THE CHALLENGES AND FACTORS THAT DETERMINE FEMALE CAREER CHOICES IN INFORMATION TECHNOLOGY PROFESSIONS: AN EXPLORATORY INVESTIGATION

by

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Abstract

This study was designed to explore challenges and factors that determined female career choices in information technology (IT). The study was intended to promote and encourage more females to go into the area of IT. A mixed-method research design was used to provide analysis for the study. The gender gap appears to be quite wide in the IT arena when examining levels of employment. The Information Technology Association of America estimated female workers in the overall IT workforce dropped from 41% to 34.9% between 1996 and 2002 (Quesenberry, J. L., Trauth, E. M., & Morgan, A. J., 2006, "Understanding the "Mommy Tracks": A Framework for Analyzing Work-Family Balance in the IT Workforce, *Information Resources Management Journal*, *19*(2), 37-53). The study participants provided several answers to open-ended questions that were relevant to this study. In some cases, cross-tabulation and chi-square or Kendall's tau tests were used to test relationships between variables. Four social factors and four challenges were investigated in the study. The social factors were role models/mentors, family, peer group, and teachers. The four challenges contributing to reasons why IT is a field dominated by men included risk concerns such as gender, discrimination and unfairness, diversity, and stereotypical beliefs regarding female professional behaviors. Three findings stood out. One of the findings suggested family as a factor that determined career choices for women in the IT arena. The second finding concerned the influence of role models; the third finding suggested job satisfaction plays a major role in the reluctance of women to enter the IT profession. Companies need to find ways to influence and promote more women and to recruit and retain qualified, well-educated women in this time of employee shortage in the IT professions.

Dedication

I would like to dedicate my dissertation to God and my family. God, You have placed Your faith in me and have helped me to stop asking, "Why," and to just say, "Thank you." For this reason, I give my love and dedication to You.

My family is very important to me, and because of the love and faith they have expressed, I dedicate this document to my family. To my mother, Ms. Rita P. Miles, thank you for your understanding, love, encouragement, patience, sacrifices, and support. I also want to give thanks to my aunts and uncles, Mr. and Mrs. Abe Pierce, III; Mr. and Mrs. Phillip Casanova; Mrs. Catherine Dees; and Mrs. June E. Taylor. Each one of you has played a significant part in my completing this goal. Thank you for sharing this accomplishment with me.

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CHAPTER 1. INTRODUCTION

According to recent studies, women were found to be under-represented in the information technology (IT) field. A study produced by the Information Technology Association of America (ITAA) Blue Ribbon Diversity Panel (Quesenberry, Truath, & Morgan, 2006, p. 37) found that representation of American women in high-tech employment fell from 41% to 34.9% between 1996 and 2002. This number was significantly low, since that during the same period the percentage of women in all occupations in the U.S. was 46%. Although the number of women in the labor force was increasing, the number of women in the IT workforce was noticeably lower.

Over the past 20 years, shifting interest in computer science major has spurred sponsorship of a number of studies by major universities, such as Carnegie Mellon University, University of Virginia, and Ohio State University, and professional associations, including the Association for Computing Machinery (ACM) and ACM's Women's Chapter. These studies found a lack of information about nontraditional career choices. Computer science was one of the science and engineering majors with low enrollment by women. "Given our society's image of computing as a male activity, few women were likely to consider a computer science (CS) major unless they were explicitly encouraged to do so"(Cohoon, 2002, p. 48). *The Chronicle of Higher Education* reported findings from the Higher Education Research Institute indicating, "Women's interest in computer science fell 80% between 1998 and 2004, and only 0.3% of incoming freshmen

women in 2004 expressed an interest in majoring in computer science" (Brown, Garavalia, Hines Fritts, & Olson, 2006).

Background of the Study

In the past few years, the public has become aware of the declining numbers of young women entering the computer science major. The problem has been well researched and documented by Lopez, Schulte, and Giguette (2005), especially in the Tracy Camp articles, "The Incredible Shrinking Pipeline" and "The Incredible Shrinking Pipeline Unlikely to Reverse." The "incredible shrinking pipeline" problem has become the euphemism for the dilemma of declining numbers of women seeking bachelor's degrees in a computing discipline. In the current research, the computing discipline has been defined as an academic program that leads to a bachelor's degree in one of the following areas: computer engineering, software engineering, computer science, computer information systems, information systems, management information systems, and information technology (Lopez et al., 2005).

According to Vegso (2006), the 2006 Computing Research Association (CRA) Taulbee Survey reported that computer science has the dubious distinction of being the only science field to see a decline in the share of its bachelor's degrees granted to women between 1983 and 2002. Between 1983 and 2002, the share of CS bachelor's degrees awarded to women dropped from 36% to 27%. The number of overall female degree recipients grew by 50% in that period, and in 2002 numbered 13,504. Nevertheless, the Taulbee Survey reported this was lower than the 15,126 degrees granted to women in 1986, during the last boom in degree production.

Several studies have found that boys and girls use computers in different ways. A survey of high school students found that while many girls were computer literate, they were not looking toward a career in IT. This lack of female attraction toward the technology industry has been attributed to the technology community's poor public relations effort. Girls defined career success as being personally happy, having the respect of family and friends, and having a happy family life. Only a small number of girls mentioned money as an aspect of career success (Leever, Dunigan, & Turner, 2002, p. 173).

The National Science Foundation (2007) showed that in elementary school, about as many girls as boys have positive attitudes toward science. In a recent study of fourth graders, 66% of girls and 68% of boys reported liking science. However, something else began happening in elementary school. By second grade, when students (both boys and girls) were asked to draw a scientist, most portrayed a white male in a lab coat. Any female scientist drawn looked severe and not very happy. The persistence of the stereotypes started to turn girls off, and by eighth grade, boys were twice as interested in STEM (science, technology, engineering, and math) careers as girls were. The female attrition continued throughout high school, college, and even the workforce. Women with STEM higher education degrees were twice as likely to leave a scientific or engineering job as were men with comparable STEM degrees (National Science Foundation, 2007).

The National Science Foundation (2007) showed that parental support (as well as that of teachers) has been shown to be crucial to a girl's interest in science, technology, engineering, and math. Making girls aware of the range of science and engineering careers available and their relevance to society worked to attract more women (as well as

men) to STEM careers. Parents, teachers/counselors, and peer groups were also in a position to tell young people about the coursework and grades needed to put themselves on a path to a STEM career. Teachers often interacted more with boys than with girls in science and math. A teacher would often help a boy do an experiment by explaining how to do it, while when a girl asked for assistance, the teacher would often do the experiment, leaving the girl to watch rather than do.

Research has shown that when teachers were deliberate about taking steps to involve the female students, everyone benefited. This meant making sure everyone in the class was called on over the course of a particular lesson, or everyone was asked a question, and the teacher waited 10 seconds before calling on anyone. Good math and science teachers recognized that when instruction was inquiry-based and hands-on, and when students engaged in problem solving as cooperative teams, both boys and girls were motivated to pursue STEM activities, education, and careers (National Science Foundation, 2007).

It was notable that the drop in women's representation did not recover during the surge in bachelor's degree production that occurred in the late 1990s. The number of incoming freshmen women majoring in CS had fallen for several years, and was at its lowest point since the late 1970s (Vegso, 2006). The issues of declining numbers were actually a much-needed wake-up call for those in the field to re-evaluate, rethink, and re-shape what computer science really meant and how it was perceived in the public consciousness (Frieze, 2005).

Statement of the Problem

The gender gap appeared to be quite wide in the IT arena, when examining gender distribution of employment opportunities in information technology industries. The Information Technology Association of America (ITAA) estimated female workers in the overall IT workforce dropped from 41% to 35% between years 1996 and 2002. Kaminski and Reilly (2004) showed that when women were hired, they tended to start at lower positions and earned lower starting salaries than men did. Over time, the gap between men's and women's salaries and promotion rates grew at an increasing rate. The salary gap was found even in studies that equated years of experience, levels of education, and industry knowledge (Isaacs, 2005). Recent research published by the American Association of University Women (AAUW) Educational Foundation, a national organization that promotes education and equity for women and young girls, indicated women accounted for only 25% of professional IT staff workers (Kaminski & Reilly, 2004).

The purpose of the current study was to investigate the challenges and factors that influenced the cause of females being underrepresented in IT. The researcher investigated four social factors and four challenges. The social factors were role models/mentors, family, peer group, and teachers. The four challenges that contributed to the reasons why IT is a field dominated by men included risk concerns such as discrimination and unfairness, gender, diversity, and stereotypical beliefs about female professional behaviors.

A new form of gender discrimination had appeared: bullying in the workplace. The research showed females were targeted more than were men. According to Namie's

U.S. Hostile Workplace Survey, men and women were equally responsible for the bullying behavior. Women comprised 84% of those employees targeted for the abuse, and women bullies targeted women employees more often than they targeted men (Brunner & Costello, 2003). As it related to stereotypes, people saw those in the IT organization as “nerds” or “geeks.”

Purpose of the Study

The purpose of this study was to investigate the challenges and factors that influenced the cause of females being underrepresented in IT. Four social factors and four challenges were investigated. The social factors were role models/mentors, family, peer group, and teachers. The four challenges that contributed to the reasons why IT is a field dominated by men included risk concerns such as gender, discrimination and unfairness, diversity, and stereotypical beliefs regarding female professional behaviors. The reason for conducting this study was to explore the challenges and factors that determined career choices for women in the IT arena. The study was intended to promote and encourage more females to go into the area of IT.

Rationale

According to Nester (2005), who cited Sterling, a program manager for Microsoft Research, there had been an overall decline in American students' interest in information technology and engineering, and the competitiveness and marketability of young people in the United States was at stake. Sterling and other corporate representatives spoke before a House subcommittee that was the third in a series examining high school

education in the United States. While the decrease in interest was evident among both men and women, the situation was worse with women. Nester reported the number of women choosing computer science as an undergraduate major had declined every year since 1984.

The Department of Labor projected that computer systems analysts, database administrators, and computer scientists were to be among the fastest-growing occupations through 2012. These technology jobs were to grow faster than the national average for all occupations because of increasingly sophisticated technology, according to the department's Web site (Nester, 2005). If the Department of Labor projected an increase in science and technology, there were to be more males than females in the coming years.

The rationale of this study was threefold: the first reason was to identify what factors influenced (positively or negatively) female participation in the field of computer science. The second was to substantiate that there were gender issues in the IT workplace. The third was to provide opportunities to mitigate discouraging factors in seeking greater gender diversity in the field of IT.

Research Questions

1. What factors were identified by females currently in IT that influenced their decisions to pursue a career in the IT field?
2. What impacts did social influences such as role models and mentors, family, peer group, and teachers play on career choices of females in IT?
3. What factors discouraged recruitment and retention of females in the IT field?

Hypotheses

H1: Females in IT careers report the utilization of positive role models affected their career choice.

H2: Females in IT careers report the use of computer technologies in home and school environments affected their career choice.

H3: Females in IT careers report male-dominated industries affected their career choice.

Significance of the Study

The significance of the study was to add to the body of literature that helped to reveal cause/effect relationships that may exist between women and associated factors such as role models, family influences, and use of technology and gender when making career choices in information technology. The research was expected to contribute to a broader understanding of reasons that contributed to decreasing numbers of women in technology fields.

Definition of Terms

Affirmative action. A program designed to stop discrimination; a policy or program aimed at countering discrimination against minorities and women, especially in employment and education (*MSN Dictionary*, 2006).

Computer science. The study of computers; the study of the mathematics and technology of computers and their applications (*MSN Dictionary*, 2006).

Discrimination. Treating people differently through prejudice; unfair treatment of one person or group, usually because of prejudice about race, ethnicity, age, religion, or gender (*MSN Dictionary*, 2006).

Diversity. "Representation, in one social system, of people with different group associations of cultural importance" (Aghazadeh, 2004, p. 522).

Glass ceiling. A barrier to career advancement; an unofficial but real impediment to somebody's advancement into upper-level management positions because of discrimination based on the person's gender, age, race, ethnicity, or sexual preference (*MSN Dictionary*, 2006) .

Mentor. An experienced adviser and supporter; somebody, usually older and more experienced, who advises and guides a younger, less experienced person (*MSN Dictionary*, 2006).

Old boy network. A system of informal contacts; systems of informal contacts between men who belong to the same social group, especially alumni of a school or university, who use their influence to help one another (*MSN Dictionary*, 2006).

Assumptions and Limitations

Several assumptions were made throughout this research. It was assumed that all the participants taking the survey would be females in the IT environment, and that all the participants would be knowledgeable in the IT arena of their areas of expertise. It was acknowledged that age would be a factor in the outcome of this study. The population of the study was also limited to only women in the IT environment.

Conceptual Framework

This study was based on five career development theories. These five conceptual theories with relevance to women in IT were Betz and Hackett's (1981) self-efficacy theory, Farmer's model of career and achievement motivation (1985), Astin's socio-psychology model (1984), Gottfredson's theory of career aspirations (1981), and Magolda and King's self-authorship theory. These theories were used to develop a conceptual framework for the study to expand the understanding of the challenges and factors contributing to women's career choices (Wentling & Thomas, 2007, p. 34).

Betz and Hackett (1981) suggested the application of self–efficacy theory to vocational behavior. Self-efficacy was originally proposed by Bandura, and self-efficacy expectations referred to a person's beliefs concerning his or her ability to perform a given task or behavior successfully (Betz, 2004). Betz and Hackett believed that self-efficacy could explain why some women do not fully develop their capabilities and talents in their career pursuit (as cited in Hoi & Hiebert, 2005). The second theory, Farmer's model of career and achievement motivation (1985), presented a multidimensional model consisting of three sets of variables (background, environment, and personal) of career and achievement motivation for women and men (as cited in Hoi & Hiebert, 2005).

Astin's socio-psychology model (1984) emphasized that both psychological factors and cultural-environmental factors interacted to influence career choice and work behavior. According to Astin, work was important because it was a means to fulfilling certain basic needs such as survival, pleasure, and contribution (as cited in Hoi & Hiebert, 2005).

Gottfredson's theory of career aspirations developed a model that consisted of self-concept, developmental stages, and match between individuals and occupation (1981). Gottfredson acknowledged his theories came from John Holland and Donald Super. Gottfredson maintained that individuals' perceptions of career and training opportunities played a significant role in determining their occupational aspirations and choices (as cited in Hoi & Hiebert, 2005).

Baxter Magolda (as cited in Creamer & Laughlin, 2005) made the link between self-authorship and decision-making explicit in her definition: self-authorship was "the ability to collect, interpret, and analyze information and reflect on one's own beliefs in order to form judgment" (p. 3). Self-authorship played a major role in career decision making because it influenced how students made meaning of the advice they received from others: how susceptible they were to negative feedback, including that from peers, and the extent to which the decision-making reasoning they employed reflected an internally grounded sense of self. Self-authorship was about the cognitive process people used to make meaning.

These five theories attempted to explain the phenomena of women's career development, but they were summarized into two main categories: external and internal factors. Some of the external factors noted by Astin, Baxter Magolda and King, Farmer, Gottfredson, and Betz and Hackett included sexual discrimination and harassment, mentoring, gender, gender-role socialization, work-family constraints, role models, and opportunities for advancement. Some internal factors included age, sex, race, personality traits, academic achievement, self-efficacy, persistence, and motivation. Farmer suggested that internal and external factors have different values for different women.

Internal factors were more influential for some women, and external factors were for others (see Table 1). Either way, there appeared to be an interaction between internal and external factors, which resulted in an individual's career path (Wentling & Thomas, 2007).

Table 1. *Factors in Women's Career Development*

External Factors	Internal Factors
Sexual discrimination and harassment	Age
Mentoring	Sex
Gender	Race
Gender-role socialization	Personality traits
Work-family constraints	Academic achievement
Role models	Self-efficacy
Opportunities for advancement	Persistence
	Motivation

Organization of the Remainder of the Study

This study identified the challenges and factors that determined females' career choices in the IT arena. The study consists of five chapters. Chapter 1 provides the introduction to the research paper, which consists of the problem and background of the study, the purpose of the study, rationale, the research questions, significance of the study, definitions of terms, assumptions and limitations, and the conceptual framework of the study. Chapter 2 reviews the literature, which consists of the historical overview, challenges and social factors that influence females' career choices in IT, and statistics concerning women in the IT arena. Chapter 2 also includes information associated with

women in the IT profession. Chapter 3 contains the methodology and procedures that were utilized in the study. Chapter 4 presents the results of the study, and Chapter 5 presents the conclusions of the study, which consist of the discussion, implications for actions taken, and suggestions for further research.

