IT declined. In several instances universities have even eliminated their IS/IT degree programs.

More recently, emerging technologies like cloud computing, blockchain, artificial intelligence, and machine learning have started to change the dynamics and business activities of organizations and individuals once again (Panetta, 2017). Attracting students to Science, Technology, Engineering and Math (STEM) fields has never been more important. However, possessing only

technical skills is not sufficient. Business and management skills are also necessary, suggesting that the adoption and implementation of innovative information and communication technologies require both technical and business expertise. Computer Information Systems (CIS) students distinguish themselves by having strong communication, analytical, critical thinking skills, and leadership and collaboration skills (Mandviwalla, Harold, Pavlou, & Petrucci, 2017). Parks, Ceccucci, and McCarthy (2018) suggest that analytical skills, information technology (IT) skills, and communication skills are expected from new graduates. Therefore, Information Systems (IS), Computer Information Systems (CIS), and Management Information Systems (MIS) majors from business schools are ideal employment candidates for the 21st century since they have technology and business skills. While there are other college majors that compete with CIS students in the IT field, such as Computer Science and Computer Engineering, CIS majors bring valuable knowledge from multiple perspectives to the IT related job market.

Even though salaries are high and career opportunities are abundant, attracting CIS majors is a challenge for business schools and filling open IT positions with applicants that have technology and business knowledge is worrisome for employers. Based on the Information Systems Job Index report published in 2017 the salaries for CIS majors are significantly higher than other typical business majors. In a survey of 2,140 respondents in the United States, the average salary for employees with a CIS bachelor's degree is \$62,820, while CIS master degree employees average \$72,517 (Mandviwalla et al., 2017). In the United States, it is estimated that there are about 3 million available CIS and IS jobs. However, there are less than 1,300 IS related programs offered in business schools.

For many prospective and current college students, CIS job opportunities, career paths, and necessary IT skills are poorly understood. The CIS major and labor market are obscured by computer science and computer engineering majors and employment opportunities, thus the CIS major and CIS field face shortages of students and job applicants. If business schools are to effectively recruit CIS majors, it is wise not only to understand what factors influence the choice of CIS and other business majors, it is sensible to understand when students decide on their college major and when they decide on their career field.

If CIS departments are to attract students to CIS and grow the CIS major and to understand where the next generation of CIS talent will come from, it is imperative to identify the factors that influence a student's choice of CIS as a major and what influences students to choose other business majors. Moreover, it is also important to understand the timing of when students make their college major decision and when they decide upon their career, which are often overlooked. While there is a considerable number of students who choose to study business, few of them choose or are even aware of CIS and related majors. Therefore, this research intends to provide guidance to recruit CIS majors by answering the following research questions:

RQ1. What factors influence a student's choice of CIS as a major compared to other business majors?

RQ2. What factors influence when a student chooses a college major?

RQ3. What factors influence when a career field is decided?

Next, a literature review and theoretical framework follows. Then, the research methodology is discussed, along with the analysis and results. The paper concludes with a CIS recruitment strategy and conclusion sections.

2. LITERATURE REVIEW

The literature review examines previous studies related to college major choice, the timing of the college major selection, and when a career field is decided. It is interesting to note that many studies have been conducted surrounding the reasons why students choose college majors, though few have been conducted related to CIS. Further, research in the areas of when a major is chosen or when a career field is decided upon is nearly non-existent, especially in the area of CIS.

There are a number of reasons that affect whether or not students choose CIS as a college major. Interest has been identified as a key element to selecting CIS/MIS as a major (Ferratt, Hall, Prasad, & Wynn, 2010). Hodges and Corley (2016) examined gender in their study and discovered that personal image and genuine interest influence when females decide whether to choose a CIS major. Jung, Clark, Patterson, and Pence (2017) argue that viewing technology majors as "smart/intelligent" and "nerdy" may prevent female students from selecting CIS as a major. Positive attitude towards IT has also been

strongly associated with selecting IT related majors (Heinze & Hu, 2009). Turner, Bernt, and Pecora (2002) identified that social and familial influences have very strong impact on women choosing IT related majors. Further, Downey, McGaughey, and Roach (2011) suggest that the social and personal image of a CIS career, the major workload, and influences from family, friends, peer students, and professors are major reasons that business students do not select the CIS major. In addition, Walstrom, Schambach, Jones, and Crampton (2008) found that students did not select CIS as a major because it is "not what I wanted to do" and the "subject is not of interest." Additionally, Zhang (2007) found that gender, interest, family, and professors were influential in selecting an IS major. Last, students who choose CIS majors tend to have a strong interest in linking business with technology (Ferratt et al., 2010).

