

# Reboot: Revisiting Factors Influencing Female Selection of the CIS Major

Darin Hodges, MBA  
hodgesdc@appstate.edu

Ken Corley  
corleyjk@appstate.edu

Computer Information Systems and Supply Chain Management  
Appalachian State University  
Boone, NC 28608, USA

## Abstract

A concern among many universities, this study reflects and continues research on the changing attitude and intent of selecting a Computer Information Systems major. Focusing on the gender gap for selection of major for women in this field, studies indicate instrumental beliefs and subjective norms can influence behavior and indicate how selection is influenced in undergraduate major selection. Experiential beliefs, overall image, job accessibility, and educational cost (workload) have been shown to influence academic path selection. Salient referents including family, friend, professors, and advisors have also been shown to indicate intent on selection of an academic major. The combination of these factors with respect to intent may be changing over time, and this study reconstructs survey questions and analyzes the difference in responses between the original research and this study. Comparison of student responses have indicated factors that females utilize to select undergraduate majors could be moving. All salient referents, personal image, genuine interest, overall attitudes toward the CIS major, and the intent of females to ultimately choose a CIS major showed significant differences between the studies. With these findings, this study discusses and recommends additional research to find what additional factors may be a work when selection of an undergraduate major by females is being completed.

**Keywords:** Information Systems, Gender, Theory of Reasoned Action, Subjective Norm, Behavioral Intention, Undergraduate Major, Career.

## 1. INTRODUCTION

Research models studying why female participation is lacking in choosing a Computer Information Systems major has long been an area of study for the academic community. Job availability, family influence, and genuine interest have, in the past, been proven to be significant when females choose an academic major (Ahuja, 2002; Banerjee et al., 2012; Kuechler, McLeod, & Simkin, 2009; Zhang, 2007). However, even though extensive study has been performed as to why females are not choosing the Computer

Information System (CIS) major, many academic programs are still having difficulty attracting females to CIS programs (Nielsen, von Hellens, Pringle, & Greenhill, 1999). In 2007, Dr. Wei Zhang performed a study and developed a model to determine the factors influencing female participation in the CIS major. This study recreates Dr. Zhang's previous survey and compares the results to determine if significant factors in 2007 still hold true today. Although different methods and studies have been performed, results and methods have varied with varying outcomes (Ahuja, 2002; Banerjee et al.,

2012; Randall, Reichgelt, & Price, 2003; Zhang, 2007). We feel the comparison between Dr. Zhang's 2007 study and our survey provide the best opportunity to help administrators of CIS departments better understand which factors may be changing, and help attract and retain more female students. For this study, Information Systems will include related fields of study including Computer and Management Information Systems.

As this study seeks to gather evidence about selection of a major by females, the overall gender landscape inside the greater IS community is changing. Factors such as social image, overall aptitude, and job related beliefs have been found to influence female participation in the IS major (Croasdell, McLeod, & Simkin, 2011; Zhang, 2007). Joined with subjective norms like advisors and professors, and experiential factors such as genuine interest can determine overall interest and intent to major in the IS field (Adya & Kaiser, 2005; Croasdell et al., 2011). With IS gender inequality prevalent within the business environment, the business community overall is concerned with creating and cultivating more opportunities for females globally (Ahuja, 2002). Some studies suggest barriers, including gender, have negative effects on retention in the IS field where, historically, lower-level positions and pay are held by females (Igbaria, et al., 1990). As firms are competing for talent to find new ways to diversify workforce, technology, and product, influencing females to choose an IS major could help firms become more competitive and balance gender induced effects between colleges and the overall business community (Nielsen et al., 1999). The research question asks: Are factors influencing female selection of the IS major changing over time?

This study begins with a detailed review of previous studies determining selection of an IS major by undergraduate females. A discussion of the survey instrument, methodology and analysis of results follows this review. Concluding discussion with results of the study will cover if factors influencing female selection of an IS major are changing.