CHAPTER 2. LITERATURE REVIEW

The purpose of this study was to identify the factors that have led females to pursue IT careers. The scarcity of females in the computer science field has been quite apparent in the United States. After continuous recruiting, the lack of women in the field continued, not exclusively in the United States but around the world, as well. Many inquiries has been performed in efforts to reveal reasons behind the lack of females in computer science. The purpose of these studies was to make programs in the computer science field more appealing, which has been thus far a disappointment (Gharibyan & Gunsaulus, 2006). From 2000 to 2004, the number of computer science freshman declined by a shocking 60% to merely 1.4%. The largest proportion of female computer science majors was 3.4% in 1998. In 2012, the U.S. Bureau of Labor Statistics projects an expansion in computer specialization professionals to be between 20% and 50%, with the exclusion of computer operators and programmers. Meanwhile, the number of computer operators is expected to decline, and the number of programmers is anticipated to decrease. Scouting potential occupants for IT positions will surely prove to be a difficult feat (Denning & McGettrick, 2005).

Historical Overview

Pioneering Females in Computer Science

Many may assume women have contributed very little to the arena of computer science; however, women have made great contributions to the industry. Augusta Ada Byron Lovelace (1815-1852) and Grace Murray Hopper (1906–1992) were computer science's pioneering forces. Both of these women imbued the necessary desire to envision the potential of computer science. Lovelace was the first comprehensible programmer. Hopper foresaw the significance of a further developed language in future computing (Gurer, 2002).

Lovelace was an assertive, ingenious, brilliant woman in the Victorian Era, when women in science were scarce. In honor of her contributions, the Department of Defense named its intricate language Ada. At the age of 17, Lovelace met Charles Babbage, who was a mathematician, philosopher, and mechanical engineer who originated the idea of a programmable computer. Babbage was sometimes referred to as the "father of computing" (University of Minnesota, 2007, p. 1). After he showed Lovelace the difference engine, which she deemed a "thinking machine," she understood early on the apparatus' potential profit for math and science (Gurer, 2002, p. 175).

Grace Murray Hopper's intensity, enthusiasm, and resolve as a mentor and technological theorist made Lovelace highly revered. Hopper obtained a bachelor's degree in physics and mathematics from Vassar College, and while at Yale, acquired a Ph.D. in mathematics. She joined the Navy after teaching at Vassar and was assigned to a program that computed the coefficients of the arctangent. Hopper grew familiar with programming and her work evolved into, as she summarized, "the world's first large-

scale digital computer" (Gurer, 2002, p. 176). Hopper joined the fledgling Eckert-Mauchly in 1949, while the first commercial electronic computers, Binac, and UNIVAC I, were being created. At Eckert-Mauchly, Hopper was responsible for the department that developed A-0, the first compiler, and its heir, A-2. She was also credited with the only implemented business information processing language of her time, the FLOW-MATIC programming language. Gurer reported the COBOL community used FLOW-MATIC as a prototype, and in turn, Hopper was cited as the grandmother of COBOL.

Females and the Earliest Computers

In 1946, John Mauchly and J. Presper Eckert developed the Electronic Numerical Integrator and Computer (ENIAC). It was designed and built to calculate artillery-firing tables for the U.S. Army's Ballistic Research Laboratory. Six women who did most of the programming of ENIAC by manipulating its switches and cables were inducted in 1997 into the Women in Technology International Hall of Fame. As they were called in 1946, they were Kay McNulty, Betty Jennings, Betty Snyder, Marlyn Wescoff, Fran Bilas, and Ruth Lichterman (Soulliere, n.d.). From designing to funding, as well as, programming, women were involved in every stage of early computers. Most programmers, or calculators or computers, as they were called, were actually women. Gurer (2002, p. 176) stated that women were usually classified as ideal for programming: "Programming requires lots of patience, persistence, and a capacity for detail and those are traits that many girls have." Early female programmers felt that they received equal treatment and respect among the male programmers.

Females in IT

In 2003, the Information Technology Association of America Blue Ribbon Panel on Information Technology Diversity documented 34.9% of females in the IT field as of 1996: That was down from 41% in 2002 (Quesenberry et al., 2006). The U.S. Bureau of Labor Statistics concluded in 2002 that women made up 46.6% of the total U.S. labor force. The data showed the imbalance of women in the IT field, in comparison to the entire field (as cited in Riemenschmeider, Armstrong, Allen, & Reid, 2006). Both industry professionals and institution professors have been cognizant of the waning number of students selecting professions in computing, in turn diminishing the passageway to industry and the academic community. The rate of post-baccalaureate degrees awarded for computing has plunged, as well. The presence of women, minorities, and people with disabilities in this dwindling collection is unsatisfactory (Stephenson, Miguel, Peckham, Herv'e, & Hutt, 2007).

In countries other than the U.S., the cultural message of career decision focused on what abilities one possessed. For example, an Australian woman from China elaborated that in China, the choice to forgo a particular career was based upon academic strengths rather than desire. She indicated that she had no attraction to IT work, but was urged to follow an IT career path due to her performance on university entrance exams (Trauth, Quesenberry, & Huang, 2006). Many believed that having standard testing in middle and high school could have been important in influencing more females to select IT careers.

Cleveland, Ohio, native, Sister Mary Kenneth Keller, obtained a Ph.D. in computer science (Gurer, 2002). In 1932, Keller entered a Catholic religious order, the

Sisters of Charity, and affirmed her oath in 1940. She later studied at De Paul University and acquired a B.S. in mathematics and an M.S. in mathematics and physics. In 1965, she obtained a computer science Ph.D. from the University of Wisconsin. Her thesis work entailed formulating algorithms that carried out diagnostic variation on algebraic expressions, written in CDC FORTRAN 63. Gurer reported that as a graduate student, Keller studied at Dartmouth, the University of Michigan, and Purdue. While Keller was at Dartmouth, the school ended its men-only policy and permitted her to work in the computer center, where she was involved in the growth of BASIC. At the age of 71, Sister Mary Keller left behind lineage of education and computers at Clarke College.

An IBM Fellow Emeritus, Frances Allen, received a computing accolade comparable to the Nobel Prize. The Association for Computing Machinery, ACM, proclaimed Allen the winner of the Turing Award due to her contributions that furthered the efficiency of computer programs in solving problems and accelerated the use of high performance computing. This was the first time a woman had received such an accolade. First given in 1966, the Turing Award, is widely considered the Nobel Prize in Computing. It carried a $100,000 prize, with financial support provided by Intel Corporation (Geringer, 2007).

Challenges Females Encounter in Information Technology

Discrimination and Fairness

Research has concluded that women have been inadequately represented in tenured ranks in the sciences. The Government Accountability Office (GAO) announced to Congress that female scientists trailed behind men in salary and rank (as cited in

Ginther & Kahn, 2006). Many women claimed that jobs offered at research universities complicated the balance of work and home. Data have revealed that an inhospitable environment made academic employment unappealing. Although women have been poorly represented in the higher level of academic science, one could not conclude from the National Science Foundation, CAWMSET, or Nelson reports that unfair treatment in the promotion process was the underlying cause of the gender gap in academic promotion (Ginther & Kahn, 2006).

A gender bias in academia was one possible cause for the lack of females in the IT arena. A study by Leever et al. (2002) showed that professors have been found to remember the names of men more often than of women, that they asked men more challenging questions, and that they gave men more positive evaluations, even though this behavior was usually unintentional. Women faculty were found to be evaluated more harshly than males by both students and fellow faculty members, which adds to the decrease in women studying in the field. A gender bias in both academia and the workplace is one possible cause for the lack of females (Leever et al., 2002).

In 1991, in response to public outcry and through the leadership of Labor Secretary, Elizabeth Dole, Congress passed an amendment to the Civil Rights Act of 1991 concerning the glass ceiling. The legislature appointed the bipartisan Glass Ceiling Commission (GCC) to investigate the phenomenon. The GCC was charged with the mission of conducting a study and preparing recommendations for eliminating the glass ceiling. The Commission pinpointed the dominant reason for the glass ceiling as a feminized grouping of management.

For instance, in the United States, the increase of female managers in personnel or human resources sectors escalated to 58% in 1991, in contrast to 21% in 1970. In corporate America, it was commonplace for occupants of management positions in marketing, sales, commerce, or manufacturing to be elevated to the upper organizational echelons. Women historically have not been hired in these pipeline positions and were put in charge of areas like human resource management that do not lead to top jobs. Carly Fiorina's successful career was an example of rising above the constraints of the glass ceiling environment. Fiorina was the former CEO of Hewlett-Packard who managed to overcome two significant obstacles: the glass ceiling and the old-boys network (Elmuti et al., 2003).

Carr-Ruffino (2003) found that not only did inequality against diverse workers affect career development, but also it also affected conviction, motivation, and productivity with other members of the workforce. It affected those discriminated against in every phase and aspect of their work experience. A litany of ways companies excluded diverse staff members included recruitment and screening practices; different standards, terms, and conditions of employment; tracking and promotion practices; job segregation; performance evaluation, training, and development decisions; and layoff, discharge, and seniority practices (Carr-Ruffino, p. 102).

Strategies for Breaking the Glass Ceiling

Labor Department studies, as reported by Crampton and Mishra (1999), indicated that the glass ceiling kept many women from moving up in management and leadership positions. Even in traditionally female professions, women did not hold essential positions in connection with their numbers. For example, in primary education, women

taught and men organized, planned, directed, and controlled. In social organizations, females were commonly middle organizers, overseeing direct service employees; meanwhile, men orchestrated affairs, prepared budgets, and performed other more important tasks. Even when women had earned the highest degree in their profession, which was a testament to their ability, they usually filled lower positions. Crampton and Mishra reported American women assumed merely 16% of the administrator jobs and just 4% of authoritative occupations in current organizations.

For women to succeed in the male-dominated world of business, they had to become familiar with the system, be prepared for competition, and understand as well as accept the fact that sex role differences would be difficult to overcome. They had to strive for excellence and refuse to give in to the pressures of a primarily male-dominated business world. Women had to take advantage of their strengths, recognize their weaknesses, and improve upon them. With a positive attitude and tenacity to withstand the pitfalls, more women were projected to obtain managerial accomplishments. Entrepreneurship has been one path to achievement that women have utilized in an effort to reach upper level positions that were difficult to achieve in the traditional corporate hierarchy. Developing their own businesses allowed women the freedom to be their own managers without the discrimination against them that would be involved in the larger corporations (Chaffins, Forbes, Fuqua, & Cangemi, 1995).

A major obstacle for women who aspired to achieve a managerial position was the presence of constraints imposed upon them by society, the family, and women themselves. Some researchers referred to such constraints as myths, preconceived ideas, or unsupported notions. For example, females were stereotyped as needy, emotional,

compliant, noncompetitive, inner-oriented, empathetic, sensitive, subjective, intuitive, and supportive (Crampton & Mishra, 1999).

There was another form of discrimination in the workplace: bullying. Bullying can be female vs. female, male vs. male, or female vs. male. Bullying in organizations has become one the prime social phenomena, which could have had a direct as well as indirect impact on productivity of employees and managers. Four prominent factors that were identified as promoting bullying behavior in a work environment included (a) deficiencies in leadership behavior–inadequate oversight or lack of training of supervisors or managers in how to identify and manage bullying behavior, (b) deficiencies in work design, (c) a socially exposed position of the victim, and (d) low morale standards in the department (Harvey, Heames, Richey, & Leonard, 2006, p. 6).

Stereotypes

According to Leever et al. (2002), Margolis found that women avoided the computer science major because of the perception of the super nerd male hacker who was perceived as cracking the Defense Department's computers with a single keystroke. Margolis found that the stereotype was a greater cause of distress for women because they did not see themselves as fitting the hacker image. After college, females still believed that a computer scientist lived in a solitary, antisocial world and had a lack of diverse interests (Leever et al., 2002). Generally, in the U.S., the word "geek" is an insult, and as a result, many young girls did not want the negative labels associated with an interest in IT. Therefore, they chose to pursue non-IT careers. Yet in China, it was just the opposite, because *geek* was a term of endearment (Trauth et al., 2006). Leever et al.

indicated the existence of these stereotypes left women feeling less comfortable and competent with computers.

Women, for many generations, have been viewed as the weaker sex. This weakness was considered not just physical but moral, intellectual, and emotional as well. In the late 18th century, the female skull was thought to be too small to hold a powerful brain. From these concepts developed the great man theory, stating that leadership was vested in a small number of individuals whose inheritance and destiny made them leaders (Elmuti et al., 2003).

Traditionally, males were thought to be of the right breed, which makes them great leaders. Until recently, a large number of men in the U.S. believed women were not intelligent enough to work or able to bring in enough money to support a family. This stereotype caused the male population to insist that women stay at home and raise the family while men went out and earned the money. This attitude progressed into the stereotype of women in business. Both the great man theory and the "woman's place in the home" view led to the emergence of men as business managers and leaders of the country (Elmuti et al., 2003).

One reason that led men to believe that their leadership was superior was women's ambivalence or distaste toward power. The lack of power or political competence proved an obstacle in the path of women's leadership. Organizations often did not fully support women leaders. Stereotypes affected the leadership styles of women, as did the organizational context. On the one hand, many believed that leaders were to be aggressive, competitive, and tough. Yet, women leaders who behaved this way were

disliked and they created dissatisfaction among subordinates (Mulla-Feroze & Krishnan, 2000).

Explanations for Stereotypes

Among the various stereotypes, three dominate throughout the United States. The first is political. Within the Declaration of Independence, it was affirmed that all men were created equal. It was generally assumed that the word *men* included women, but the view of women as possessions is still alive today. The second stereotype is economic. Women need to be able to buy, invest, and hold property. When women got married, they took their husbands' names and many gave up rights to credit or assets in their own names, which reinforced the women-as-property view. The final stereotype was education. In the past, women were forbidden to participate in higher education. "Without education and access to libraries, instruments, and networks of commutation, it was difficult for anyone—male or female—to move into professional positions" (Aghazadeh, 2004, p. 525). The feminist movement created some equality for women, but the great man theory went directly to the heart of good leadership skills. Leadership depended upon characteristics, not gender. It was imperative for people to be enlightened to appreciate and revere the differences within individuals, regardless of gender (Elmuti et al., 2003).

Diversity

Diversity is defined as "representation, in one social system, of people with different group associations of cultural importance" (Aghazadeh, 2004, p. 522). Organizational ideas involved the contribution of faith, principles, actions, and circumstances of the organization's members. Cultural factors include not only ethnicity

and nationality, but also race, religion, gender, sexual orientation, age, and disability. The word *diversity* is increasingly integrated into management and human resource circles, and organizations of all sizes and types discuss the benefits of embracing diversity within their policies and procedures. There is growing recognition that diversity is being taken seriously (Aghazadeh, 2004).

The composition of the U.S. workforce has changed. Aghazadeh (2004, p. 521) reported figures from the Census Bureau stating that by 2010, nonwhites would comprise more than a third of the U.S. population, and nearly half by 2050. It was estimated that by 2005, the ethnic minority share of the workforce was to have reached 28%. The Census Bureau anticipated that the Hispanic-American population would be the largest minority group in the U.S. by the year 2010. The decreasing presence of native white males was a wake-up call to U.S. businesses that transformations in labor force demographics will soon require adjustments in organizational culture. Aghazadeh advocated that for companies to compete fully and aggressively in the marketplace, they must consider these statistics and work toward attracting, recruiting, developing, and retaining a diverse workforce.

For example, the labor force contains a larger number of seasoned employees continuing and returning to the office among a growing percentage of women as workmates and workers from an assortment of cultural upbringings. Identical developments are occurring within the consumer marketplace (in some cases, global marketplace), and it, therefore, seems beneficial for organizations to consider how to meet the needs of a diverse workforce so that the workforce can reflect and contribute to meeting a wider range of customer expectations (Farrer, 2004).