Previous research in non-CIS major selection studies has identified a number of influential factors. These factors include, interest in the subject matter (Noble Calkins & Welki, 2006), subjective beliefs, personal tastes, and potential earnings (Wiswall & Zafar, 2014), early grade performance in college (Stinebrickner & Stinebrickner, 2011) and interest in the related career field (Leon and Uddin, 2016), and perceived social image (Kumar & Kumar, 2013; Ma, 2011).

While there are many studies that evaluate the factors that influence students' choice of college major, studies that assess the timing of this choice are limited. Very few studies fully discuss the importance of the timing of the decision and its implications for student recruitment. Most of the research that examines the timing of the college major decision is in the accounting field and these studies are inconclusive. Some research indicate that major selection is made prior to entering college and others indicate that this decision is made in the first or second year of college (Hermanson, Hermanson, & Ivancevich, 1995; Jackman & Hollingworth, 2005; Karnes, King, & Hahn, 1997; Mauldin, Crain, & Mounce, 2000). Interestingly, Kugler, Tinsley, and Ukhaneva (2017) report that female students are more likely to switch out of STEM related majors due to lack of fit with the major, low grades, and external stereotyping signals. A survey of high school students suggested that students tend to select their majors early (Granitz, Chen, & Kohli, 2014).

Knowing when students are likely to decide on a vocation or career and what influences this

decision is essential for student recruitment. To date, there does not appear to be any research in this area in the CIS field. Interest however, has been linked to education and career choices. Vocational interest is "interest in a particular field of education or employment" (Leon & Uddin, 2016) and is a central predictor in choosing a college major, particularly a STEM major like CIS (Akbulut & Looney, 2007). From an embeddedness perspective, interest plays a critical role in the selection of technology related majors (Dabney, Johnson, Sonnert, & Sadler, 2017; Morganson, Major, Streets, Litano, & Myers, 2015). Similar to college major decision, vocational interest may emerge across a wide age spectrum (Maltese, Melki, & Wiebke, 2014).

3. THEORETICAL FOUNDATION

Previous CIS major studies have routinely used Theory of Reasoned Action (TRA) as the theoretical framework (Downey et al., 2011; Hodges & Corley, 2016; Kuechler, McLeod, & Simkin, 2009; Zhang, 2007). This research utilizes Theory of Planned Behavior (TPB) (Ajzen & Fishbein, 1980; Fishbein & Ajzen, 1975), which is an extension of TRA. TPB was chosen because of its multidimensional view and because TPB has had a major impact on extending theory in choice and decision-making behaviors (Leon & Uddin, 2016; Prislun & Crano, 2008). As a widely utilized theory in the psychology and information systems, TPB focuses on understanding the relationship between attitude toward behavior, subjective norms, and perceived behavioral control with intention and the actual behavior. Attitude toward behavior means individuals have a favorable or unfavorable reflection of the behavior of interest. Subjective norm is a social factor that reflects the extent to which a person perceives social pressures from significant others to perform or not to perform a behavior. Perceived behavioral control refers to individuals' perception of ease or difficulty in conducting the behavior of interest. It is suggested that the more favorable the attitude and the subjective norm, and the greater the perceived behavioral control, the higher the likelihood that the intention and behavior will be acted upon (Ajzen, 1991, 2002).

Given the literature review and theoretical framework, this paper contributes in several ways. First, this study expands upon the CIS major selection research. Second, this paper analyzes when CIS and other business majors are selected and when the career field is selected. The timing of CIS major selection and interest in the field have not been previously studied. These insights will provide crucial information for

effective CIS recruiting efforts by university CIS departments. Third, this study uses TPB as its theoretical foundation, rather than TRA. By doing so, we include perceived behavioral control into the model and therefore allowing for increased generalizability of the results for CIS college major selection studies. Last, recruiting guidelines for CIS majors are presented.