## 2. BACKGROUND

Many institutions and researchers try to determine what attitudes (job availability, social image, and interest) and subjective factors (family, professors, other students) influence how students determine a major (Croasdell et al., 2011; Kuechler et al., 2009; Zhang, 2007). Ahuja (2002) concluded the need to study this

subject "because women drop out of computer career pipelines at several different points and the entire variance cannot be placed in one place." Many researchers have concluded the need for longitudinal studies to determine what the causal issues may be (Ahuja, 2002; Banerjee et al., 2012; Kuechler et al., 2009). The Theory of Reasoned Action (TRA) (Ajzen & Fishbein, 1980) have provided the foundation of many frameworks developed within the research (Croasdell et al., 2011; Zhang, 2007). The framework used by Zhang (2007) (Appendix A, Figure 1) is broken down into job, image, cost, and experiential related beliefs, and subjective norms involving family, fellow students, advisors and professors.

### Job Related Beliefs

Job availability across literature is studied extensively with respect to female major selection (Croasdell et al., 2011; Kuechler et al., 2009; Turner & Bowen, 1999; Zhang, 2007). The concerns about jobs after graduation significantly influence how women choose an undergraduate major (Croasdell et al., 2011; Zhang, 2007). Even as the job market has improved after the dot.com bubble, and the most recent economic downturn, institutions "cannot expect IS enrollments to self-heal as the IS job market recovers" (Zhang, 2007). Even with demand for workers of both genders in the IS field, all job-related beliefs are sometimes not considered a priority by women when determining an undergraduate major (Croasdell et al., 2011; Zhang, 2007; Brooks, 2014). In some literature, job availability is a significant factor in the job category and job availability strongly influences females in major selection (Zhang, 2007), while Kuechler et al. (2009) provides support that job related beliefs is the only major factor attributable to major selection. (Croasdell et al., 2011). Therefore, we hypothesize (see Appendix 2, Table 1):

**Hypothesis 1a:** There will be no significant difference between Job Availability Beliefs between undergraduate female students in 2007 when compared to undergraduate female students in 2015.

**Hypothesis 1b:** There will be no significant difference between Job Security Beliefs between undergraduate female students in 2007 when compared to undergraduate female students in 2015.

**Hypothesis 1c:** There will be no significant difference between Job Salary Beliefs between undergraduate female students in 2007 when

compared to undergraduate female students in 2015.

### **Image Related Beliefs**

Literature has shown how social and personal image relate to why women select a major. Croasdell et al. (2011) describes social image as thinking "business people look up to or respect IS professionals", and personal image as a "fear that IS professional are "geeks" or "nerds". In keeping with this description, research has indicated more of a preference by women to focus on social image over personal image. On issues that would determine major selection, women have shown they are "influenced by the opinions of the person surrounding them" (Zhang, 2007) than that of a personal image belief. Croasdell et al., 2011 came to the same conclusions finding that female social image was more important than that of personal image stating "females feel that societal views are more important" in selecting a IS major. Findings by Kuechler et al. (2009) and Banerjee et al. (2012) supported the personal image belief that women do not necessarily see the IS filed as 'geeky' or 'nerdy'. Therefore, we hypothesize (see Appendix 2, Table 1):

**Hypothesis 2a:** There will not be a significant difference between Personal Image Beliefs between undergraduate female students in 2007 when compared to undergraduate female students in 2015.

**Hypothesis 2b:** There will not be a significant difference between Social Image Beliefs between undergraduate female students in 2007 when compared to undergraduate female students in 2015.

### **Cost Related Beliefs**

Cost related beliefs, not to be confused with financial costs, are those which create more academic problems for participants in the major than those who choose another path (Zhang, 2007). Earlier research has determined that inclusion of instrumental beliefs, such as academic cost associated with aptitude (Lowe & Simons, 1997), the workload required for the major (Cohen & Hanno, 1993), and the overall difficulty in the courses and the chosen degree (Adams, Pryor, & Adams, 1994) can influence a student's choice of major and was therefore included in previous research. Female aptitude in computer usage, how much work the major may require, and the difficulty of the major and curriculum may be found to be not significant factors in costs associated with major determination (Croasdell et al., 2011; Varma, 2010; Zhang, 2007). Early studies have shown

that overall cost related beliefs by women and "perceived difficulty of the IS curriculum or IS major, workload, and aptitude - were not statistically significant." Research following the Zhang (2007) study continue to support a logic that women who associate themselves with the IS major consider themselves to have the aptitude to succeed. But, as studies have progressed, an opinion about a IS degree by females continues to be seen as being too technical and more difficult (Kuechler et al., 2009). Studies also indicate that women who choose to not major in CIS considered themselves not very good at the major, or consider the workload to be excessive (Croasdell et al., 2011). Therefore, we hypothesize (see Appendix 2, Table 1):

**Hypothesis 3a:** There will be no significant difference between Difficulties of the Curriculum in undergraduate female students in 2007 when compared to undergraduate female students in 2015.