The Legal Definition of Diversity

The Age Discrimination in Employment Act (ADEA) of 1967 prohibited discrimination in hiring and managing employees on the basis of age. Areas covered include hiring, workforce reductions, promotions, firings, compensation, benefits, job assignments, and education or training (Moody, Beise, Woszczynski, & Myers, 2003). In the Civil Rights Act of 1964, Title VII fended off race-based injustice in employment, as well as national origin, sex, and religion. It was unlawful to discriminate against any employee or applicant for employment because of his/her race or color in regard to hiring, discontinuation, advancement, payment, job preparation, or any other term, condition, or privilege of employment (U.S. Equal Employment Opportunity Commission, 2008).

Title VII also prohibited employment decisions established on stereotypes and expectations about adeptness, traits, or the performance of individuals of certain racial groups. Title VII banned both purposeful discrimination and impartial job tactics that unevenly forced out minorities. Title I of the Americans with Disabilities Act of 1990 banned independent employers, local and state officials, agencies of employment, and labor unions from partiality toward adept persons with disabilities in job placement protocols, hiring, firing, growth, payment, job instruction, and other terms, conditions, and privileges of employment (U.S. Equal Employment Opportunity Commission, 2008).

Benefits and Drawbacks of Diversity

There are many advantages to having a diverse workplace. A study by Aghazadeh (2004, p. 526) indicated that the number of white non-Hispanics would decrease from 80% of the nation's population in 1980 to only 64.3% in 2020. Latinos were estimated to

comprise 37% of the population increase, with African Americans and Asians following. Aghazadeh reported a majority of the changes were to take place in the Southeast as its commerce broadened, which was essential for companies to understand. A company that was prepared for such a change in demographics was considered to be prepared for the future, as both the market and the pool of applicants changed. The company also would be able to experience many of the advantages that a diverse workplace brought. Hanyzewski (1998) compiled a list of advantages of diversity, which included multiple perspectives, greater openness to new ideas, multiple interpretations, and increased creativity.

With all of the positive aspects that multiculturalism brought to a company, there were a few disadvantages. Hanyzewski (1998) listed disadvantages as well, which included ambiguity, complexity, confusion, miscommunication, and difficulty in agreeing on specific action. Many people feel threatened by working with people of a different age, sex, or culture (Aghazadeh, 2004).

Mishandled diversity had widespread results on worker contentment and efficiency. Employees who perceived themselves as valued members of their organization were harder working, involved, and innovative. Minorities felt less appreciated due to stereotyping, ethnocentrism, and prejudice. Mismanagement of diversity in the form of denied access or unfavorable treatment had negative consequences, such as inhibiting workers' abilities and motivation. This led to lower job performance. Therefore, if an organization overlooked its employees' diversity, it overlooked the potential of its employees (Aghazadeh, 2004).

Diversity in IT Organizations

The concept of a diverse workforce has been a part of organizational employment practices since 1965, when Lyndon Johnson signed into law Executive Order 11246 (27). This law required that employers, over a minimum size, have an affirmative action plan that (a) monitored the number of its employees in protected classes and (b) took action regarding hiring and promoting those in the protected classes, if it were to find that their numbers did not match the numbers of qualified people in the protected classes who were employable in those jobs. This act defined protected classes as women, African Americans, Hispanic Americans, Asian Americans, and Native Americans (Moody et al., 2003).

Diversity in the IT workforce was important, according to Moody et al. (2003). Without women on IT development teams, technology pursuits focused more on doing things faster and less on doing new things. Without disabled persons on IT teams, technology advances evolved farther away from accessibility, as with graphical user interfaces. Without age diversity, rich knowledge was lost. Teams found themselves re-inventing or even missing successful development methodologies without the inclusion of aging IT workers. Moody et al. concluded culturally diverse IT teams were critically necessary as globalization became a reality in the workplace.

Gender Differences in the IT Arena

Women found careers in computing unattractive. A report from the American Association of University Women stated that women accounted for only 17% of the high school students who took advanced placement exams in computer science and that women earned only 28% of computer science undergraduate degrees. This confirmed an

earlier report that noticed a sharp drop in CS degrees that women earned between 1986 and 1994 (Palma, 2001, p. 27). Universities experienced lower enrollment, particularly of women, in IT-related majors, contradictory to the impression of the women's movement, which found more women were venturing into male-dominated fields. While women represented 46.6% of the U.S. workforce, between 1996 and 2002, the number of women in the U.S. IT workforce declined from 41% to 34.9%. More disturbingly, women held only 10% of high-ranking positions in the U.S. IT field, and a diminishing number of women were climbing up the ranks in contrast to the past (Adya & Kaiser, 2005).

The Root of the Problem

Several reasons explained why women did not join the IT ranks and why those who did stayed in lower echelons. As reported by industry insiders, educators, guidance counselors, and parents were still guiding girls away from science and math classes, and most science teachers and role models were men. For example, at the university level in the U.S., 94% of the engineering faculty was male, according to Gaudin (1999). The stereotype of the geeky IT worker with the pocket protector, raised hemline that revealed thick white socks, and a pair of unfashionably taped spectacles was a tough image for young girls to take in, especially as they dealt with the awkwardness of adolescents. The predominantly male industry was a lonesome and tough old-boys-club to break into. According to the 1999 Network World Salary Survey, women working in IT earned a fraction of their male counterparts' paychecks, averaging 72 cents on the dollar for female network professionals. Additionally, the extensive hours involved with a growing industry were difficult to balance with family responsibilities (Gaudin, 1999). One option

to attracting more women to the IT field was to get away from the work model wherein everyone was to be physically present in the office, and instead build work-from-home programs (Roberts, 2007).

One significant problem with declining interest from women was that the U.S. economy could not afford to drive away qualified IT workers. In 1999, an estimated 400,000 IT jobs were unoccupied in the United States, according to Meta Group. In Silicon Valley alone, there were nearly 160,000 available IT occupations, which equated to a costly $3 billion to $4 billion in lost production each year, according to the high-tech collaborative Joint Venture: Silicon Valley. Not even Microsoft could find enough IT workers: 10% to 15% of positions were vacant, with IT jobs being the hardest to fill, according to a company representative. The situation only got worse as business dependence on high tech grew. The U.S. Commerce Department predicted that by 2009, the economy was to have generated 1.3 million new positions. American universities and colleges, with a reported 45,000 computer science graduates per year, were not feeding enough new workers into the field even to come close to keeping up (as cited in Gaudin, 1999).

Vilner and Zur (2006) suggested the following problems that women encountered:

1. CS courses had a reputation for being boring and not giving the students creative freedom, which discouraged women from entering the field.

2. Before entering college, women had significantly less hands-on experience with computing than most men. While more males experienced an intense fascination with computers while they were quite young, women's interest was aroused at a later stage. Female students started at a lower level and felt inferior to their male counterparts due to their deprivation of computing knowledge before college.

3. CS students usually suffered from the nerd image: people who lacked social skills, who were obsessed with the computer, and who spent a great

deal of time in front of it. This stereotype was more damaging for women than for men.

4. Women usually did not receive the same level of support as men for entering and persisting in this field, and more women than men transferred out of CS before the third year, expressing a loss of interest (Vilner & Zur, 2006).

Social Factors Influencing Females' Career Choices in IT

Role Models/Mentors

Role models often influence young women's career choices. Women in the workforce, however, have a more difficult time finding role models and mentors to motivate their careers. Teen role models are often societal figures who promote certain lifestyles, social images, and behaviors that have little impact in motivating career choices other than in music, sports, or movies. Not surprisingly, career choice role models are familial or educational. Prior literature did not recognize the distinctive influence of role models from media versus from family, and separating the two was challenging (Adya & Kaiser, 2005).

Mentoring was a possible means to attract and keep more women interested in computer science fields. History has shown that women needed female role models to show that success was possible. A study by Leever et al. (2002) showed that the success of a mentoring program depended on total commitment by both the mentor and the protégé. The program's success relied on the resolve of the pairs to communicate and responsibly enable the progression of women and minorities. In corporations, many women often requested female mentors, but the lack of women in computer science resulted in few available female mentors. For this reason, males were used as mentors in many cases until more females began succeeding in computer science. Leever et al.

reported that many companies had begun to realize this need for guidance and had created mentoring programs designed to encourage women to continue toward the top.

Family

Family is one of the most influential contexts of socialization in childhood and adolescence. While the impact of parental guidance is felt unequivocally in choice of traditional and non-traditional careers, it is most strongly observed in choice of non-traditional careers. Direct forms of parental influence, such as the degree to which students saw their parents choosing IT careers or having contact with technology, were strong motivators to train for technical jobs. Family members motivated career choices indirectly equally persuasively. For instance, a parent may not have been an IT professional but may have encouraged girls to pursue or actively compete in careers perceived to be masculine. Such parents acted as role models of perseverance and achievement without being IT professionals (Adya & Kaiser, 2005).

Adya and Kaiser (2005) suggested that women who entered male-dominated fields such as science often came from families where mothers were working, both parents were highly educated, and success was considered critical. Mothers with 4-year degrees were more likely to influence career choices than were mothers without such qualifications. Even though mothers with higher education affected both conventional and non-conventional career choices, women choosing non-traditional careers indicated their fathers had a stronger, more direct bearing on careers choices in nontraditional environments.

Adya and Kaiser found that 73% of working women indicated their fathers as having strongly influenced their career choice. However, children who were close to their

parent of the same sex reflected career choices of that parent. Siblings also had some influence on career choices. In particular, girls' older brothers influenced the entry of girls into traditionally masculine careers. On the other hand, girls who had only sisters tended to choose careers that were more traditionally feminine. Similar sibling influence was found for boys with male siblings (Adya & Kaiser, 2005).

Peer Groups

In the absence of mentors, peers influenced careers. In teenage years, peers had more impact on social responsiveness, behaviors, fashion styles, and attitudes but little on career choices. During these adolescent and post-adolescent stages, peer influence, particularly of boys on girls, was often observed to impact female self-concept, self-efficacy, classroom experiences, and outside ambition. Influence from peers was shown to have both positive and negative effects on career choices. Adya and Kaiser (2005) discovered that male peers often played an important part in choice of MST as a career choice for some women.

Teachers/Counselors

Research findings leaned toward the negative regarding the role of teachers and counselors on MST career choices. Adya and Kaiser (2005) examined 2,000 high school students and found that teachers had a strong influence on girls' choices of careers in mathematics. Other empirical evidence was not as encouraging. Teacher/counselor advising tended to reflect a gender bias when directing girls toward traditional careers and boys to non-traditional careers. Women in IT were most discouraged by teachers, guidance counselors, and male professors, although women who moved from non-IT to IT careers often indicated male professors as a strong influence in that move. Since most

computer science and IT faculties were predominately male, some students had few female professors in these courses (Adya & Kaiser, 2005).

The National Center for Education Statistics (NCES) found that career and occupational counseling ranked fifth out of eight functions typically performed by high school counselors. Considering that only about 29% of girls received support from career counselors, the amount of positive IT counseling provided to girls was directly influenced. Middle and high school teachers and counselors tended to feel comfortable advising in more traditional fields, mainly because they did not have sufficient IT background to be aware of its career paths. College level professors had a broader perspective of IT career opportunities and could direct students more effectively. Students attaining a higher level of maturity by college were able to make choices based on a broader perspective of social and structural influences on their careers (Adya & Kaiser, 2005).

Statistics of Women in Information Technology

Since to the year 2000, the number of women in IT has declined. Women comprised a smaller percentage of employed IT professionals in this country, according to examination of government labor data by CIO Insight (DeGiglio, 2007). DeGiglio reported that in 2000, the Department of Labor's Bureau of Labor Statistics found that approximately 984,000 women held one of eight IT positions: managers, computer scientists, systems analysts, system developers, software designers, support experts, database managers, network/computer systems administrators, or network systems/data communications analysts. That year, women made up 28.9% of the nearly 3.41 million

employed IT workers. Notably, in 2006, overall IT employment hit a record of nearly 3.47 million. In 2006, 76,000 fewer women worked in IT than in 2000. The 908,000 women working in the profession that year represented 26.2% of employed IT pros, which was a 7.7% drop from 2000. In 2003, when the economy rebounded from the dot-com bust, women employment in IT rose by 35,000 from 2002, but then dropped by 43,000 in 2004. However, for most of the past several years, DeGiglio found fewer women seemed interested in making IT their career.

Table 2 shows the percentage of bachelor's, master's, and doctoral degrees granted to women since 1985. Although the gender of Ph.D. receivers was followed by the Taulbee Survey, questions about the gender of bachelor's and master's degree recipients have been included only since 1994. The survey's outcomes were analyzed with information from National Science Foundation (NSF) surveys in engineering and science (S&E) degrees. The most recent results for NSF data were from 2001 for bachelor's and master's degrees (no data were reported for 1999) and 2003 for doctorates (National Science Foundation, 2007).

Although the Taulbee results combined computer engineering (CE) and computer science (CS) results, while NSF figures reflected CS degrees only, the inclusion of CE data had little impact on the ratio of men to women in Taulbee's results. Table 3 shows that the Ph.D. authorizing departments aimed at by the Taulbee Survey granted a smaller proportion of bachelor's and master's degrees to women than the much broader range of schools that were surveyed by NSF (National Science Foundation, 2007).

Table 2. *Percentage of S&E and CS/CE Degrees Granted to Women*

	Bachelor's		Master's		Doctorates	
	Taulbee CS/CE	NSF S&E	Taulbee CS/CE	NSF S&E	Taulbee CS/CE	NSF S&E
1984/85		39%		32%	11%	26%
1985/86		39%		32%	13%	27%
1986/87		40%		33%	10%	27%
1987/88		41%		32%	9%	27%
1988/89		41%		34%	13%	28%
1989/90		43%		34%	13%	28%
1990/91		44%		36%	12%	29%
1991/92		45%		36%	11%	29%
1992/93		45%		36%	14%	30%
1993/94	18%	46%	19%	37%	16%	30%
1994/95	18%	47%	20%	38%	16%	31%
1995/96	17%	47%	20%	39%	12%	32%
1996/97	17%	48%	23%	41%	14%	33%
1997/98	17%	49%	23%	41%	14%	34%
1998/99	17%		26%		15%	35%
1999/2000	19%	50%	26%	43%	15%	36%
2000/01	19%	51%	27%	44%	16%	36%
2001/02	18%	51%	25%	44%	18%	37%
2002/03	18%	50%	26%	43%	17%	38%
2003/04	17%	50%	25%	44%	18%	38%
2004/05	15%	51%	25%	44%	15%	38%
2005/06	14%		23%		18%	
2006/07	12%		23%		19%	

Note. From *CRA Taulbee Trends: Female Students & Faculty,* 2007, by J. Vegso, at http://www.cra.org/info/taulbee/women.html Adapted with permission.

Table 3. *Percentage of CS/CE Degrees Granted to Women*

	Bachelor's		Master's	
Year	Taulbee CS/CE	NSF CS	Taulbee CS/CE	NSF CS
1993/94	18%	29%	19%	26%
1994/95	18%	29%	20%	26%
1995/96	17%	28%	20%	27%
1996/97	17%	27%	23%	28%
1997/98	17%	27%	23%	29%
1998/99	17%		26%	
1999/2000	19%	28%	26%	34%
2000/01	19%	28%	27%	34%
2001/02	18%	28%	25%	33%
2002/03	18%	27%	26%	32%
2003/04	17%	25%	25%	31%
2004/05	15%	22%	25%	29%
2005/06	14%		23%	
2006/07	12%		23%	

Note. From *CRA Taulbee Trends: Female Students & Faculty,* 2007, by J. Vegso, at http://www.cra.org/info/taulbee/women.html Adapted with permission.

Conclusion

The House Committee on Science, presented by a Congressional Commission, introduced a plan of advisements that they declared would eliminate the country's critical shortage of high-tech workers. The solution, set forth by the commission after analyzing the past, was to draw more women, minorities, and people with disabilities into the high-tech workforce. They added that if IT attracted the same number of women as men, there would be no shortage of skilled high-tech workers (Gaudin, 2000).