Research Model and Hypotheses

The conceptual research model (Figure 1) is developed from the literature review and TPB. It shows that this research intends to answer the research questions from the following hypotheses:

RQ1. What factors influence a student's choice of CIS as a major compared to other business majors?

- H1a. A student's attitude toward a major will directly influence the choice of major.
- H1b. Subjective norms will directly influence a student's choice of major.
- H1c. A student's perceived ability to perform in the major will directly influence the choice of major.

RQ2. What factors influence when a student chooses a college major?

- H2a. A student's attitude toward a major will influence when the student decides upon the major.
- H2b. Subjective norms will influence when a student chooses the major.
- H2c. A student's perceived ability to perform in the major will influence when the choice of major is made.

RQ3. What factors influence when a career field is decided upon?

- H3a. A student's attitude toward a career field will influence when interest in the career field begins.
- H3b. Subjective norms will influence when interest in the career field begins.
- H3c. A student's perceived ability to perform in the career field will influence when the choice of career field is made.

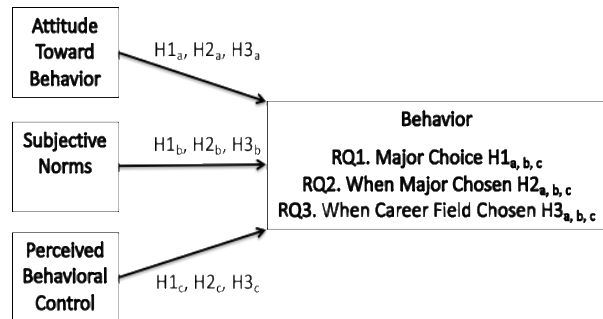


Figure 1 Research model

4. RESEARCH METHODOLOGY

Data Collection Instrument

An online survey was created using the TPB framework and survey items from previous studies (Hodges & Corley, 2016; Leon & Uddin, 2016; Zhang, 2007). The categorical variables used in the analysis along with their overall significance are presented in Table I in the appendix. *Major Choice*, *When Major Chosen*, and *When Career Field Chosen* are the dependent variables for each of the multinomial logistic regression (MNL) regressions. Computer Information Systems (CIS) is the reference category for the Major Choice model. Thus, a comparison is made between CIS majors and four other college major groups. One group includes accounting, finance and banking, risk management, insurance, and economics majors. A second group includes management majors (management, international business, and hospitality and tourism). The two remaining groups include marketing majors and supply chain management majors.

The variables and constructs selected for this study are presented in Tables 1 and 2 in the appendix. Several variables in this research fall into one or more constructs. Gender could be applied to attitude toward behavior and/or subjective norms. In some cultures, it is not expected or acceptable for women to conduct certain jobs or occupations. Influenced by Prior Experience in the Field could be applied to both attitude toward behavior and/or perceived behavioral control. Prior experience can influence a student's attitude toward a particular major or subject area and after experiencing a subject area, a student is either reassured that they possess the skills to continue in the major or career field. The explanation for Extracurricular Activities is similar to that of Influenced by Prior Experience in the Field. In addition, since Extracurricular Activities by their very nature are group activities, social norms is likely to affect behavior.

Among the variables in Table I in the appendix, respondents were asked to select "all that apply" regarding awards students received in high school, which extracurricular activities they participated in during their high school years, and who influenced or will influence them the most in choosing their college major.

The metric variables that were included in the analysis and overall significance are described in Table II in the appendix. The research study asked respondents nine influence measures. Respondents were asked using a 7-point Likert scale (1 = Definitely Not Influential, 7 = Very Influential): "What influenced you or will influence you to choose a college major?" They were also asked to what extent they agree with the following statement using a 7-point Likert scale (1 = Strongly Disagree, 7 = Strongly Agree): In high school I considered myself proficient in math.

Data Collection Process

An online survey was administered to students in several undergraduate and graduate classes from a southeast United States public university in the spring 2018 semester. The survey was available to 191 students in six sections who represented a variety of college majors. The survey returned 145 total responses (75.9 percent response rate). Students were enticed to complete the survey by offering extra credit. Four responses were incomplete, and 10 responses were from non-business majors. Therefore, these 14 responses were excluded from the analysis. Thus, the net response rate for the survey was 68.6 percent. Furthermore, 14 respondents were undecided about their career field, accordingly, these 14 responses were excluded from the *when career field chosen* analysis.