**Hypothesis 3b:** There will be no significant difference between Difficulties of the Major in undergraduate female students in 2007 when compared to undergraduate female students in 2015.

**Hypothesis 3c:** There will be no significant difference between in Workload in undergraduate female students in 2007 when compared to undergraduate female students in 2015.

**Hypothesis 3d:** There will be no significant difference between in Aptitude toward the CIS major in undergraduate female students in 2007 when compared to undergraduate female students in 2015.

### **Experimental Beliefs**

As one of the overarching themes among literature, genuine interest by females in Information Systems is a determining factor in major selection (Cohen & Hanno, 1993; Croasdell et al., 2011; Downey, McGaughey, & Roach, 2011; Kuechler et al., 2009; Nielsen et al., 1999; Zhang, 2007). In recent studies, "interest in the major was by far the most important factor influencing one's attitude toward one's choice of major" (Downey et al., 2011; Nielsen et al., 1999). Interest in the subject to determine a choice of major was found to be statistically significant indicating females showed much less interest in IS overall (Zhang, 2007). Additionally, interest in a career choice can be formative very early in life. Some studies have indicated relationships between interest level and gender

stereotypes, early adolescent counseling, and family education level (Adya & Kaiser, 2005). Even though they show interest with technology in general, women have a genuine lack of interest in IS (Banerjee et al., 2012) and that "genuine interest" is a key determinant in the choice of a university major" (Croasdell et al., 2011). Therefore, we hypothesize (see Appendix 2, Table 1):

**Hypothesis 4:** There will not be a significant difference in Genuine Interest between undergraduate female students in 2007 when compared to undergraduate female students in 2015.

#### **Salient Referents/Subjective Norms**

Previous research has indicated any choice of major or college curriculum could possibly be influenced by family, friends, peers, advisors and professors. Ayda et al. (2005) found, "career choice is directly influenced by role models, gender stereotypes...and that career role models primarily emerge from family-mothers, fathers, and siblings-and to a lesser degree, from among peers, teachers, and counselors." Females relied more on subjective norms, with family playing a significant role on female major selection (Croasdell et al., 2011). Gender stereotypes by professors (Zhang, 2007) and overall lack of female professors in the IS field (Croasdell et al., 2011) continue to indicate a lack of influence from professors and advisors. Therefore, we hypothesize (see Appendix 2, Table 1):

**Hypothesis 5a:** There will not be a significant difference between Family Influence toward the CIS major in undergraduate female students in 2007 when compared to undergraduate female students in 2015.

**Hypothesis 5b:** There will not be a significant difference between Fellow Student Influence toward the CIS major in undergraduate female students in 2007 when compared to undergraduate female students in 2015.

**Hypothesis 5c:** There will not be a significant difference between Advisor Influence toward the CIS major in undergraduate female students in 2007 when compared to undergraduate

**Hypothesis 5d:** There will not be a significant difference between a Professor's Influences toward the CIS major in undergraduate female students in 2007 when compared to undergraduate female students in 2015.

### **3. RESEARCH METHOD**

#### **Survey Design**

For this study, a replication of a survey questions, based on previous research, was prepared and submitted to the Institutional Review Board (IRB) and included questions derived from Zhang's (2007) study. The survey was administered to students at a medium sized university in the southeast United States. Approval was given to submit the survey to undergraduate students enrolled in an introductory Information Systems classes during the Spring 2015 semester. Some survey items were identical to those used in Zhang's (2007) research study and was given to business students who may or may not have declared a business major. Additional questions were added to collect demographic data from participants, such as gender. Because of the sensitivity of demographic data, unique and random identification codes were used to protect participant's anonymity when accessing the survey.

Participation was voluntary and the survey was administered online through surveymonkey.com. Survey items were rated on a seven-point scale from strongly disagree to strongly agree. The results were analyzed to determine if significant differences exist between studies. A list of the survey items measuring instrumental beliefs and salient referents can be found in Appendix A and include: job availability, job security, job salary, personal image, social image, difficulty of the major, difficulty of the curriculum, workload, aptitude, genuine interest, family, other students, professors, and advisors.