On August 9, 2007, President Bush signed into law the H.R. 2272, the "America COMPETES Act" or the "America Creating Opportunities to Meaningfully Promote

Excellence in Technology, Education, and Science Act," designed to boost research and education in math and the science through a funding package of about $42 billion. This authorized various programs at the National Science Foundation and at the Departments of Energy, Commerce, and Education that were intended to strengthen education and research in the United States related to science, technology, engineering, and mathematics (Noyes, 2007).

This was a positive boost for research and education in math and science and meant more research in this area, more jobs, and more money. It was also important for organizations to conduct research on gender gaps in the IT environment. While business organizations were struggling to hold on to their best and brightest women, the persistence of the glass ceiling made progress difficult (Ragins, Townsend, & Mattis, 1998).

CHAPTER 3. METHODOLOGY

Introduction

The purpose of this research was to identify challenges and factors that have led some females to pursue career opportunities in the computer science field. Chapter 3 describes and explains the research methodology used for the study and includes the research design, sample, setting, instrumentation and measures, data collection, data analysis, validity and limitation of the research study. A description methodology was used to answer the research questions with regard to the problem of under-representation of women in computer science. The researcher investigated the following questions:

1. What factors were identified by females currently in IT that influenced their decisions to pursue a career in the IT field?
2. What impacts did social influences such as role models and mentors, family, peer group, and teachers play on career choices of females in IT?
3. What factors discouraged recruitment and retention of females in the IT field?

Research Design

Creswell (1994) suggested that mixed design was an effective research methodology, as it included both quantitative and qualitative approaches. Researchers who collect data that included closed-ended items with numerical responses as well as open-ended items on the same survey conduct mixed methods research. Mixed methods

research combines both qualitative and quantitative approaches (Rocco, Bliss, Gallagher, & Perez-Prado, 2003, p. 19).

Mixed methods research has been used by practicing researchers who utilized methodologies that described techniques closer to what they actually used in practice. Mixed methods research, as the third research paradigm, helps bridge the schism between quantitative and qualitative. Creswell and Plano Clark (2006) defined mixed methods research as:

> a research design with philosophical assumption as well as methods of inquiry. As a methodology, it involves philosophical assumptions that guide the direction of the collection and analysis of data and the mixture of qualitative and quantitative approaches in many phases in the research process. As a method, it focuses on collecting, analyzing, and mixing both quantitative and qualitative data in a single study or series of studies. Its central premise is that the use of quantitative and qualitative approaches in combination provides a better understanding of research problems than either approach alone. (p. 5)

Mixed Methods Approaches to Research

Mixed methods research involves collecting, analyzing, and integrating both quantitative and qualitative data in a single study or in multiple studies in a sustained program of inquiry. This approach arose from an exploration by social science scholars intrigued by the possibilities that this method offered (Creswell, Trout, & Barbuto, 2002). Mixed methods research is a general type of research in which quantitative and qualitative methods, techniques, or other paradigm characteristics are mixed in one overall study. There are two major types of mixed research: mixed method and mixed model research.

Creswell et al. (2002) defined *mixed method research* as research in which the researcher uses the qualitative research paradigm for one phase of a research study and

the quantitative research paradigm for another phase of the study. For example, a researcher conducts an experiment (quantitative) followed by an interview study with the participants (qualitative) to see how they view the experiment and whether they agree with the results. Mixed method research has been considered similar to conducting two mini-studies within one overall research study.

Creswell et al. (2002) noted that *mixed model research* is research in which the researcher mixes both qualitative and quantitative research approaches within a stage of the study or across two of the stages of the research process. For example, a researcher conducts a survey and uses a questionnaire composed of multiple closed-ended or quantitative type items, as well as several open-ended or qualitative type items. The researcher collects qualitative data and tries to quantify it (Johnson & Christensen, 2004).

Strengths and Weaknesses of Mixed Research

The strengths and weaknesses of mixed methods research aid in the decision-making process to use or not use a mixed methods research approach for a given research study. One of the primary strengths of mixed research is that it maximizes the benefits of both quantitative and qualitative methods. Words, pictures, and narrative are used to add meaning to numbers, and numbers are used to add precision to words, pictures, and narrative. Mixed research answers a broader and more complete range of research questions because the researcher is not confined to a single method or approach, and the strengths of an additional method are used to overcome the weaknesses in another method by using both in a research study. Mixed methods adds insights and understanding that would be missed when only a single method is used, and it provides stronger evidence for a conclusion through convergence and corroboration of findings. It

is used to increase the generalizability of the results. Qualitative and quantitative research used together produce more complete knowledge that is necessary to inform theory and practice (Johnson & Onwuegbuzie, 2004).

In spite of it strengths, mixed method research also has weaknesses. It is difficult for a single researcher to carry out both qualitative and quantitative research, especially when two or more approaches are used concurrently; it requires a research team. It is more expensive and more time consuming, and methodological purists contend that one should work within either a qualitative or a quantitative paradigm (Johnson & Onwuegbuzie, 2004). There are five major reasons to conduct mixed methods research and analysis.

1. Triangulation: Seeking convergence and linkage of results from different methods and designs evaluating the same phenomenon

2. Complementary: Seeking detail, elaboration, enhancement, illustration, and clarification of results from one method with results from the other methods

3. Initiation: Discovering paradoxes and contradictions that lead to a re-framing of the research hypothesis

4. Development: Using the findings from one method to help support the other method

5. Expansion: Seeking to expand the breadth and scope of research by using different methods for different research elements. (Johnson & Onwuegbuzie, 2004, p. 21)

Rocco et al. (2003) believed that qualitative research gained acceptance, and therefore, the paradigm wars were over. This statement was not true: Instead of fighting over the advantages of quantitative versus qualitative approaches to research, the challenge was to match research method and paradigm to the purposes, questions, and

issues. There were many useful research designs; the question depended on the research questions asked. Researchers for many years collected both quantitative and qualitative data in the same studies. However, to put both forms of data together as a distinct research design or methodology was relatively new (Creswell & Plano Clark, 2006).

One of the reasons mixed methods was selected for the current study was agreement that mixed methods have been used to encourage researchers to collaborate across adversarial relationships between quantitative and qualitative researchers (Creswell & Plano Clark, 2006). Mixed method research answers questions that were not answered by quantitative or qualitative alone and those the answers provided a foundation that was not confined to a single method or approach. Mixed methods research is more useful to people making policy decisions about business, technology, education, and society (Rocco et al., 2003).

Creswell (1998) advocated the qualitative researcher should identify a small sample number that would provide quality information about each person or site. To determine an adequate sample size, researchers utilized sample size formulas available in research methods textbooks. Lipsy (as cited in Creswell & Plano Clark, 2006) indicated that when quantitative research design was an experiment, investigators were to look to power analysis formulas. Fowler (as cited in Creswell & Plano Clark, p. 112), in contrast, indicated that if the study were a survey, sampling error formulas would allow researchers to identify the appropriate size for the sample. The researcher used the sample size calculator to determine how many people were required to achieve results that reflect the target population as precisely as possible. The required sample size was 40.

Following is the formula used in the sample size calculator (Creative Research Systems, 2007) for a population of 50 with a confidence interval of 7.

$$ss = \frac{Z^2 * (p) * (1-p)}{c^2}$$

Where
ss = sample size
Z = Z value (e.g., 1.96 for 95% confidence level)
p = percentage, picking a choice, expressed as a decimal (.5 used for sample size needed)
c = confidence interval of 7, expressed as a decimal (e.g., .04 = ±4)

Study Design

This study utilized a descriptive, non-experimental, survey evaluation design. The participants for this research consisted of women with computer science credentials and/or those women who were working in the IT profession from the general population. A general population experiment allows researchers to assign representative subject populations to experimental conditions of their choosing, according to Time-sharing Experiments for the Social Sciences (2000-2005). The participants were selected using the following criteria: (a) female, (b) employed with information technology companies or within information technology environments**,** and (c) education or technical backgrounds in computer science or in computer-related coursework.

To locate these women, community and civic organizations like Alpha Kappa Alpha Sorority, Inc. (AKA), The Association for Women in Computing (AWC)**,** African American Women in Technology (AAWIT), Anita Borg Institute for Women and Technology (Systers), and colleges and universities were contacted. The researcher is a member of Alpha Kappa Alpha Sorority, Inc., the Association for Women in Computing,

AAWIT, Systers, and has been in the IT profession for more than 15 years. The organizations and universities were affiliated with women in IT; however, they did not provide e-mail addresses as part of their privacy policy. Prospective participants who met the criteria required for this study were reviewed.

After the prospective study participants were identified, an introductory letter and invitation were sent to the participants, requesting they participate in the survey through electronic mail. The survey was a single and cross-sectional collection approach, which is the most widely used design in social research (Robson, 2003). The immediate purpose of exploratory research is to develop hypotheses or questions for extended research, and it is used to save time and money over the entire research timeline (Cooper & Schindler, 2003, p. 146). A descriptive study was used to discover answers to the questions who, what, when, where, and, sometimes, how. The descriptive study is popular in business research because of its versatility across disciplines (Robson, 2003). This researcher described and defined the subjects by creating a profile of the group of problems and people. The survey instrument was a Web-enabled Internet model to allow timely distribution and delivery of survey content.

Sample

The general population of the study was women who had computer science credentials or who worked in the IT profession. The organizations used to select the population that met the qualifications to represent women working in IT professions were Alpha Kappa Alpha Sorority (AKA), Association for Women in Computing (AWC), African American Women in Technology (AAWIT), and the Systers.

Alpha Kappa Alpha Sorority, Inc., (AKA) has as members over 200,000 college-trained professional women from around the world. It has an active membership of over 49,000 women who represent a diverse range of careers, from educators to heads of state, politicians, lawyers, medical professionals, media personalities, and decision-makers of major corporations. Sorority members have made an honorable commitment to serve all mankind through a united front of more than 200,000 women in over 975 chapters in the United States, the Caribbean, Canada, Germany, Korea, Japan, and in the continent of Africa (Alpha Kappa Alpha Sorority, Inc., 2009).

The Association for Women in Computing (AWC) is a not-for-profit, professional organization for individuals with an interest in information technology. The organization is dedicated to the advancement of women in the computing fields, in business, industry, science, education, government, and the military (Women in Business, 2001). The organizational Web site, AWC-HQ.org.net, is an informative and educational Web site.

African American Women in Technology (AAWIT) is a non-profit organization dedicated to the education, support, and advancement of African American women in the field of information technology. The organization encourages, promotes, and serves the interests of African American women in information technology, striving to help its members advance their careers and enhance their personal development through special resources and networking opportunities. AAWIT.net is an informative, educational, resourceful, online community and is oriented toward research, quality, and community (AAWIT, 2009).

Systers is the world's largest email community of technical women in computing. It was founded by Anita Borg in 1987 as a small electronic mailing list for women.

Today, Systers broadly promotes the interests of women in the computing and technology fields. Borg created Systers to "increase the number of women in computer science and make the environments in which women work more conducive to their continued participation in the field" (Anita Borg Institute for Women and Technology, 2008, p. 1).Systers' is a forum for all women involved in the technical aspects of computing. The list has over 3,000 members in at least 54 countries around the world. The organization welcomes technical women of all ages and at any stage of their studies or careers to participate.

Instrumentation and Measures

The Creamer, Lee, and Meszaros survey, Factors Associated with Women's Interest in Computing (Creamer, Burger, & Meszaros, 2006), was evaluated and chosen for use because of its close resemblance to the requirements outlined in the current study. This researcher modified the survey and added two questions to more closely align it with the information sought for the current study. The survey used in this research is found in Appendix A. Permission from the owners of the survey was obtained before use.

Field Study

Before the final questionnaire was constructed, it was useful to conduct a field study to determine if each question delivered the type of information required for the research. It was good research practice to review elements of the questionnaire for any ambiguity and to concentrate on questions to which participants may have had difficulty in responding. The survey instrument was designed to solicit constructive comments about the relevance of each question as related to research goals. The researcher provided

a methodology for each participant to recommend additional research questions not included in the survey questionnaire. "Administering the questionnaire personally and individually to a small group of respondents is usually the way to proceed with your study," according to Simon & Francis, 2001, p. 59. The researcher made the necessary adjustments to the survey based on the feedback received from the participants. A field study was conducted to determine the appropriateness of the instrument used for this study and necessary adjustments were made based on the feedback received from field study participants. Below are credentials of the panel members who were selected to evaluate the field study:

1. *Panel Member A*
   Education: BS, MS
   Employment: Fortune 500 company
   IT Professions: yes
   Years in the fields: 10 years

2. *Panel Member B*
   Education: BS, MS
   Employment: Healthcare IT
   IT Professions: yes
   Years in the fields: 20 years

3. *Panel Member C*
   Education: BS, MS
   Employment: Fortune 500 company
   IT Professions: yes
   Years in the fields: 25 years

4. *Panel Member D*
   Education: BS
   Employment: Retired
   IT Professions: yes
   Years in the fields: 30 years

5. *Panel Member E*
   Education: ABD
   Employment: IT Consultants, Inc.
   IT Professions: Consultant

Years in the fields: 15

6. *Panel Member F*
Education: ABD
Employment: Education
IT Professions: yes
Years in the fields: 15

A number of changes were made in the final questionnaire, based on results of the field study. Extensive details of the changes are outlined here.

Section 1: background characteristics. Initially, the first two questions addressed participants' high school participation in a computer related program; however, those questions were moved to numbers 8 and 9, and the first section consisted of demographic data (i.e., age, ethnic group, occupation, etc.). The first question, which addressed age range, simply listed several ranges. These were re-categorized, adding a "below 21" range. Instead of listing "Age range," the directions for the first question read: "Please select the category that includes your age (in years)." For question 2, instead of stating "Ethnic background," it was reworded to "Select your race/ethnicity," and "Hispanic American" was added as an option. Initially, question 3 simply asked "Occupation" which was changed to "Your current occupation."

Question 4 asked for "Highest education/degree earned is." It was changed to "Your highest education/degree completed is." Question 5 on the original survey was deleted. It stated, "Undergraduate degree was earned at," with the levels listed (i.e., associate, bachelor's, master's, etc.). Questions 6-8 on the original survey that asked the following: 6) "Undergraduate degree is in", 7) "Master's degree is in", and 8) "Doctorate degree is in" were also deleted. Question 9 on the original survey questioned "Highest educational level/degree earned by parents." On the new survey, that question was

divided into two questions: "What is the highest education level/degree completed by mother?" and "What is the highest education level/degree completed by father?"

Section 2: Background information on computer and technology use. This section listed questions 1 and 2 from the original survey addressing participants' high school participation in a computer related program. Section 3 initially stated, "Computer Use: Reasons for Taking a Computer Course," and the directions read, "The following questions are about reasons why you may have already taken a computer course. Circle 1 for yes and 2 for no." On the revised survey, Section 3 stated, "This section explores reasons for taking a computer course." The directions were also changed to read, "The following questions explore reasons why you may have already taken a computer course. Select the number that corresponds to your answer. Have you taken a computer-related course for any of the following reasons: 1 for yes or 2 for no," stating the directions in more scientific terms.

The directions to the next question on the original survey read, "The following questions are about reasons you might have for planning to take a computer course." This was changed to "The following questions examine the reasons that you might have for planning to take a computer course. Select the number that corresponds to your answer. Do you plan to take a computer-related course for any of the following reasons? 1 for yes or 2 for no." Also, the phrase "needed to get a good job" was changed to "needed to get a better job."

Section 4 initially was entitled "Parental Support: Attitudes about People Who Work in Computer-related Fields." "Parental Support" was deleted from the title and the directions originally read, "The following question concern attitudes about the

characteristics of workers in computer fields. Circle the number that indicates how much you disagree or agree with each of these statements." The directions were changed to read, "The following questions explore what you think are the characteristics of people in computer-related fields. Select the number that indicates how much you disagree or agree with each of these statements. I think people who chose careers in computers are:" and the participants were to select their choice of answers.

Section 5 was restructured from asking questions about the participants' "Parents' Opinions or Views" to "This section examines the impact of influence or other factors" and addressed questions related to the family, peer groups, role models/mentors, or teachers/counselors. The Parents' Opinions or Views section was moved to a latter part of the survey.