5. ANALYSIS AND RESULTS

This section discusses the results and the research questions. This research seeks to understand the factors that influence selecting a particular major, knowing when a particular major will be chosen, and knowing when a career field was chosen. Thus, multinomial logistic regression (MNL) is employed, which is appropriate when dependent variables are nominal categorical.

The nine (9) survey items related to, "what influenced you or will influence you to choose a major" show good reliability with a Cronbach's alpha reliability coefficient of 0.753 (Nunnally, 1978). Additionally, each of the three MNL models fit well. When covariates are added to the models,

each model's - 2 Log Likelihood and Nagelkerke pseudo R-squares improve. When testing the global null hypothesis, the likelihood ratio tests (Tables III, V, VII in the appendix) are significant, concluding that the models with predictors are a better fit than without predictors. The tables contain a column labeled Reciprocal of Odds Ratio showing the reciprocal of the Odds Ratio when the Odds Ratio is less than one. By doing so, the prominent variables stand out, providing a more intuitive and clear meaning of the results with less room for misinterpretation.

College Major Choice

The first research question, "What factors influence a student's choice of CIS as a major compared to other business majors?" is addressed in this section. The results in Table III in the appendix indicate that Gender, Who Influenced, HS Math Proficiency, High Starting Salary, Prestige, Positive Career Outlook, Prior Experience, and Father's Career Level are significant factors influencing a student's major choice.

The findings support each of the hypotheses. Gender, Influence from High Starting Salary, Prestige, Positive Career Outlook, and Prior Experience in the Field support H1a. Gender, Who Influenced, and Father's Career Level support H1b while Prior Experience and HS Math Proficient support H1c.

The odds of male students choosing CIS over Accounting/Finance is 8.475 times, Management is 4.237 times, and Marketing is 14.286 times than that of female students. Advisors influence CIS majors to a greater degree than Accounting/Finance and Marketing majors and, Relatives influence CIS majors to a greater degree than Supply Chain Management majors. Students who see themselves as proficient in math tend to choose CIS over Management. A one unit increase in a student's response on HS Math Proficiency will increase the odds of choosing CIS over Management by approximately 34 percent (odds ratio = 1.339). Students who are influenced by High Starting Salary tend to choose CIS over Management and Marketing. A one unit increase in a student's response on High Starting Salary will increase the odds of choosing CIS over Management by approximately 158 percent (odds ratio = 2.577) and CIS over Marketing by approximately 343 percent (odds ratio = 4.425). On the Prior Experience scale, there is a significant difference between CIS and the other four major categories. As the score on the Prior Experience scale increases, the odds of choosing CIS increase compared to that of

Accounting/Finance, Management, Marketing, and Supply Chain Management.

When Major is Chosen

The second research question, "What factors influence when a student chooses a college major?" is addressed in this section. Table IV in the appendix shows when students decide on a major by discipline. This research supports previous research, which suggests that most students select their major before their junior year. This may be attributed to students typically would start their college major classes in their junior year. Additionally, this study found that there is a large contingent of CIS majors who chose their major prior to university study.

Table V in the appendix shows Who Influenced, Extracurricular Activities, and Awards in High School are significant factors in deciding when a major is selected.

The findings support the hypotheses. Extracurricular Activities supports H2a, Extracurricular Activities and Who Influenced support H2b, and HS Award Received supports H2c.

Students who are influenced to choose a major by a Relative tended to choose their major Before College. When Mothers or Advisors influenced the student's choice, the student was more likely to choose their major in their Junior/Senior Year. Students who participated in Student Government in High School were more likely to choose their major Before College followed by choosing their major in their Freshman/Sophomore Year. Students who participated in Academic or Service Clubs in High School were more likely to choose their major in their Junior/Senior Year. Students who won an award for high Grades or placed on the Honor Roll were more likely to choose their major in their Freshman/Sophomore Year.