#### **Participants**

To test the survey and operationalize the thesis question, participants were recruited from a required undergraduate introductory IS course taken by all business majors at a medium sized university in the Southeast United States. The course is typically taken by students prior to COB admission and official major declaration. All students enrolled in the introductory IS course were invited to participate on a voluntary basis, but only female responses were used for analysis. Extra credit was offered as an incentive for participation.

A total of 440 students were invited to participate in the survey. A total of 293 (or 67.0 %) students voluntarily participated in the survey which included 118 (or 41.3%) female students. The participation level reached expectations and provided sufficient responses to perform an analysis of the results. A breakdown of the

gender participation results is shown in Appendix C, Table 2.

#### 4. ANALYSIS & RESULTS

##### Analysis and Results

To determine the differences between the two studies, T-tests were performed to analyze the sample means and standard deviations of the current survey, and the reported results of Zhang's (2007) survey. Table 3 in Appendix D contains the results of the t-test analysis between the different factors Dr. Zhang had determined from his TRA methodology.

Results of the t-test comparison of the surveys would indicate that there is not a significant difference between job related beliefs among females. All job-related constructs of job availability (JA:  $t = -0.65$ ,  $p = 0.52$ ), job security (JSE:  $t = -0.62$ ,  $p = 0.54$ ), and job salary (JSA:  $t = -0.51$ ,  $p = 0.61$ ) indicate there is no significance between the two studies.

Cost related beliefs were not statistically different across surveys. In the four categorized factors, females in both studies were statistically the same when it came to overall difficulty concern of the major (DIFM:  $t = -0.82$ ,  $p = 0.41$ ), difficulty of curriculum (DIFC:  $t = -0.06$ ,  $p = 0.96$ ), overall workload (W:  $t = 0.00$ ,  $p = 1.00$ ), and aptitude (APT:  $t = 1.32$ ,  $p = 0.19$ ).

With image related beliefs, there are some discrepancies between the studies. My analysis shows a significant difference between the personal image factor (PI:  $t = 2.87$ ,  $p < 0.01$ ) and the finding of Zhang's 2007 study. The social image factor (SI:  $t = -0.84$ ,  $p = 0.40$ ) results found no significant difference between the two studies.

Experimental beliefs, notably the student's genuine interest in the IS major and area of study, was found to be significantly different. Female students responded to having a substantially lesser amount of interest in the IS field as compared to the previous study (INT:  $t = 2.36$ ,  $p < 0.05$ ).

Attitude and interest were found to be significant different in how women choose the IS major. Attitudes were significantly different to the prior study (A:  $3.91$ ,  $p < 0.01$ ), as well as intentions to choose a IS major (I:  $t = 6.13$ ,  $p < 0.01$ ).

The results indicate that the salient referents and subjecting norms for the IS major are significantly different from the previous study. The results indicate females attending the

mandatory CIS introductory class at disagreed that family (REF1:  $t = 3.38$ ,  $p < 0.01$ ), students (REF3:  $t = 3.87$ ,  $p < 0.01$ ), advisors (REF4:  $t = 5.45$ ,  $p < 0.01$ ), and professors (REF5:  $t = 3.76$ ,  $p < 0.01$ ) played a role in a determination of selecting a IS major.

The results of the hypotheses can be seen in Appendix E, Table 4.

#### 5. DISCUSSION & CONCLUSION

##### Discussion

There were considerable differences between the studies overall. Zhang's (2007) study found that females were statistically influenced by family, professors, the overall difficulty of the curriculum, job availability, and genuine interest. In this study, some factors remained constant, such as influences of job availability and difficulty of the curriculum. However, there were differences in general interest and subjective norms that need to be addressed and further studied to better understand why women are leaving the CIS major.

Overall, the results of the analysis seem to indicate job related factors is consistent over time. Scores from both studies indicate females in both time periods believe jobs would be available, pay well, and have good security in the IS field. Zhang's (2007) study provides evidence to suggest only job availability influenced females when choosing a IS major. This study supports Zhang's (2007) findings. Job availability can be viewed as a major selection criteria considering the recovering US economy from the 2008 recession, and the availability of jobs across all sectors of the economy.