The next question on the original survey asked, "Do you feel your family/parents influenced you in pursuing a career in Computer Science in other ways as well? Please explain." The next two questions on the old survey addressed "the most positive factor which fostered your interest in computer science" and ranking "the positive impact on female recruitment and retention on computer science." On the new instrument, the two questions addressed the "most supportive of your interest in computer science" and "the most positive views regarding the recruitment and retention of females in computer science."

On the original survey, the next two questions read, "In your opinion, are there any other factors besides these three (teachers, parents, role models/mentors) that play an important role in female recruitment and retention in computer science?" and "In your opinion, are there any specific encouragement mechanisms that you would like to suggest

that might play an important role in female recruitment and retention in computer science? Please list and explain." These statements were reworded to read, "Are there any suggestions that may have encouraged recruitment and retention of females in the computer science field? Yes or No Please explain," and "Are there any suggestions that may have discouraged recruitment and retention of females in the computer science field? Yes or No Please explain."

The next three sections, Sections 6, 7, and 8 on the revised survey, addressed the same issues noted on the old survey; however, the format of the questions was restructured for the sake of clarity. Section 6 addressed "Your Parents' Opinions or Views," Section 7 addressed "Credibility of Information Sources," and Section 8 addressed "Sources of Career Information." Question 21 on the revised survey was stated exactly as it was on the original survey, asking if the participant knew someone who had a position in a computer field similar to their interest. It was not changed. The next section on the original survey addressed "IT Attitudes: Important Fact ors in Career Choice." Section 9 on the revised survey read, "IT Attitudes. This section explores how motivation and goals can influence your career choice." The directions were reworded; yet they were very similar.

The last question was not changed. It addressed factors that influenced the career choice of the participants. The closing remarks were not changed, thanking the participants for their participation in completing the survey. An additional statement was added to the end of the survey: "This completes the survey," which added closure. These changes were made to improve the survey instrument and were used accordingly. Table 4 shows a matrix linking the elements of the current study to related theories.

Table 4. *Matrix of the Theory, Research, and Hypothesis Questions*

Theory	Survey Questions
Betz and Hackett's self-efficacy theory	10, 11, 12, 14, 15, 16, 17, 18, 21, 22
Farmer's model of career and achievement motivation	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 14, 15, 16, 17, 18, 20
Astin's sociopsychology model	6, 7, 10, 11, 14, 15, 16, 17, 21, 22, 23
Gottfredson's theory of career aspirations	3, 4, 10, 11, 14, 15, 16, 17, 21, 22, 23
Magolda	3, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23
Research Questions	
What factors are identified by females currently in IT that influenced their decisions to pursue a career in the IT field?	8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23
What impacts do social influences such as role models and mentors, family, peer group, and teachers play on career choices of females in IT?	8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21,
What factors discourage recruitment and retention of females in the IT field?	8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21
Hypothesis Questions	
Females in IT careers report the utilization of positive role models affected their career choice.	8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21
Females in IT careers report the use of computer technologies in home and school environments affected their career choice.	8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21
Females in IT careers report male-dominated industries affected their career choice.	12, 18,19, 20, 21

Survey Design

A 5-point Likert-type scale was used for sections 1, 3, 4, 6, 7, 8, 9, with open-ended questions on sections 2 and 5. The survey took approximately 20-25 minutes to complete. A summary of each question and its purpose is found in Table 5.

Table 5. *Summary of the Purpose of the Questions*

Section	Purpose
1	Background characteristics
2	Background information on computer and technology use
3	Reasons for talking a computer course
4	Attitudes about people who work in computer-related fields
5	Examines influences and factor impact
6	Parents' opinions or views
7	Credibility of information sources
8	Sources of career information
9	IT attitudes

Data Collection

The data collection steps included the following: (a) setting the boundaries for the study, (b) collecting information through a Web-based survey and visual materials, and (c) establishing the protocol for recording information (Creswell, 1994, p. 148). The Web site survey was sent via hyperlink to the general population of women who had computer science credentials or who worked in the IT profession. An introductory letter accompanied the survey. The participants were given written instructions for the survey, and they were requested to submit the survey to the researcher. The data were collected over a period of 45 days using a Web-enabled survey hosted by Zoomerang. This survey

was designed for female participation only and it began with a gender question. If the person were a female, she was to proceed with the survey. The results were downloaded from the hosting site into a Microsoft Excel format without any identifying information. The data were analyzed using SPSS statistical software.

Data Analysis

The process of data analysis involved analyzing the text and image data. It also involved preparing the data for analysis, conducting a variety of analyses, moving deeper and deeper into understanding the data, representing the data, and interpreting the larger meaning of the data (Creswell, 2003, p. 109). The research study used descriptive statistics to provide a detailed and accurate picture of the phenomenon as a means of generating and testing hypotheses and pinpointing areas of needed improvements (Simon & Francis, 2001).

Two approaches to hypothesis testing were used in this study: classical statistics and Bayesian statistics. The classical statistics were found in all of the major statistics books and were widely used in research applications. Such an approach represents an objective view of probability in which the decision-making rests totally on an analysis of available sampling data (Cooper & Schindler, 2003). In classical tests of significance, two kinds of hypotheses are used. The null hypothesis is used for testing. It is a statement that no difference exists between the parameter (a measure taken by a census of the population or a prior measurement of a sample of the population) and the statistics being compared to it (a measure from a recently drawn sample of the population). The second is the alternative hypothesis, which is the logical opposite of the null hypothesis.

Parametric and nonparametric are the two general classes of significance tests. Parametric tests are more powerful because their data are derived from interval and ratio measurements. Parametric tests place different emphases on the importance of assumptions**.** For purposes of this research, Cronbach's alpha, a parametric test, was used. Cronbach's alpha method was chosen because it could be applied when test items are scored dichotomously. Cronbach's alpha is one of the most commonly reported reliability estimates in the language testing literature (Brown, 2002). Nonparametric tests were used to test the hypotheses with nominal and ordinal data. Nonparametric tests have fewer and less stringent assumptions (Cooper & Schindler, 2003)

This research used the chi-square test. The most familiar use of the chi-square test is when a researcher wants to see if there are statistical differences between the observed (actual) frequencies and the expected (hypothesized) frequencies of two variables presented in a cross-tabulation or contingency table. The larger the observed frequency is in comparison with the expected frequency, the larger the chi-square statistic is and the more likely the difference is statistically significant (Simon & Francis, 2001). This nonparametric test is the most widely used. It is particularly useful in tests involving nominal data, but it can be used for higher scales. Typical are cases where persons, events, or objects are grouped in two or more nominal categories such as "yes-no," "favor-undecided-against," or class "A. B, C, or D." Chi-square is useful in cases of one-sample analysis, two independent samples, or k independent samples. It must be calculated with actual counts rather than percentages (Cooper & Schindler, 2003).

The Kendall tau was also used in this research as a measure of association appropriate for the ordinal variables being investigated. The Kendall tau rank correlation

coefficient is a non-parametric statistic that measures the strength of association of the cross tabulation. Kendall 's tau is a refinement of gamma that considers tied pairs, which occurs when subjects have the same value on the X variable, on the Y variable, or on both (Cooper & Schindler, 2003, p. 599). The Kendall tau coefficient (τ) has the following properties: (a) If the agreement between the two rankings is perfect (i.e., the two rankings are the same), the coefficient has a value of 1; (b) If the disagreement between the two rankings is perfect (i.e., one ranking is the reverse of the other), the coefficient has a value of −1; (c) For all other arrangements, the value lies between −1 and 1, and increasing values imply increasing agreement between the rankings. If the rankings are completely independent, the coefficient has a value of 0 on average (Becchetti, Colesanti, Spaccamela, & Vitaletti, 2008).

Validity and Reliability

Pre-existing foundational questions were among the most useful tools for the researcher. The benefits of using pre-existing and standardized tests were that the items and total scores had been analyzed, and their validity and reliability had been established by statistical controls (Simon & Francis, 2001). The advantages of using pre-existing questions included time savings, in that there was no need for development of coding categories or show cards, and because measurement techniques had already been established (Hyman, Lamb, & Bulmer, 2006). Hyman et al. reported the potential pitfalls of using pre-existing questions included (a) the questions that are available may not meet requirements of the current study, (b) possible limited availability of information on responses, and (c) copyright issues.

Reliability provides an estimate of how well measurements reflect true (non-random) differences. As a researcher, one is obligated to select the most reliable instruments. The purpose of the testing determined, in part, the minimum reliability coefficient that could be tolerated. However, reliable tests may not necessarily be valid tests (Simon & Francis, 2001). Three main types of reliability coefficients can be measured.

1. Stability: The extent to which individuals maintain their relative standings when the same or similar exam is administered twice over a period of time.

2. Equivalence: Correlation of scores on two or more forms of the same test by the same persons.

3. Internal consistency: Correlation between questions on the same test to determine if they measure the same trait (Simon & Francis, 2001, p. 58).

Validity refers to the extent to which measurements achieve the purpose for which they are designed. The researcher determined the validity of the content by asking the following questions suggested by Simon & Francis (2001).

1. Did each item measure predetermined criteria?

2. Did previously obtained scores accurately predict the criteria measured?

3. Did the behavior or conditions of administrating the test affect the results?

The reliability and validity of survey data depends to a considerable extent on the technical proficiency of those designing the survey. If the questions are incomprehensible or ambiguous, the exercise is a waste of time. This is also a problem of internal validity, where valid information is not obtained about the respondents and what they were thinking, feeling, doing, and so on (Robson, 2003).

Ethical Considerations

Capella University requires that the researcher complete the Institutional Review Board (IRB) documentation and the Collaborative IRB Training Initiative (CITI) modules. The CITI certification required the researcher complete all eight modules successfully. As researchers anticipate data collection, they need to respect the participants and the sites for research. Researchers must have their research plans reviewed by the IRB on their college and university campuses. IRB committees exist on campuses because of federal regulations that provide protection against human rights violations (Creswell, 2003).

As part of the instructions to the survey, all participants were informed that any response of participants, as well as any identifying information, was to be kept strictly confidential, and participants were guaranteed complete anonymity. All participants in this study were advised that they could get a copy of the survey results by supplying a current e-mail address. This study met all Capella University's IRB requirements for waiver of signed consent.

All data, both electronic and hard copy, will be stored in a locked location to which only the researcher has access for the required period of 7 years. At the end of the required time, data will be deleted, erased, and shredded. No one else will have access to any data during that time.

CHAPTER 4. RESULTS

Introduction

The purpose of this quantitative dominant, mixed methods research study was to identify challenges and factors that have led some females to pursue career opportunities in the computer science field. This chapter contains four major sections, which include a description of the data analysis procedures, a summary of the demographic characteristics of the research sample, a descriptive summary of the survey responses and the results for each research hypothesis. The chapter provides the data analysis results of the research survey in order to test the following research hypotheses:

1. Females in IT careers report the utilization of positive role models affected their career choice.
2. Females in IT careers report the use of computer technologies in home and school environments affected their career choice.
3. Females in IT careers report male-dominated industries affected their career choice.

Data Analysis Procedures

This section of the chapter outlines the data analysis procedures. The quantitative survey data were analyzed using SPSS (version 16.0). Cronbach's alpha was used to determine the inter-item reliability of the survey items. However, only those items that were based on a numerical Likert-type scale were included in the analysis. The results of the Cronbach's alpha indicated that the reliability coefficients ranged from .64 to .78.

Only one of the items had a reliability coefficient less than .70 (see Table 6). Based on the inclusion of all of the quantitative Likert-type scale items in the analysis, the reliability of the survey was acceptable ($\alpha = .75$).

Table 6. *Cronbach's Alpha by Item*

Source	α
Item 12	0.64
Item 13	0.72
Item 18	0.78
Item 19	0.70
Item 20	0.70
All items	0.78

The categorical demographic survey items in Section 1 were analyzed using frequency distributions. The research hypotheses were tested by analyzing the survey responses using frequency distributions and bar charts. In some cases, cross-tabulation and chi-square or Kendall's tau were used to test relationships between variables. Chi-square was used when examining the relationship between two nominal variables or a nominal variable with an ordinal variable. Kendall's tau was used when examining the relationship between two ordinal variables. Statistical significance was determined by p value $\leq .05$. Finally, in addition to the analysis of the quantitative survey items, the open-ended responses were reviewed, coded, and analyzed for themes.

Summary of Research Sample

This section of the chapter provides a summary of the sample demographic characteristics. The study contained 50 participants who provided complete survey data, although 59 participants provided at least some data. The age range of the sample is summarized in Table 7. The most common age category was between 41 and 50 years of age (37.3%) and the least common age category was the between 21 and 30 years of age (20.3%). Finally, the majority of the research sample was 41 years of age or older (55.9%).

Table 7. *Age of Research Sample*

Age	*f*	%
21-30	12	20.3
31-40	14	23.7
41-50	22	37.3
Older than 50	11	18.6

The racial composition of the research sample is provided in Table 8. The results indicate about an equal split of African American or Black participants (47.5%) and Caucasian or White participants (45.8%). Two participants identified themselves as Asian or Pacific Islander and two participants identified themselves as Hispanic American.

The participants' current job positions ranged greatly and included positions such as school teacher or professor, information technology positions (e.g., systems analyst, programmer, software developer, etc.), engineering, quality assurance, graduate student, self-employed, and retiree.

Table 8. *Racial Composition of the Research Sample*

Race	*f*	%
African American or Black	28	47.5
Asian or Pacific Islander	2	3.4
Caucasian or White	27	45.8
Hispanic American	2	3.4
Other, please specify	3	5.1

The educational attainment of the research sample is summarized in Table 9. The results indicate that almost all of the participants in the study had at least a bachelor's degree (91.5%) and the most common educational level was to have a master's degree (42.4%). Results showed 18.6% of the sample held a doctoral degree.

Table 9. *Educational Level of Research Sample*

Race	*f*	%
No response	1	1.7
High school	1	1.7
Some college	3	5.1
Bachelor's degree	16	27.1
Master's degree	25	42.4
Master's degree plus	2	3.4
Doctoral degree	11	18.6

The participants were asked to indicate whether they held a degree in information technology. The summarized results in Table 10 indicated that a small majority held a degree in information technology (55.9%). One participant did not provide a response.

Table 10. *Degree in Information Technology*

IT degree	*f*	%
No response	1	1.7
No	25	42.4
Yes	33	55.9

Table 11. *Educational Level of Participant's Mother*

Mother's education	*f*	%
Don't know	2	3.4
Less than high school	4	6.8
High school	4	6.8
Nursing or post high school program	3	5.1
Associate's degree	5	8.5
Bachelor's degree	4	6.8
Specialist	1	1.7
Master's degree	18	30.5
Doctoral degree	6	10.2

Participants were asked to indicate the educational level of both their mothers and fathers. The summarized results for mothers are provided in Table 11. The results indicate that the participants' mothers tended to be highly educated, with 30.5% having

master's degrees and another 10.2% having doctoral degrees. Some of the participants' mothers did not complete high school (6.8%) or had only a high school degree (6.8%).

The results for the participants' fathers are provided in Table 12. The results indicate that fathers tended to be less educated, on average, than were mothers. However, many of the fathers had a post-baccalaureate degree (32.2%). Some participants (10.2%) did not know the educational attainment of their father.

Table 12. *Educational Level of Participant's Father*

Father's education	*f*	%
Don't know	6	10.2
Less than high school	3	5.1
High school	13	22.0
Post high school program/ some college	3	5.1
Associate's degree	6	10.2
Bachelor's degree	9	15.3
Master's degree	12	20.3
Doctoral or law degree	7	11.9

Descriptive Summary of Survey Responses

This section of the chapter provides the descriptive results of the survey responses. A descriptive account of each survey item is presented. The first section on the survey to be analyzed was Section 2, which consists of Items 8 and 9. Item 8 asked, "In the high school(s) you attended, did you have access to functioning computers with Internet access in the classroom and/or laboratories on a regular basis?" Based on the

participants' responses, 14% had access and 86% did not have access to functioning computers with Internet access. Similarly, Item 9 asked, "In high school or college, did you participate in a computer-related program like an after-school class, club, or summer program?" According to the participants' responses, 26% did and 74% did not participate in such a program. The bar chart in Figure 1 summarizes the results for Items 8 and 9.