When Career Field Chosen

The third research question, "What factors influence when a career field is decided?" is addressed in this section. Table VI in the appendix shows that 42 percent of CIS majors become interested in their career field prior to beginning their college studies.

Table VII in the appendix indicates that Math Proficiency, Who Influenced, Extracurricular Activities, and Prior Experience in the Field are significant factors that influence when a career field is chosen.

The findings support each of the hypotheses. Extracurricular Activities and Influenced by Prior Experience in the Field support H3a, Who Influenced and Extracurricular Activities support H3b, and Extracurricular Activities, Math Proficiency and Prior Experience in the Field supports H3c.

The odds of deciding on a career field Before College over the Junior/Senior YR by those influenced by Advisors is 5.864 times than those who have not been influenced by Advisors. The odds of deciding on a career field in the Freshman/Sophomore YR over the Junior/Senior YR by those influenced by Mothers is 2.545 times than those who have not been influenced by Mothers. The odds of deciding on a career field in the Junior/Senior YR over the Before College category by those who entered a Technical Skills Competition is 5.556 times than those who have not entered a Technical Skills Competition.

As the score on the Math Proficiency scale increases by one unit, the odds of deciding on a career field being established in the Junior/Senior YR increases by 31 percent (odds ratio = 1.305) compared to that of the Freshman/Sophomore YR. As the score on the Prior Experience scale increases by one unit, the odds of deciding on a career field being established Before College increases by 45 percent (odds ratio = 1.450) compared to that of the Junior/Senior YR.

CIS Career Insights

Additional insights for recruiting CIS majors were achieved by asking 101 non-CIS majors from the sample, supplementary questions related to the CIS career field. The survey asked students why they were not pursuing a CIS career and overwhelmingly, 65.3 percent of the students said they were not interested in the CIS field, and 18.8 percent answered that they did not feel they were capable of performing well in this field. Other responses by students included that they have other interests and are steadfast on another career field. Interestingly, none of the students answered that salaries in the CIS field were not high enough. Next, these students were asked, what do you think would help persuade you to choose a CIS career? Fifty percent of the students responded by saying that being previously exposed to the field would have helped, followed by an information session (22%), job security (10%), and job growth (10%).

In addition to the previous questions, non-CIS major students were asked to what extent they agree with the following three statements using a

7-point Likert scale (1 = Strongly Disagree, 7 = Strongly Agree):

1. I heard of Computer Information Systems before I graduated from high school. Fifty-nine percent of the students responded with somewhat agree, agree, or strongly agree, though only 16 percent strongly agreed with this statement.

2. Before I graduated from high school, I knew what Computer Information Systems was. Fifty percent of the students responded with somewhat agree, agree, or strongly agree, though only 10 percent strongly agreed with this statement.

3. Computer Information Systems is a fun career. Forty-one percent of the students responded with somewhat agree, agree, or strongly agree, though only two percent strongly agreed with this statement.

Furthermore, we asked non-CIS majors who have previously enrolled in a CIS class to answer the following two questions (n = 81):

1. I would take more Computer Information Systems courses, if available. Thirty-two percent of the students responded with somewhat agree, agree, or strongly agree, though only 2 percent strongly agreed with this statement.

2. Now that I understand more about Computer Information Systems, I am more likely to go into a Computer Information Systems career. Nineteen percent of the students responded with somewhat agree, agree, or strongly agree, though only 1 percent strongly agreed with this statement.

6. CIS RECRUITMENT STRATEGY

Given the results of this study, there are a number of possible recruitment strategies that CIS departments can undertake. While interest is not significantly different between the dependent variables in each of the MNL models, interest is highly influential in college major and career selection. A large percentage of non-CIS majors did not select CIS as their major because they are not interested in the CIS field. Interest can be sparked by exposing students to the field. One promising approach is to provide work experience for students. As Kim, Markham, and Cangelosi (2002) pointed out, business students tend to pursue a fit with perceived ability. Prior experience allows students to gauge their ability prior to selecting a major and can expose students to CIS careers. Other possible ways to expose students to the CIS field and for them to

gain interest in the field through prior experience can come from internships, job shadowing, part-time employment, and allowing students to conduct special projects. Students suggested that information sessions could persuade them to select CIS as a major and a career. Considering that very few high school students know exactly what CIS is and that CIS has a less than exciting image, information sessions appear to be a good idea. However, exposure through experience in the CIS field is a more effective approach.