There was a significant difference for one image related belief between the studies. Personal image showed a significant difference. Women in Zhang's (2007) study were more concerned with being viewed as geeky or nerdy when associated with an IS major. Smartphones were introduced in the mid 1990's, entered mainstream usage in 2001, and attained widespread popularity in 2007 with the introduction of Apple's iPhone (McCarty, 2011); around the same time Zhang was initiating research and after the original study (Sarwar & Soomro, 2013). Since then, technology has integrated itself more than ever into the everyday lives of students (Sarwar & Soomro, 2013). The finding of the current research study could support the belief that increased usage of technology has reduced the geeky or nerdy image associated with the IS major. The model adopted by Zhang (2007)

which included the personal image factor may need to be modified to reflect the changing perceptions included in Zhang's (2007) TRA model. The removal of this factor may help simplify the model and facilitate the addition of new constructs used to measure women's intentions to major in IS. The social image construct remained consistent with the previous study and evidence suggest female students felt the IS major was a respectable career choice.

Female perceptions associated with the overall cost of an IS major did not significantly change related to: difficulty of the major and curriculum, workload, and aptitude. Zhang's (2007) results indicated that difficulty of the curriculum was a significant factor in determining females' attitude toward selection of a IS major. The current studies research would support his conclusions, and support earlier literature that indicated women find the IS major a technical and more difficult major than available alternatives (Croasdell et al., 2011). All factors involved in the cost construct were remarkably similar with the prior study, except for the aptitude factor. The questions, "I find myself good at CIS courses," and "I have the aptitude required for a CIS concentration" both scored lower compared to the previous findings. Although not statistically significant, females' aptitude (APT:  $t= 1.32$ ,  $p < 0.20$ ) about the major fell from the previous study but held as a neutral response (A: Mean = 3.91). This could be an indication of an overall lack of knowledge about the IS major. Future research studies should be performed to investigate whether or not current efforts to educate students about the CIS major is having the desired effect.

The experimental factor of genuine interest along with the subjective norms of family, other students, professors, and advisors was found to be significantly different than the previous study. Previously, Zhang (2007) found genuine interest, along with the subjective norms of family and professor influence, to be a significant factor in selecting an IS major. This study has findings supporting genuine interest as being a reason females select a IS major, but the results show that fewer females interested in the IS major. Additionally, this study has findings supporting that subjective norms are less of a factor for women at as this small southern university then those in the previous study. The mean response level from all subjective factors, along with the interest factor, were below those of Zhang's (2007) study. The lack of interest could be a result of family influence, education, or gender stereotypes in earlier formative years as

recommended by earlier studies (Adya & Kaiser, 2005). With a diminishing lack of interest by females in the IS major, and a decrease in influence from family and professors, additional study is needed to determine if IS departments would benefit more from tangible relationships with elementary and high school establishments.

### Conclusion

In conclusion, the results would indicate that factors affecting a female's intention to choose an IS major have at least moved, if not changed, over time. The factors proven to not be a significant in a female's choice of major in Zhang's (2007) earlier study remained consistent. However, all significant factors, except for a woman's perception of the difficulty of the IS curriculum and job availability, differed from the previous study. In the Theory of Reasoned Action model used by Zhang (2007), most constructs are used to develop an attitude toward the IS major, and when combined with subjective norm, develop an overall intention to choose a CIS major. As can be seen in Appendix F, Table 5, and reported earlier, both overall intent and attitude toward the CIS major by females in my study were significantly lower. These results would indicate that the factors explaining the lack of women majoring in Information Systems could be changing over time.

Across the many factors identified in the earlier study, mean response rates declined among females. This lead to over an overall decrease in both attitude and intent to major in IS. Other studies should be performed to determine if the limitations of this study, such as geographic location or homogeneity of the student sample, altered this study's results. Results of this study indicate additional research should be performed to determine if the overall model and factors are unique to the IS major, or if these factors apply to alternative majors as well. Because previous literature has supported interest in the IS major to be a significant reason women choose to major in the field (Adya & Kaiser, 2005; Banerjee et al., 2012; Downey et al., 2011; Kuechler et al., 2009; Zhang, 2007), future research should be performed to determine what factors influence interest in the IS major. Additional studies could also be performed to determine if interest in the IS field is lost prior to arrival at post-secondary institutions.