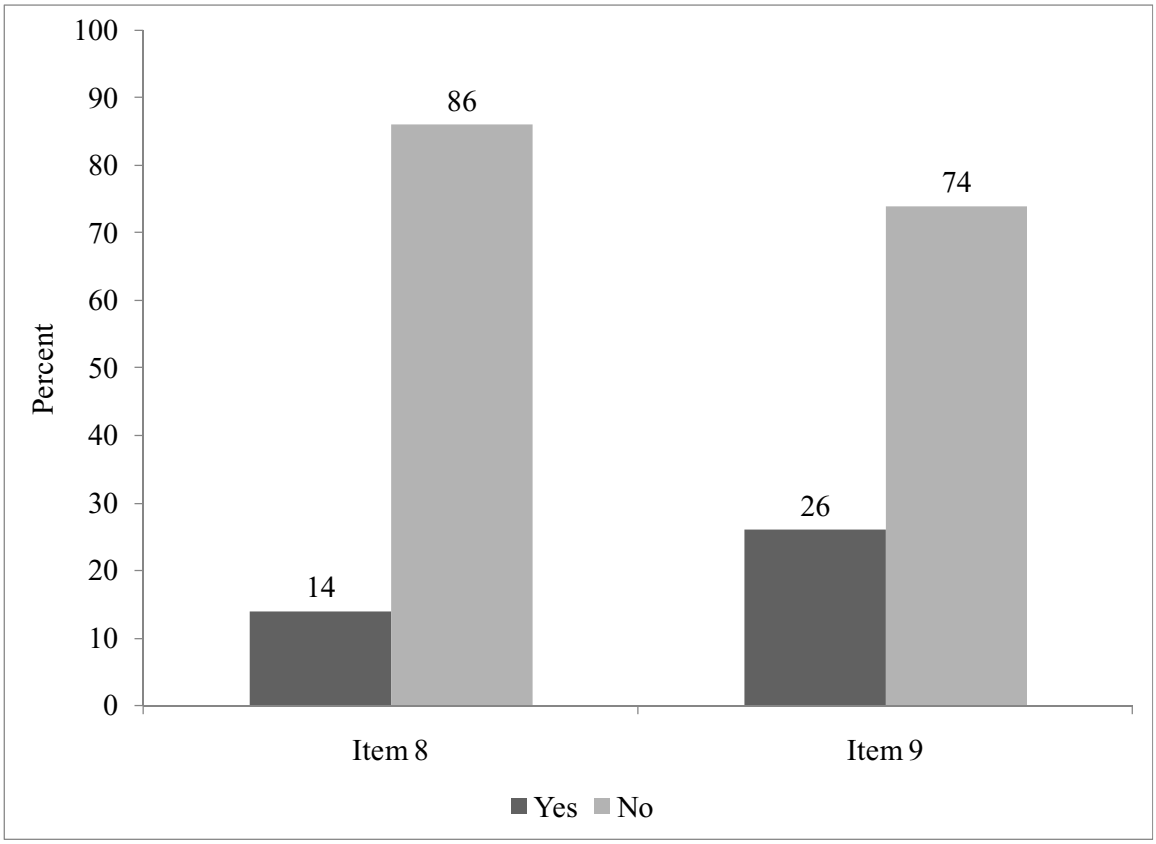

Figure 1. Response frequencies for items 8 and 9

The primary reason given by participants for not having access to computers with Internet access was because they went to school before computers and/or the Internet was in use, or they were in school when computers and/or the Internet was still in its infancy (n = 13). One participant indicated that he/she had weekly computer classes and another participant indicated that he/she visited a high school in Germany.

Section 3 on the survey contains Items 10 and 11, which pertain to reasons for taking a computer course. Item 10 asked, "Have you taken a computer-related course for any of the following reasons?" The participants were given a list of seven reasons. The participants' summarized responses are presented in Figure 2. The results indicated that the most common reason for taking a computer-related course was for enjoyment (94%), followed by having a general interest in computers and technology (89%). Conversely, the least common reason for taking a computer-related course was due to the advice of a parent/guardian or the advice of a counselor, advisor, or teacher (28%).

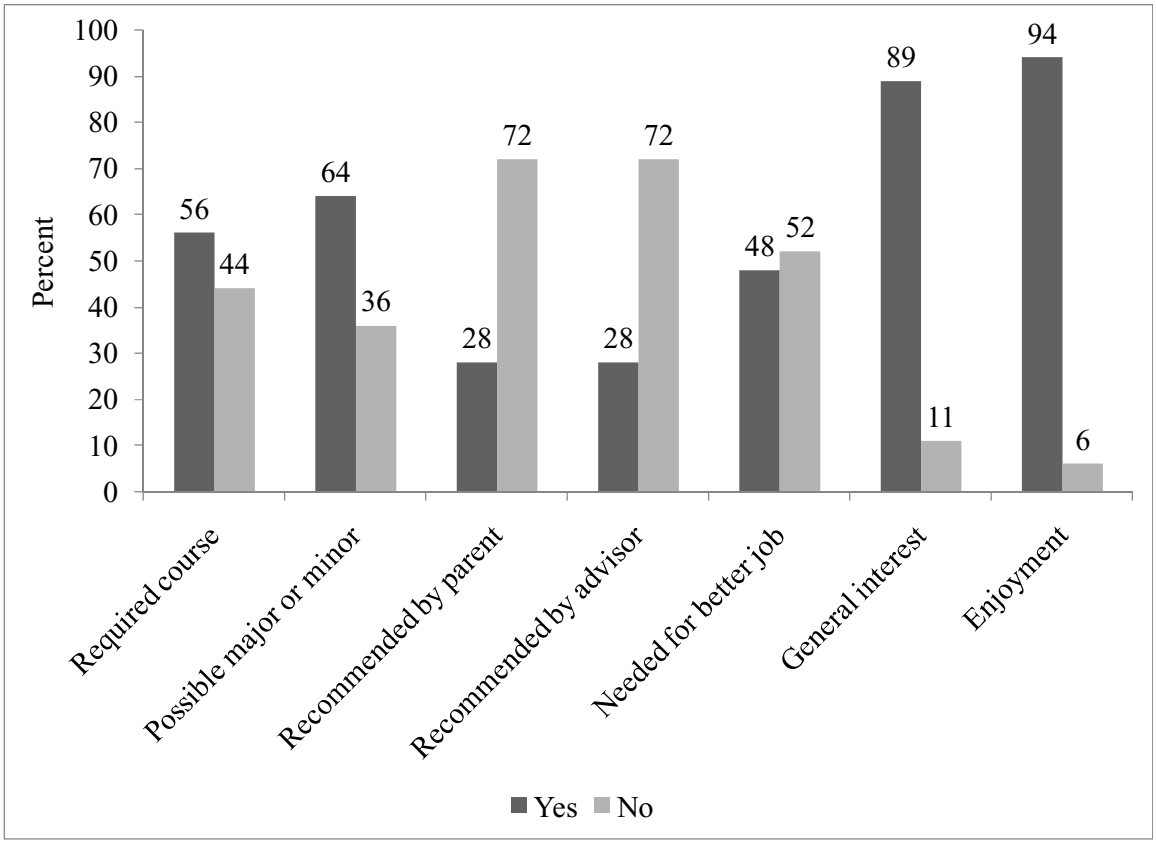

Figure 2. Response frequencies for item 10

Item 11 asked, "Do you plan to take a computer-related course for any of the following reasons?" The same list of seven reasons was provided. The participants' summarized responses in Figure 3 indicate that again, the most common reason selected was for enjoyment (87%), followed by having a general interest in computers and technology (83%). Conversely, the least common reason was based on the advice of a parent/guardian (7%).

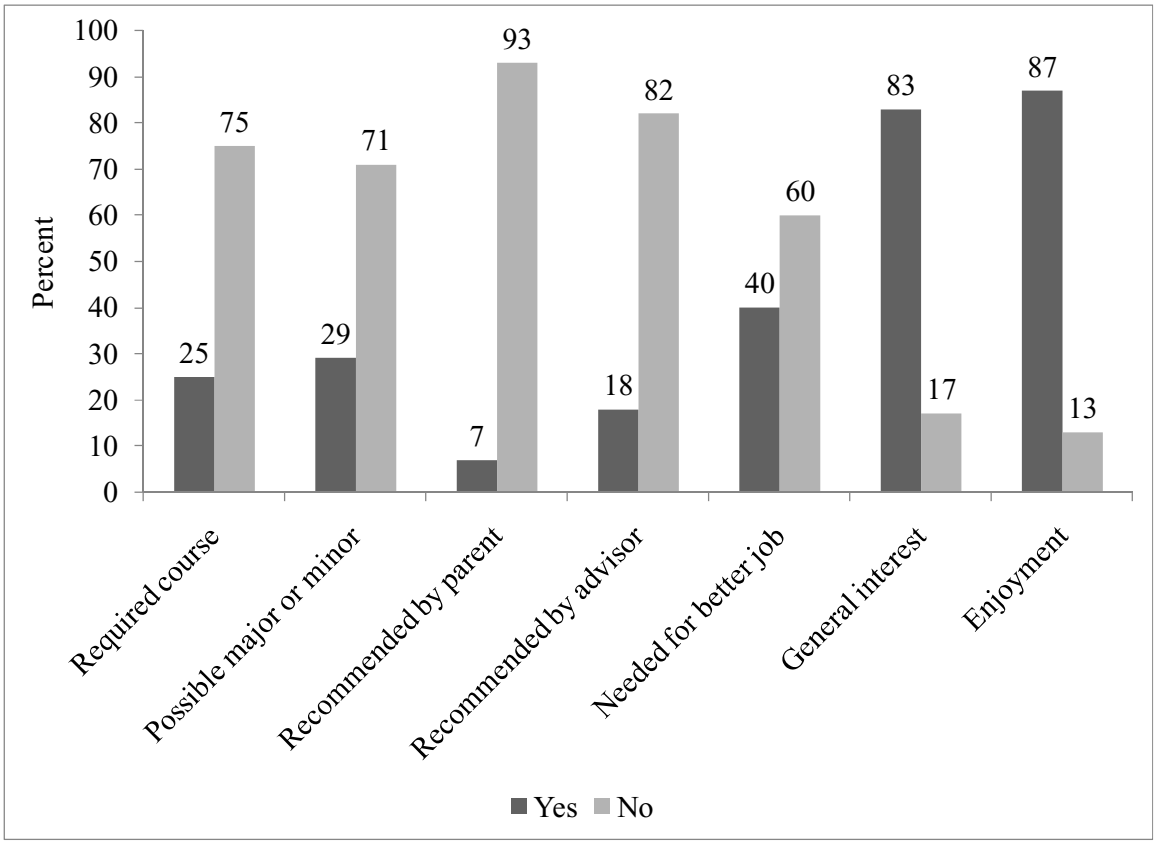

Figure 3. Response frequencies for item 11

Section 4 on the survey contains only Item 12, which pertains to attitudes about people who work in computer-related fields. Item 12 stated, "Select the number that indicates how much you disagree or agree with each of these statements." The first

statement was “I think people who chose careers in computers are geeks.” The summarized responses in Table 13 indicated that the participants had mixed views, with 32.0% disagreeing, 20.0% slightly disagreeing, 36.0% slightly agreeing and 12.0% agreeing with the statement.

Table 13. *People Who Chose Careers in Computers are Geeks*

Geeks	*f*	%
Disagree	16	32.0
Slightly disagree	10	20.0
Slightly agree	18	36.0
Agree	6	12.0

The next statement was “I think people who chose careers in computers are likely to be male.” The summarized responses in Table 14 indicated that participants were most likely to either slightly agree (34.0%) or agree (36.0%) with the statement. However, as many as 22.0% disagreed with the statement and another 8.0% slightly disagreed.

Table 14. *People Who Chose Careers in Computers are Likely to be Male*

Male	*f*	%
Disagree	11	22.0
Slightly disagree	4	8.0
Slightly agree	17	34.0
Agree	18	36.0

The next statement was "I think people who chose careers in computers are loners/antisocial." The summarized responses in Table 15 indicated that the most common response was to disagree (44.0%). However, 34.0% slightly agreed and 4.0% agreed with the statement. On average, participants were more likely to show some level of disagreement than agreement with the statement.

Table 15. *People Who Chose Careers in Computers are Loners/Antisocial*

Loners/antisocial	*f*	%
Disagree	22	44.0
Slightly disagree	9	18.0
Slightly agree	17	34.0
Agree	2	4.0

The next statement was "I think people who chose careers in computers are interesting." The summarized responses in Table 16 indicated that an overwhelming majority of the participants either slightly agreed (57.1%) or agreed (26.5%) with the statement.

Table 16. *People Who Chose Careers in Computers are Interesting*

Interesting	*f*	%
Disagree	4	8.2
Slightly disagree	4	8.2
Slightly agree	28	57.1
Agree	13	26.5

The next statement was "I think people who chose careers in computers are hard-working." The results in Table 17 indicated that almost the entire sample either slightly agreed (56.0%) or agreed (34.0%) with the statement.

Table 17. *People Who Chose Careers in Computers are Hard-Working*

Hard-working	*f*	%
Disagree	2	4.0
Slightly disagree	3	6.0
Slightly agree	28	56.0
Agree	17	34.0

Table 18 provides the summarized responses for the next item, which states, "I think people who chose careers in computers are smart." The results indicated that almost all of the participants either slightly agreed (44.0%) or agreed (48.0%) with the statement.

Table 18. *People Who Chose Careers in Computers are Smart*

Smart	*f*	%
Disagree	3	6.0
Slightly disagree	1	2.0
Slightly agree	22	44.0
Agree	24	48.0

The next statement was "I think people who chose careers in computers are creative." The summarized responses in Table 19 indicated that the vast majority of the

sample either slightly agreed (44.0%) or agreed (40.0%) with the statement; only 4.0% disagreed and 12.0% slightly disagreed.

Table 19. *People Who Chose Careers in Computers are Creative*

Creative	*f*	%
Disagree	2	4.0
Slightly disagree	6	12.0
Slightly agree	22	44.0
Agree	20	40.0

Figure 4 provides the ranked mean ratings for all of the statements associated with Item 12. The results indicated that on average, participants were least likely to agree that people who chose careers in computers are loners/antisocial and most likely to agree that people who chose careers in computers are smart.

Section 5 of the survey contained Items 13 through 17. Participants were instructed to indicate how much they agree or disagree with five statements listed on the survey. The first statement was "I find it helpful to listen to the input of others before I make an important decision." The summarized responses in Table 20 indicated that the vast majority of the participants either slightly agreed (39.6%) or agreed (50.0%) with the statement. Only 6.2% disagreed and only 4.2% slightly disagreed with the statement.