Since non-CIS majors are not likely to switch to CIS later, the timing of exposure and creating interest is important. Providing opportunities to expose students to CIS prior to students entering college is essential. CIS majors tended to know what major and career they wanted prior to entering college. In contrast, students in the other majors in this study tended to select their major after entering college. There is a significant advantage to introducing students to CIS in high school or earlier. This can be accomplished through extracurricular activities in high school or from influencers such as mothers, relatives, and advisors. Influencers from industry can be particularly effective. They can coordinate efforts with high school and middle school administrators and professional organizations. These efforts can lead to class presentations and summer programs as introductions to CIS subject matter. Industry people can also assist with CIS student clubs and mentorship programs.

The objective should be to give new learners opportunities to develop interest and then nourish that interest into the future. Knowing that behaviors change over time, continuing to reinforce interest and awareness with additional activities is important. With the assistance from higher education personnel, middle and high schools could create CIS learning paths so that students can continue to gain skills, confidence, and maintain continued interest so they are less likely to change their minds later. Furthermore, parents can get involved too. Since a parent's influence is significant, CIS professionals who are parents can assist in many of the school and professional work activities and provide support and encouragement for CIS careers. In summary, if CIS departments plan to recruit current college students for their major, it is likely that they will win over a small number of recruits. The larger impact and more effective approach however, is to focus recruitment efforts on the students who have not begun their college career.

7. CONCLUSION

One method to supply IT personnel for future job growth is to fill the pipeline of CIS majors. In order to attract students to CIS, effective recruitment strategies are essential. This research study is intended to improve the effectiveness of CIS recruitment initiatives by exploring the factors that influence a student's choice of major, when a student chooses a major, and when a career field is chosen.

The contributions that this paper delivers come from several directions. The research expanded the current CIS college major selection literature by consolidating in one study many of the variables dispersed throughout CIS college major choice studies and compared multiple business majors concurrently. However, there are three other primary contributions of this paper. First, it identified factors that influence when a major is chosen and when a career field is chosen, therefore a timely and targeted CIS recruitment strategy can be developed. Second, based on the findings of this study, suggestions for a recruitment strategy are proposed. Third, this study uses TPB as its theoretical foundation rather than TRA, thus including student performance (perceived behavioral control) as a construct, consequently expanding CIS college major selection research. The paper does this by extending TPB to the timing of when a college major is chosen and to when a career field is selected. The implications of this paper suggest that for CIS recruitment initiatives to be effective, the timing of the recruitment activities must be considered.

Limitations of this paper include the small sample size and that the sample was obtained from one university in the southeast United States. These limitations however, provide future research opportunities. Future research could replicate this study in other geographic regions, particularly focusing on securing a larger sample size and examining factors that influence when the CIS major is selected and when interest in the CIS career field begins. Further, the before college category could be expanded more to include middle school and each year in high school.

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Appendix

Table I Summary categorical variables, significance, theoretical construct

Categorical Variables	Frequency	Percent	Major Choice Model	When Major Chosen Model	When Field Chosen Model	TPB Framework
Major Choice ^a						B
Accounting, Finance & Banking, Risk & Insurance, Economics	19	14.5%				
Computer Information Systems ^b	40	30.50%				
Management, Int'l Business, Hospitality and Tourism	36	27.5%				
Marketing	20	15.3%				
Supply Chain Management	16	12.2%				
When Major Chosen ^a						B
Before College	34	26.0%				
Freshmen/Sophomore Year	73	55.7%				
Junior/Senior Year ^b	24	18.3%				
When Field Chosen ^a						B
Before College	46	36.2%				
Freshmen / Sophomore Year	41	32.3%				
Junior / Senior Year ^b	40	31.5%				
Gender			Y	N	N	ATB, SN
Female ^b	45	34.4%				
Male	86	65.6%				
Work Experience			N	N	N	ATB, SN
No	34	26.0%				
Yes	97	74.1%				
HS AP and IB Classes			N	N	N	PBC
AP	93	71.0%				
IB	4	3.1%				
HS Awards			N	Y	N	PBC
Academic Award	79	60.3%				
Special Recognition (Grades, Honor Roll)	100	76.3%				
Technical Skills Competition	21	16.3%				
HS GPA			N	N	N	PBC