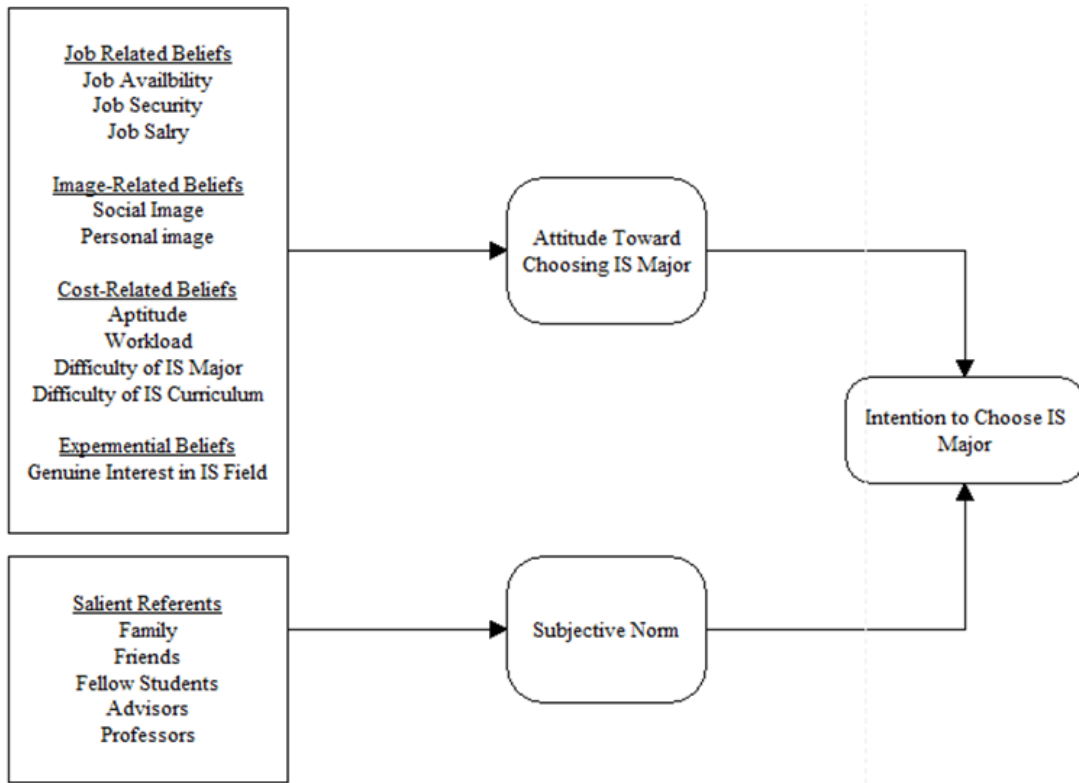
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### Editor's Note:

*This paper was selected for inclusion in the journal as a EDSIGCon 2016 Distinguished Paper. The acceptance rate is typically 7% for this category of paper based on blind reviews from six or more peers including three or more former best papers authors who did not submit a paper in 2016.*