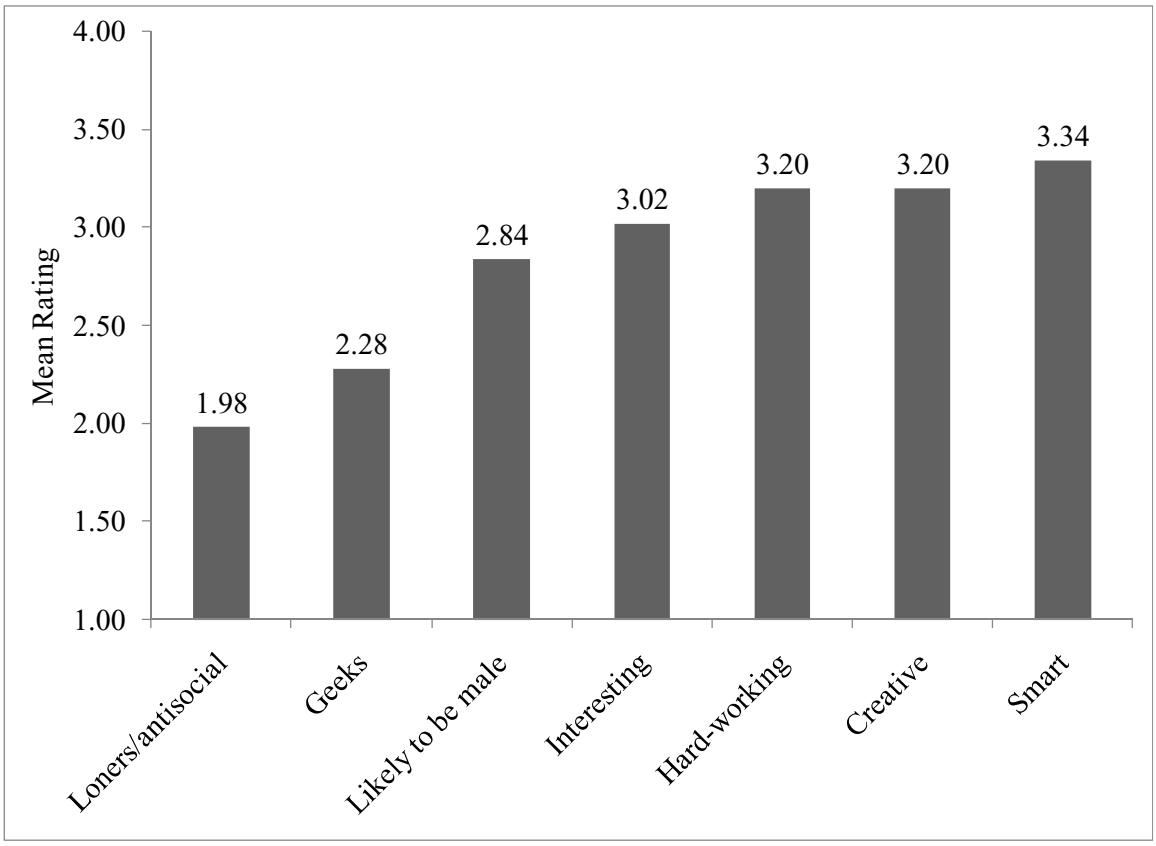

Figure 4. Ranked mean ratings for item 12

Table 20. *Helpful to Listen to the Input of Others before Making a Decision*

Listen to input from others	*f*	%
Disagree	3	6.2
Slightly disagree	2	4.2
Slightly agree	19	39.6
Agree	24	50.0

The next statement was "When I make an important decision, I often seek the input of members of my family." The summarized responses in Table 21 indicated that the vast majority of the participants either slightly agreed (35.7%) or agreed (53.1%) with

the statement. In fact, no one disagreed, while 12.2% slightly disagreed with the statement.

Table 22 provides a summary of the participants' responses to the statement, "When I make an important decision, I often seek the input of my peer groups." The results indicated that more than half of the participants (55.1%) slightly agreed and 24.5% agreed with the statement. Only 2.0% disagreed, while 18.4% slightly disagreed with the statement.

Table 21. *Seek Input from Family Members*

Seek input from family	*f*	%
Disagree	0	0.0
Slightly disagree	6	12.2
Slightly agree	17	34.7
Agree	26	53.1

Table 22. *Seek Input from Peer Groups*

Seek input from peers	*f*	%
Disagree	1	2.0
Slightly disagree	9	18.4
Slightly agree	27	55.1
Agree	12	24.5

The next statement was "When I make an important decision, I often seek the input of my role model/mentor." The summarized responses in Table 23 indicated that the participants were somewhat varied in their responses. The most common response

was to slightly agree (40.8%) followed by agree (28.6%). Results showed 20.4% slightly disagreed and an additional 10.2% disagreed with the statement.

Table 23. *Seek Input from Role Model/Mentor*

Seek input from role model/mentor	*f*	%
Disagree	5	10.2
Slightly disagree	10	20.4
Slightly agree	20	40.8
Agree	14	28.6

The last statement associated with Item 13 was "When I make an important decision, I often seek the input of my teacher(s)/counselor(s)." The summarized responses in Table 24 indicated that the responses were fairly evenly distributed across the response options. Participants were about equally as likely to show some level of agreement as they were to show some level of disagreement. Overall, the most common response was to slightly agree (28.6%), followed by slightly disagree (26.5%).

Table 24. *Seek Input from Teacher(s)/Counselor(s)*

Seek input from teacher/counselor	*f*	%
Disagree	12	24.5
Slightly disagree	13	26.5
Slightly agree	14	28.6
Agree	10	20.4

A summary of the ranked mean ratings for the statements associated with Item 13 is provided in Figure 5. The mean ratings indicated that participants were least likely to agree that when making an important decision, they seek the input of teachers or counselors. Conversely, on average, the participants were most likely to agree that when making an important decision, they seek the input of family members.

Item 14 on the survey asked, "Which one of the persons listed below was the most supportive of your interest in computer science?" The participants were given four choices from which to select their most supportive source. The participants' summarized responses in Table 25 indicated that the majority of the participants selected family as the most supportive (63.3%), while teachers or counselors were selected least (10.2%).

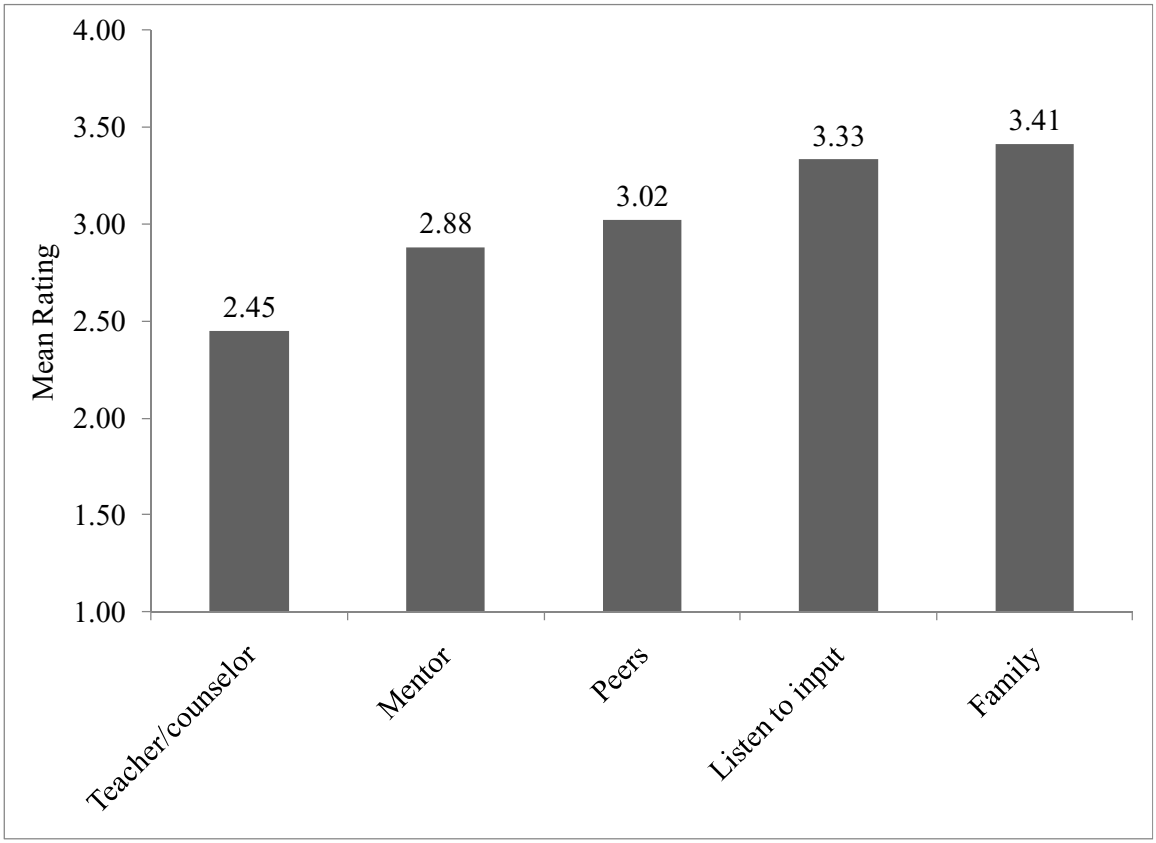

Figure 5. Ranked mean ratings for item 13

Table 25. *Person Most Supportive of Interest in Computer Science*

Most supportive	*f*	%
Family	31	63.3
Role model/mentor	6	12.2
Teacher(s)/counselor(s)	5	10.2
Peer group	7	14.3

Item 15 on the survey asked, "Which one of the persons listed below had the most positive views regarding the recruitment and retention of females in computer science?" The results for this question were diverse, as indicated in Table 26. Although the most common response was still family (30.6%), the responses were more evenly distributed across the response options.

Table 26. *Person Most Positive Views Regarding Females in Computer Science*

Most positive views	*f*	%
Family	15	30.6
Role model/mentor	11	22.4
Teacher(s)/counselor(s)	12	24.5
Peer group	11	22.4

Item 16 was an open-ended question that asked participants if there were any suggestions that may encourage recruitment and retention of females in the computer science field. The general themes that emerged in the responses are outlined in Table 27. The most commonly stated piece of advice was to provide role models and/or mentors (*n*

= 11). For example, one of the participants indicated, “More visits by women working in computers to schools” are needed, and another participant suggested, “Have more programs for females in the IT area and role model and more successful career stories.”

The second most common theme was to expose females to the possibilities of IT (*n* = 10). For example, one of the participants explained, “I think exposure to the possibilities and creativity of computer science would go a long way.” Another participant suggested, “Focus on how software (computer science) can help females run their businesses and potentially be independent financially. This is a big incentive for many women and young girls.” Other comments suggested that IT should be embedded throughout the curriculum, gender biases need to be removed, the image of IT being for geeks and/or dull and boring needs to change, and girls should be encouraged early on to embrace IT and have every opportunity to do so.

Table 27. *Item 16 Identified Themes*

Theme	*f*
Provide role models and/or mentors	11
Expose them to the possibilities of IT	10
Need better or embedded IT curriculum	5
Remove gender bias and male domination	4
Change the image of IT	4
Encourage girls early on/provide more opportunity	3

Item 17 was also an open-ended item that asked participants if there were any suggestions that may discourage recruitment and retention of females in the computer

science field. Table 28 outlines the identified themes associated with this particular question. The results indicated that a continuation of male domination in the field was the most commonly reported theme (n = 6). For example, one of the participants explained, "Too few women in the class has a chilling effect." In addition, another participant indicated that the "portrayal of computer science as a male field, e.g., through use of males exclusively in books, posters, career talks, etc." Other themes that emerged pertained to the failure to confront stereotypes associated with the IT field, the continuation of gender biases such as lower pay for women and a lack of promotion, having no flexibility in work hours or having to work unrealistic hours, and discontinuing programs and a lack of role models for girls.

Table 28. *Item 17 Identified Themes*

Theme	*f*
Continue male domination and lack of female representation	6
Fail to confront stereotypes of IT	4
Continue gender bias	4
Long and unrealistic work hours / anti-women friendly policies	3
Discontinuing programs and role models for girls	2

Section 6 of the survey contained Item 18. Participants were asked to indicate how much they disagree or agree with a set of statements. Ten participants provided a response of not applicable in some instances. The first statement was, "It is important to my mother/female guardian that I have a career." The summarized responses in Table 29

indicated that the large majority of the participants (79.5%) who responded to the item agreed with the statement.

Table 29. *Important to Mother/Female Guardian that I Have a Career*

Important to mother/female guardian	*f*	%
Disagree	1	2.3
Slightly disagree	2	4.5
Slightly agree	6	13.6
Agree	35	79.5

The next statement was, "It is important to my father/male guardian that I have a career." The summarized responses in Table 30 indicated that 73.2% agreed with the statement; only 2.4% (one person) disagreed and only 4.9% (two people) slightly disagreed with the statement.

Table 30. *Important to Father/Male Guardian that I Have a Career*

Important to father/male guardian	*f*	%
Disagree	1	2.4
Slightly disagree	2	4.9
Slightly agree	8	19.5
Agree	30	73.2

The next statement was, "My mother/female guardian has a clear idea about careers that would suit me." The summarized responses in Table 31 indicated that although the majority of the participants either slightly agreed (33.3%) or agreed (31.0%)

with the statement, 19.0% disagreed and another 16.7% slightly disagreed with the statement.

Table 31. *Mother/Female Guardian has a Clear Idea about Careers for Me*

Mother/female guardian has clear idea	Frequency	Percent
Disagree	8	19.0
Slightly disagree	7	16.7
Slightly agree	14	33.3
Agree	13	31.0

The next statement was, "My father/male guardian has a clear idea about careers that would suit me." The summarized responses in Table 32 indicated that although the majority of the participants either slightly agreed (33.3%) or agreed (28.2%) with the statement, 12.8% disagreed and 25.6% slightly disagreed with the statement.

Table 32. *Father/Male Guardian has a Clear Idea about Careers for Me*

Father/male guardian has clear idea	*f*	%
Disagree	5	12.8
Slightly disagree	10	25.6
Slightly agree	13	33.3
Agree	11	28.2

Table 33 provides the results for the statement, "My parents/guardians encourage me to make my own decisions about my future career." The results indicated that the

overwhelmingly majority agreed with this statement (88.4%). In fact, none of the participants disagreed and only 4.7% (two people) slightly disagreed with the statement.

Table 33. *Parents/Guardians Encourage Me to Make My Own Career Decisions*

Encouraged to make own career decisions	*f*	%
Disagree	0	0.0
Slightly disagree	2	4.7
Slightly agree	3	7.0
Agree	38	88.4

The next statement was, "I would like my parents to approve of my choice of career." The summarized responses in Table 34 indicated that a small majority (52.5%) agreed with the statement and another 32.5% slightly agreed. Only 10.0% disagreed and only 5.0% slightly disagreed with the statement.

Table 34. *I Would Like My Parents to Approve of My Choice of Career*

Want parents to approve career choice	*f*	%
Disagree	4	10.0
Slightly disagree	2	5.0
Slightly agree	13	32.5
Agree	21	52.5

The next statement was "My parents encouraged me to talk to others about career options." The summarized responses in Table 35 indicated that the majority of the

participants (67.5%) agreed with the statement, although 20.0% slightly disagreed and an additional 5.0% disagreed with the statement.

Table 35. *My Parents Encouraged Me to Talk to others about Career Options*

Encouraged to talk to others	*f*	%
Disagree	2	5.0
Slightly disagree	8	20.0
Slightly agree	3	7.5
Agree	27	67.5

The next statement was, "My parents encouraged me to explore a variety of career options." The summarized responses in Table 36 indicated that the vast majority either agreed (60.5%) or slightly agreed (20.9%) with statement. Although none of the participants disagreed, 18.6% slightly disagreed with the statement.

Table 36. *My Parents Encouraged Me to Explore a Variety of Career Options*

Encouraged to explore options	*f*	%
Disagree	0	0.0
Slightly disagree	8	18.6
Slightly agree	9	20.9
Agree	26	60.5

The last statement associated with Item 18 was, "When we disagree, my parents listen to my point of view." The summarized responses in Table 37 indicated that over 90% of the participants either agreed (61.9%) or slightly agreed (31.0%) with the

statement. Only one person (2.4%) disagreed and only two people (4.8%) slightly disagreed with the statement.

Table 37. *When We Disagree, My Parents Listen to My Point of View*

Parents listen to my point of view	*f*	%
Disagree	1	2.4
Slightly disagree	2	4.8
Slightly agree	13	31.0
Agree	26	61.9

Figure 6 provides a summary of the ranked mean ratings for all of the statements associated with Item 18. The results in Figure 6 indicated that on average, participants were most likely to agree (3.84) that, "My parents encourage me to make my own decisions about my future career." Participants were more likely to agree that it is important to their mother/female guardian that they have a career (3.70) than they were to agree that it is important to their father/male guardian that they have a career (3.63). Results showed the two ratings were similar and showed more agreement than disagreement. Conversely, participants were least likely to agree that their mother/female guardian (2.76) and their father/male guardian (2.77) have a clear idea about careers that would suit them.