Greater than 4.0	36	27.5%				
3.6 – 4.0	49	37.4%				
3.01 – 3.59	33	25.2%				
3.0 and less ^b	13	9.9%				
Extracurricular Activities	16	12.2%	N	Y	Y	ATB, SN, PBC
Student Government						
National Honor Society	53	40.5%				
Academic Club	38	29.0%				
Service Club	39	29.8%				
Vocational Club (DECA, VICA, FFA, FHA)	21	16.0%				
Who Influenced			Y	Y	Y	SN
Mother	42	32.1%				
Father	62	47.3%				
Relative	15	14.5%				
College Advisor	19	41.83%				
Personal Accomplishment	38	29.0%				
Mother's Education			N	N	N	SN
High School	15	11.5%				
Some College or Associates	42	32.1%				
Bachelors	53	40.5%				
Masters or Higher	21	16.0%				
Mother's Career Level			N	N	N	SN
No Work Experience	12	9.2%				
Hourly/Lower Level Salaried	55	42.0%				
Middle/Upper Level Salaried ^b	64	48.9%				
Father's Education			N	N	N	SN
High School	24	18.3%				
Some College or Associates	32	24.4%				
Bachelors	43	32.8%				
Masters or Higher	32	24.4%				
Father's Career Level			Y	N	N	SN
No Work Experience	4	3.1%				
Hourly/Lower Level Salaried	37	28.2%				
Middle/Upper Level Salaried ^b	90	68.7%				

Notes: ^a = Dependent Variables; ^b = Reference Category, Y = Significant, N = Insignificant; AP= Advanced Placement, IB = International Baccalaureate, HS = High School; Behavior = B, Attitude Toward Behavior = ATB, Subjective Norms = SN, Perceived Behavioral Control = PBC

Table II Summary metric variables, significance, theoretical construct

Metric Variable	Mean	Std Dev	Min	Max	Major Choice Model	When Major Chosen Model	When Field Chosen Model	TPB Framework
Influenced by High Starting Salary	5.702	1.201	1	7	Y	N	N	ATB
Influenced by Potential/Future Earning	6.046	1.007	1	7	N	N	N	ATB
Influenced by Prestige of the Field	5.336	1.206	1	7	Y	N	N	ATB
Influenced by Interest in the Field	6.084	0.953	1	7	N	N	N	ATB
Influenced by Positive Career Outlook	6.183	0.875	1	7	Y	N	N	ATB
Influenced by Prior Experience in Field	4.252	1.837	1	7	Y	N	Y	ATB, PBC
Influenced by Career Placement Test	3.809	1.701	1	7	N	N	N	PBC
Influenced by Books	3.382	1.561	1	7	N	N	N	ATB, SN
Influenced by Movies	3.458	1.693	1	7	N	N	N	ATB, SN
HS Math Proficient	5.400	1.722	1	7	Y	N	Y	PBC

Notes: N = 131; HS = High School; Y = Significant, N = Insignificant; Attitude Toward Behavior = ATB, Subjective Norms = SN, Perceived Behavioral Control = PBC

Table III College major choice (Significant variables only)