## Appendix A



**Figure 1: The TRA Framework**

Source: Zhang, 2007



**Appendix B**

**Table 1: Hypotheses Summary Table**

<i>Hypotheses Summary Table</i>			<i>Hypotheses Test Results</i>		
<b>Name</b>	<b>Symbol</b>	<b>Text</b>	<b>Name</b>	<b>I</b>	<b>Results</b>
H1a	JA	There will be no significant difference between Job Availability Beliefs between undergraduate female students in 2007 when compared to undergraduate female students in 2015.	H1a	JA	Supported
H1b	JSE	There will be no significant difference between Job Security Beliefs between undergraduate female students in 2007 when compared to undergraduate female students in 2015.	H1b	JSE	Supported
H1c	JSA	There will be no significant difference between Job Salary Beliefs between undergraduate female students in 2007 when compared to undergraduate female students in 2015.	H1c	JSA	Supported
H2a	PI	There will not be a significant difference between Personal Image Beliefs between undergraduate female students in 2007 when compared to undergraduate female students in 2015.	H2a	PI	Not Supported
H2b	SI	There will not be a significant difference between Social Image Beliefs between undergraduate female students in 2007 when compared to undergraduate female students in 2015.	H2b	SI	Supported
H3a	DIFC	There will be no significant difference between Difficulties of the Curriculum in undergraduate female students in 2007 when compared to undergraduate female students in 2015.	H3a	DIFC	Supported
H3b	DIFM	There will be no significant difference between Difficulties of the Major in undergraduate female students in 2007 when compared to undergraduate female students in 2015.	H3b	DIFM	Supported
H3c	W	There will be no significant difference between in Workload in undergraduate female students in 2007 when compared to undergraduate female students in 2015.	H3c	W	Supported
H3d	APT	There will be no significant difference between in Aptitude toward the CIS major in undergraduate female students in 2007 when compared to undergraduate female students in 2015.	H3d	APT	Supported
H4	INT	There will not be a significant difference in Genuine Interest between undergraduate female students in 2007 when compared to undergraduate female students in 2015.	H4	INT	Supported
H5a	REF1	There will not be a significant difference between Family Influence toward the CIS major in undergraduate female students in 2007 when compared to undergraduate female students in 2015.	H5a	REF1	Not Supported
H5b	REF3	There will not be a significant difference between Fellow Student Influence toward the CIS major in undergraduate female students in 2007 when compared to undergraduate female students in 2015.	H5b	REF3	Not Supported
H5c	REF4	There will not be a significant difference between Advisor Influence toward the CIS major in undergraduate female students in 2007 when compared to undergraduate	H5c	REF4	Not Supported
H5d	REF5	There will not be a significant difference between a Professor's Influences toward the CIS major in undergraduate female students in 2007 when compared to undergraduate female students in 2015.	H5d	REF5	Not Supported

INT = Genuine Interest; REF1 = Family subjective norm; REF3 = Fellow Students subjective norm; REF4 = Advisor subjective norm; REF5 = Professor subjective norm; JA = Job Availability; JSE = Job Security; JSA = job salary; PI = Personal Image; SI = Social Image; DIFC = Difficulty of CIS Curriculum; DIFM = Difficulty of CIS Major; W= Workload

**Appendix C**

**Table 2: Survey Respondents by Gender**

Gender	Male	Female
# of Respondents	167	118
Percentage of Total	58.50%	41.30%

**Appendix D**

**Table 3: T-test 2014 Survey Results vs. 2007 Survey Results**

Factor	2007 Results		2014 Results		Difference		
	Mean1	SDev1	Mean2	SDev2	Mean Diff	t-Stat	Sig
JA	4.53	5.01	4.86	1.40	0.33	-0.65	0.517
JSE	4.56	4.77	4.86	1.36	0.30	-0.62	0.538
JSA	4.49	4.69	4.73	1.28	0.24	-0.51	0.610
PI	3.60	3.30	2.59	1.24	-1.01	2.87	0.005*
SI	4.16	4.41	4.52	1.01	0.36	-0.84	0.404
DIFC	4.69	5.02	4.72	1.13	0.03	-0.06	0.956
DIFM	3.94	4.31	4.30	1.37	0.36	-0.82	0.412
W	4.53	4.73	4.53	1.26	0.00	0.00	0.998
APT	4.46	4.10	3.91	1.28	-0.55	1.32	0.190
INT	4.72	4.16	3.69	1.50	-1.03	2.36	0.020*
REF1	3.23	2.96	2.11	1.33	-1.12	3.38	0.001*
REF3	3.58	3.00	2.25	1.46	-1.33	3.87	0.000*
REF4	3.77	3.15	1.98	1.09	-1.79	5.45	0.000*
REF5	3.82	3.21	2.44	1.53	-1.38	3.76	0.000*
A	4.11	3.80	2.52	1.46	-1.59	3.91	0.000*
I	3.72	3.05	1.73	1.15	-1.99	6.13	0.000*

2007 Results from (Zhang, 2007) N(2007) = 49; N(2014) = 118

\* denotes significance

INT = Genuine Interest; A = Attitude toward choosing CIS major; REF1 = Family subjective norm; REF3 = Fellow Students subjective norm; REF4 = Advisor subjective norm; REF5 = Professor subjective norm; JA = Job Availability; JSE = Job Security; JSA = job salary; PI = Personal Image; SI = Social Image; DIFC = Difficulty of CIS Curriculum; DIFM = Difficulty of CIS Major; W= Workload; I = Intention to Choose a CIS Major

### Appendix E

**Table 4: Hypotheses Test Results**

<i>Hypotheses Test Results</i>		
<b>Name</b>	<b>Symbol</b>	<b>Results</b>
H1a	JA	Supported
H1b	JSE	Supported
H1c	JSA	Supported
H2a	PI	Not Supported
H2b	SI	Supported
H3a	DIFC	Supported
H3b	DIFM	Supported
H3c	W	Supported
H3d	APT	Supported
H4	INT	Supported
H5a	REF1	Not Supported
H5b	REF3	Not Supported
H5c	REF4	Not Supported
H5d	REF5	Not Supported

INT = Genuine Interest; REF1 = Family subjective norm; REF3 = Fellow Students subjective norm; REF4 = Advisor subjective norm; REF5 = Professor subjective norm; JA = Job Availability; JSE = Job Security; JSA = job salary; PI = Personal Image; SI = Social Image; DIFC = Difficulty of CIS Curriculum; DIFM = Difficulty of CIS Major; W= Workload

### Appendix F

**Table 5: T-test results 2007 to 2014 for Attitude and Intent**

<b>Factor</b>	<b>2007 Results</b>		<b>2014 Results</b>		<b>Difference</b>		
	<b>Mean1</b>	<b>SDev1</b>	<b>Mean2</b>	<b>SDev2</b>	<b>Mean Diff</b>	<b>t-Stat</b>	<b>Sig</b>
A	4.11	3.80	2.52	1.46	-1.59	3.91	0.000*
I	3.72	3.05	1.73	1.15	-1.99	6.13	0.000*

2007 Results from (Zhang, 2007) N(2007) = 49; N(2014) = 118

\* denotes significance

A = Attitude toward choosing CIS major; I = Intention to Choose a CIS Major

## Appendix G

The following questions were asked and responses were given using a seven-point Likert scale with response categories from Strongly Disagree to Strongly Agree. Strongly Disagree was given a rating of 1 and Strongly Agree was given a rating of 7. Each response was equally weighted.

### *Intention to Choose CIS as Major*

- I1 I intend to choose CIS as a major  
I2 It is likely that I will choose CIS as a major

### *Attitude toward CIS major*

- A1 Choosing a CIS major seems like a good idea to me  
A2 It will be wise for me to choose CIS as a major

### *Salient Referents*

- REF1 My family wants me to choose CIS as a major  
REF3 Other students recommended a CIS major to me  
REF4 My advisor recommended a CIS major to me  
REF5 My professors think that I should make CIS my major

### *Job Availability*

- JA1 If I choose a CIS major, there will be jobs available for me when I graduate  
JA2 If I choose a CIS major, there will be plenty of job opportunities for me when I graduate

### *Job Security*

- JSE1 If I choose a CIS major, there will always be a great market demand for people like me  
JSE2 If I graduate with a CIS major, my job security will be high

### *Job Availability*

- JSA1 I can get a high paying job if I graduate with CIS as my major  
JSA2 My starting salary will be satisfying if I graduate with CIS as my major

### *Personal Image*

- PI1 Choosing a CIS major would make me look like a computer geek  
PI2 CIS professionals are nerds

### *Social Image*

- SI1 Businessmen look up to CIS professionals  
SI2 If I choose CIS as my major, I would have a respectable career  
SI3 The business world treats CIS professionals with great respect

### *Difficulty of CIS Curriculum*

- DIFC1 To me, CIS courses are intensive  
DIFC2 I think CIS courses are challenging  
DIFC3 I think CIS courses are demanding

### *Difficulty of CIS Major*

- DIFM1 A CIS concentration would be difficult for me  
DIFM2 If I choose CIS as my major, it will take a long time for me to complete it

### *Workload*

- W1 If I choose CIS as my major, I will have to spend a lot of time studying for it  
W2 If I choose CIS as my major, it will take a long time for me to complete it

### *Aptitude*

- APT1 I find myself good at CIS courses  
APT2 I have the aptitude required for a CIS major

### *Genuine Interest in CIS major*

- INT1 I like CIS  
INT2 I find computers and information technologies interesting  
INT3 I have a true interest in the CIS subject