Parameter	Sub Category	Major	Odds Ratio	Reciprocal of Odds Ratio	Standard Error	Wald Chi-Square	Significance
Gender	Male	Accounting / Finance	0.118	8.475	0.977	4.795	0.029
		Management	0.236	4.237	0.670	4.628	0.031
		Marketing	0.070	14.286	0.849	9.847	0.002
Who Influenced	Advisor	Accounting / Finance	0.024	41.667	1.216	9.341	0.002
	Advisor	Marketing	0.030	33.333	1.213	8.406	0.004
	Relative	Supply Chain	0.054	18.519	1.265	5.319	0.021
HS Math Proficient		Management	0.747	1.339	0.178	2.711	0.100
		Supply Chain	3.458		0.586	4.489	0.034
Influenced by High Starting Salary		Management	0.388	2.577	0.520	3.313	0.069
		Marketing	0.226	4.425	0.613	5.890	0.015
Influenced by Prestige in Field		Marketing	2.283		0.394	3.986	0.046
		Marketing					
Influenced by Positive Career Outlook		Marketing	0.365	2.740	0.571	3.128	0.077
		Supply Chain	0.323	3.100	0.632	3.192	0.074
		Accounting / Finance	0.334	2.994	0.301	13.289	<0.001
Influenced by Prior Experience in Field		Management	0.714	1.401	0.197	2.926	0.087
		Marketing	0.651	1.536	0.260	2.744	0.098
		Supply Chain	0.634	1.577	0.269	2.858	0.091
Father's Career Level		Management	4.019		0.731	3.619	0.057
	Intercept Only	Intercept and Covariates	Chi-Square	Pr > ChiSq			
-2 Log L	403.737	262.427					
Likelihood Ratio			141.310	<0.0001			
Nagelkerke Psuedo R-square		0.692					

Notes: Reference Categories: Dependent Variable = CIS; Independent Variable, Gender = Female, HS GPA = 3.0 and less, Who Influenced = Yes; Father Career Level = Middle/Upper Management

Table IV When majors were chosen (in percent)

	Accounting/Finance	CIS	Management	Marketing	SCM
Before College	15.8	42.5	27.8	15.0	6.3
Freshmen/ Sophomore Year	63.1	45.0	55.5	65.0	62.5
Junior/Senior Year	21.1	12.5	16.7	20.0	31.2
n =	19	40	36	20	16

Table V When college major chosen (Significant variables only)

Parameter	Sub Category	When Major Chosen	Odds Ratio	Reciprocal of Odds Ratio	Standard Error	Wald Chi-Square	Significance
Who Influenced	Relative Mother	Before College	8.728		1.370	3.109	0.064
		Freshman / Sophomore YR	0.083	12.048	0.795	9.850	0.002
	Advisor	Freshman / Sophomore YR	0.090	11.111	1.196	4.058	0.044
Extracurricular Activities	Student Gov't	Before College	22.055		1.347	5.278	0.022
		Freshman / Sophomore YR	6.271		0.985	3.476	0.062
	Service Club	Freshman / Sophomore YR	0.142	7.042	0.856	5.207	0.022
		Academic Club	Freshman / Sophomore YR	0.209	4.784	0.812	3.720
HS Award Received	Grades / Honor Roll	Freshman / Sophomore YR	3.159		0.668	2.965	0.085
	Intercept Only	Intercept and Covariates	Chi-Square	Pr > ChiSq			
-2 Log L Likelihood Ratio	204.673	142.898	61.776	<0.0001			

Nagelkerke Psuedo R-square 0.437

Notes: Reference Categories: Dependent Variable = Junior/Senior Year, Each Independent Variable = Yes.

Table VI When career field was chosen (in percent)

	Accounting Finance	CIS	Management	Marketing	SCM
Before College	35.3	42.1	43.3	26.3	18.8
Freshmen / Sophomore YR	23.5	26.3	33.3	52.6	43.7
Junior / Senior YR	41.2	31.6	23.3	21.1	37.5
n =	17	38	30	19	16

Table VII When career field is decided upon (Significant variables only)

Parameter	Sub Category	When Career Field Chosen	Odds Ratio	Reciprocal of Odds Ratio	Standard Error	Wald Chi-Square	Significance
Math Proficiency		Freshman / Sophomore YR	0.766	1.305	0.140	3.638	0.056
Who Influenced	Advisor Mother	Before College	5.864		0.759	5.432	0.020
		Freshman / Sophomore YR	0.393	2.545	0.532	3.072	0.080
Extracurricular Activity	Technical Skills Competition	Before College	0.180	5.556	0.772	4.946	0.026
Influenced by Prior Experience		Before College	1.450		0.140	7.083	0.008
	Intercept Only	Intercept and Covariates	Chi-Square	Pr > ChiSq			
-2 Log L	215.026	188.033					
Likelihood Ratio			26.993	.003			
Nagelkerke Psuedo R-square		0.216					

Notes: Reference Categories: Dependent Variable = Junior/Senior Year, Independent Variables, Who Influenced and Extracurricular Activity = Yes.