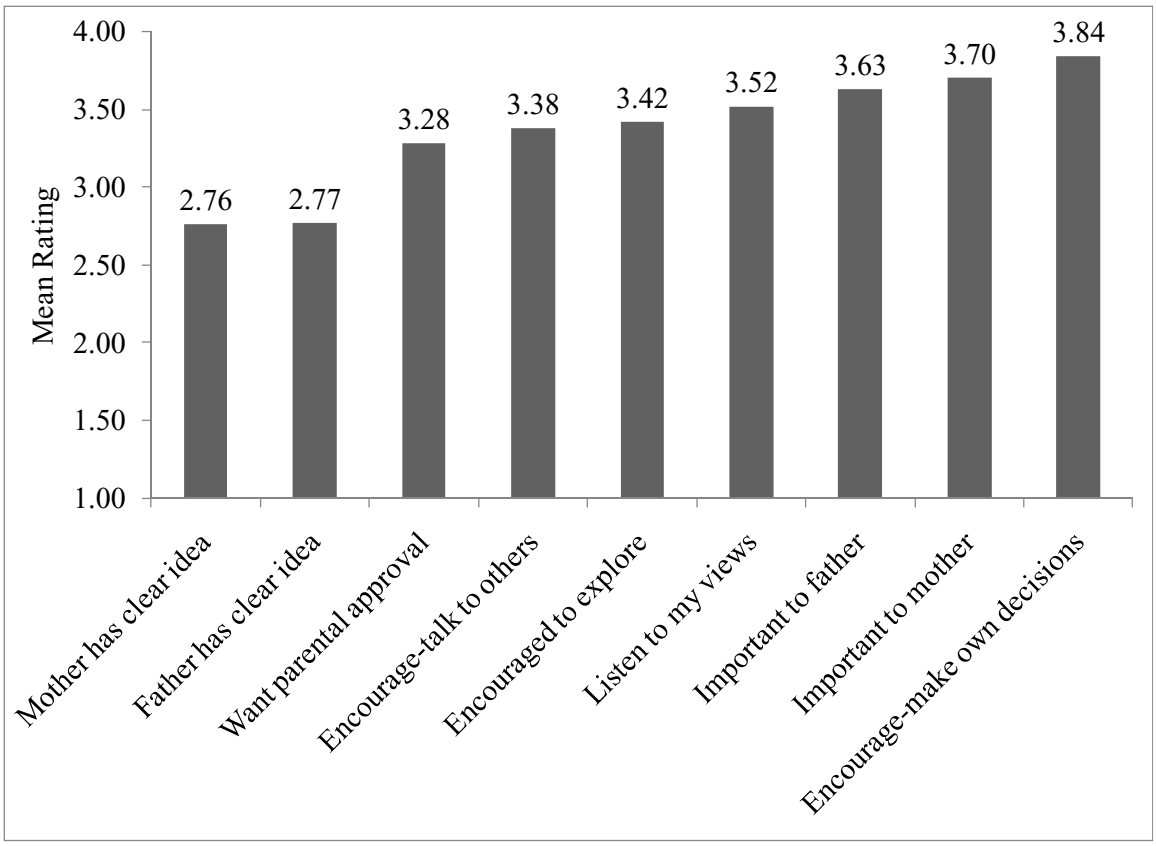

Figure 6. Ranked mean ratings for item 18

Section 7 of the survey contained Item 19, which asked participants to indicate how likely they would be to consider advice about careers offered by different people. The participants' responses to "mother/female guardian" are summarized in Table 38. The results indicated that the vast majority of the participants would be very likely (55.3%) or likely (27.7%) to consider career advice given by their mother/female guardian.

The summarized responses to "father/male guardian" in Table 39 indicated that the vast majority of the participants would be very likely (46.8%) or likely (38.3%) to consider career advice given by their father/male guardian.

Table 38. *Likelihood of Considering Career Advice Given by Mother/Female Guardian*

Mother/female guardian	*f*	%
Very unlikely	3	6.4
Unlikely	5	10.6
Likely	13	27.7
Very likely	26	55.3

Table 39. *Likelihood of Considering Career Advice Given by Father/Male Guardian*

Father/male guardian	*f*	%
Very unlikely	4	8.5
Unlikely	3	6.4
Likely	18	38.3
Very likely	22	46.8

The summarized responses for "other family members" are presented in Table 40. The results indicated that although the majority of the participants reported being likely (55.3%) or very likely (19.1%) to take advice from other family members, participants reported that they were less likely to take advice from other family members than they were from either their mother/female guardian or father/male guardian.

Table 40. *Likelihood of Considering Career Advice Given by other Family Members*

Other family members	*f*	%
Very unlikely	3	6.4
Unlikely	9	19.1
Likely	26	55.3
Very likely	9	19.1

The summarized responses for "teacher or professor" in Table 41 indicate that none of the participants reported being very unlikely to take career advice from a teacher or professor, only 6.4% reported being unlikely, 66.0% reported being likely and finally 27.7% reported being very likely to take career advice from a teacher or professor.

Table 41. *Likelihood of Considering Career Advice Given by a Teacher or Professor*

Teacher or professor	*f*	%
Very unlikely	0	0.0
Unlikely	3	6.4
Likely	31	66.0
Very likely	13	27.7

The summarized responses for "counselor or role model" are provided in Table 42 and indicated that participants were overwhelming either likely (59.6%) or very likely (29.8%) to take career advice from a counselor or role model. None of the participants reported being very unlikely to take career advice from a counselor or role model and only 10.6% reported being unlikely to take such advice.

Table 42. *Likelihood of Considering Career Advice Given by a Counselor or Role Model*

Counselor or role model	*f*	%
Very unlikely	0	0.0
Unlikely	5	10.6
Likely	28	59.6
Very likely	14	29.8

The summarized responses for "male friends" in Table 43 indicated that 58.7% of the participants would be likely to take career advice from a male friend and an additional 15.2% would be very likely to take such advice. Although only 4.3% (two people) would be very unlikely to take such advice, 21.7% would be unlikely to take career advice from a male friend.

Table 43. *Likelihood of Considering Career Advice Given by a Male Friend*

Male friend	*f*	%
Very unlikely	2	4.3
Unlikely	10	21.7
Likely	27	58.7
Very likely	7	15.2

The results for "female friends" in Table 44 indicated that the vast majority of the participants would be either likely (65.2%) or very likely (17.4%) to take career advice from a female friend. Only 4.3% (two people) would be very unlikely to take such advice and 13.0% would be unlikely to take career advice from a female friend. Participants were somewhat more likely to indicate that they would take career advice from a female friend than they would be to take career advice from a male friend.

Table 45 provides the summarized results for "significant other." The results in Table 40 indicated that the vast majority of the participants would be either likely (45.7%) or very likely (45.7%) to take career advice from a significant other. Only one person would be very unlikely (2.2%) and only three would be unlikely (6.5%) to take such advice from a significant other. The summarized responses for "employer or boss"

in Table 46 indicated that the overwhelming majority of the participants would be either likely (50.0%) or very likely (39.1%) to take career advice from an employer or boss.

Table 44. *Likelihood of Considering Career Advice Given by a Female Friend*

Female friend	Frequency	Percent
Very unlikely	2	4.3
Unlikely	6	13.0
Likely	30	65.2
Very likely	8	17.4

Table 45. *Likelihood of Considering Career Advice Given by a Significant Other*

Significant other	*f*	%
Very unlikely	1	2.2
Unlikely	3	6.5
Likely	21	45.7
Very likely	21	45.7

Table 46. *Likelihood of Considering Career Advice Given by an Employer or Boss*

Employer or boss	*f*	%
Very unlikely	2	4.3
Unlikely	3	6.5
Likely	23	50.0
Very likely	18	39.1

The summarized responses for "family friends" are provided in Table 47. The results indicated that the participants' responses were relatively diverse, in that although

54.3% would be likely to do so, 34.8% would be unlikely to do so. Overall participants would be more likely than unlikely to take career advice from family friends.

Table 47. *Likelihood of Considering Career Advice Given by Family Friends*

Employer or boss	*f*	%
Very unlikely	1	2.2
Unlikely	16	34.8
Likely	25	54.3
Very likely	4	8.7

Figure 7 provides a summary of the ranked mean ratings for Item 19. The results in Figure 7 indicated that the participants would be most likely to take career advice from a significant other (3.35) followed by a mother/female guardian (3.32). Participants would be least likely to take career advice from family friends (2.70), followed by male friends (2.85).

Section 8 of the survey contained Items 20 and 21. Item 20 asked participants to indicate how often they have discussed career options or plans with others. Participants were given the same list of people that was given for Item 19.

The results for "mother/female guardian" are provided in Table 48. The results indicated that participants were most likely to indicate that they discuss their career options or plans with their mother/female guardian many times (46.8%), followed by several times (31.9%), once or twice (17.0%), and never (4.3%).

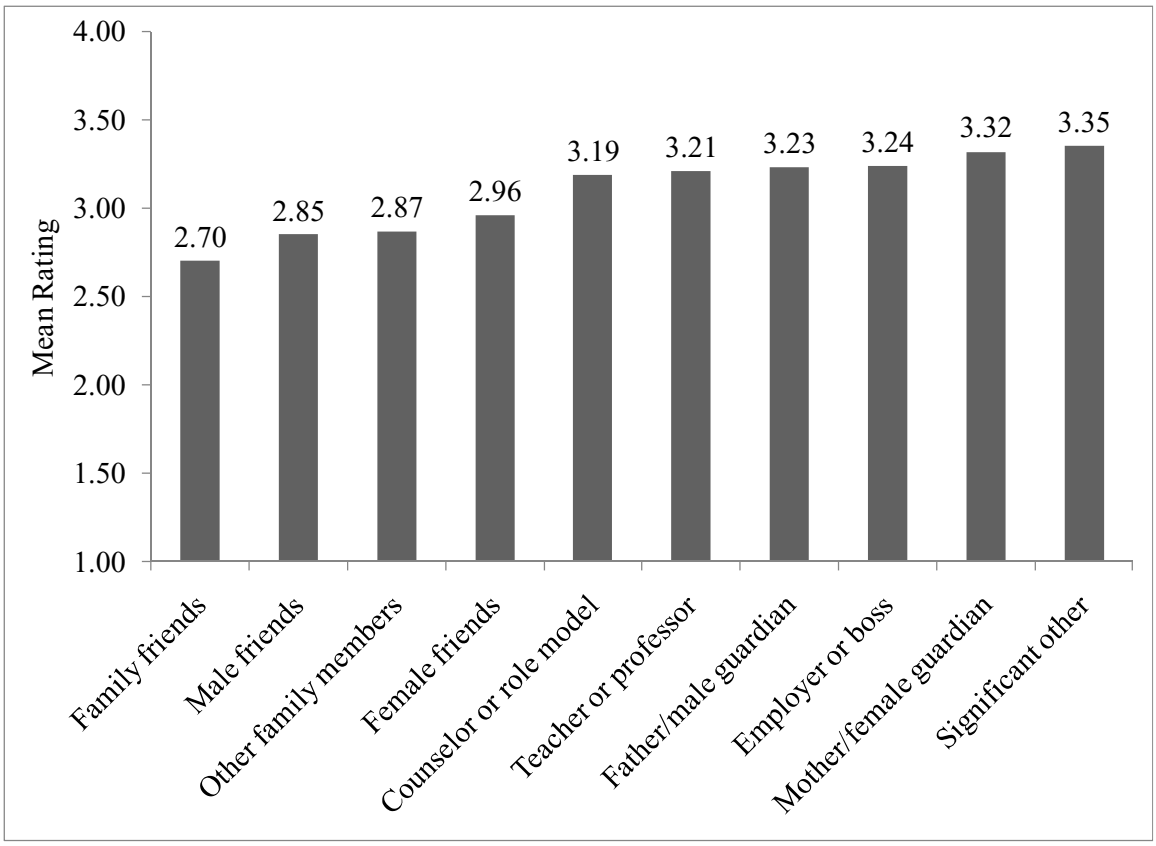

Figure 7. Ranked mean ratings for item 19

Table 48. *Discussion of Career Options or Plans with Mother/Female Guardian*

Mother/female guardian	*f*	%
Never	2	4.3
Once or twice	8	17.0
Several times	15	31.9
Many times	22	46.8

The summarized responses for "father/male guardian" in Table 49 indicated that the participants' responses were diverse. The most common response was to discuss career options or plans with a father/male guardian several times (32.6%), followed by either many times or once or twice (26.1%), and never (15.2%). The participants had very

different responses with regard to the frequency with which they discussed career options or plans with their father/male guardian.

Table 49. *Discussion of Career Options or Plans with Father/Male Guardian*

Father/male guardian	*f*	%
Never	7	15.2
Once or twice	12	26.1
Several times	15	32.6
Many times	12	26.1

The summarized responses for "teacher or professor" in Table 50 indicated that although a small majority (51.1%) have discussed their career options or plans with a teacher or professor, 29.8% have discussed career options or plans with a teacher or professor only once or twice. Overall, participants were most likely to discuss their career options or plans with teachers or professors several times or more.

Table 50. *Discussion of Career Options or Plans with Teacher or Professor*

Father/male guardian	*f*	*%*
Never	2	4.3
Once or twice	14	29.8
Several times	24	51.1
Many times	7	14.9

The summarized responses for "counselor or advisor" in Table 51 indicated that participants were almost as likely to report discussing their career options or plans with

counselors or advisors several times (41.3%) as they were to report discussing career options or plans only once or twice (39.1%). Results showed overall participants were most likely to have discussed their career options or plans with a counselor or advisor several times or more.

The summarized responses for "other family members" are provided in Table 52. The results indicated that participants were most likely to discuss career options or plans with other family members several times (40.4%), followed by only once or twice (36.2%), never (12.8%), and many times (10.6%). About half of the participants discussed such options with other family members never or rarely while about half discussed such options with other family members frequently.

Table 51. *Discussion of Career Options or Plans with Counselor or Advisor*

Father/male guardian	*f*	*%*
Never	4	8.7
Once or twice	18	39.1
Several times	19	41.3
Many times	5	10.9

Table 52. *Discussion of Career Options or Plans with other Family Members*

Other family members	*f*	*%*
Never	6	12.8
Once or twice	17	36.2
Several times	19	40.4
Many times	5	10.6

The summarized responses for "male friends" in Table 53 indicated that participants were most likely to discuss career options or plans with male friends several times (44.7%), followed by only once or twice (34.0%), and then never or many times (10.6%). Overall, a small majority indicated that they discussed career options or plans with male friends frequently.

Table 53. *Discussion of Career Options or Plans with Male Friends*

Male friends	*f*	*%*
Never	5	10.6
Once or twice	16	34.0
Several times	21	44.7
Many times	5	10.6

The summarized responses for "female friends" in Table 54 indicated that the majority of the participants discussed career options or plans with female friends several times (48.9%) or many times (21.3%). The participants in this study discussed their career options or plans with their female friends more often than their male friends, on average.

Table 54. *Discussion of Career Options or Plans with Female Friends*

Female friends	*f*	*%*
Never	3	6.4
Once or twice	9	19.1
Several times	23	48.9
Many times	10	21.3

Table 55 provides the summarized responses for "significant other." The results indicated that participants were most likely to have discussed their career options or goals with significant others many times (45.7%), followed by only once or twice (26.1%), several times (21.7%), and never (6.5%). Overall, the majority of the participants discussed their career options or goals with a significant other several times or more.

Table 55. *Discussion of Career Options or Plans with Significant Other*

Significant other	*f*	%
Never	3	6.5
Once or twice	12	26.1
Several times	10	21.7
Many times	21	45.7

The summarized results for "employer or boss" in Table 56 indicated that participants were likely to have discussed their career options or goals with an employer or boss several times or more. Results showed 21.7% discussed their career options or goals with an employer or boss only once or twice and 6.5% never discussed their career options or goals with an employer or boss.

Table 56. *Discussion of Career Options or Plans with Employer or Boss*

Employer or boss	*f*	%
Never	3	6.5
Once or twice	10	21.7
Several times	25	54.3
Many times	8	17.4

The summarized responses for "family friends" in Table 57 indicated that participants were most likely to have discussed their career options or plans with family friends only once or twice (44.4%), followed by several times (31.1%), never (13.3%), and many times (11.1%). The majority of the participants did not discuss career options or plans with family friends on a regular or frequent basis.

Table 57. *Discussion of Career Options or Plans with Family Friends*

Family friends	*f*	%
Never	6	13.3
Once or twice	20	44.4
Several times	14	31.1
Many times	5	11.1

A summary of the ranked mean ratings for Item 20 are presented in Figure 8. The results indicated that on average, participants discussed their career options or plans most often with their mother/female guardian (3.21), followed by significant other (3.07). Conversely, participants discussed their career options or goals least often with family friends (2.40), followed by other family members (2.49).

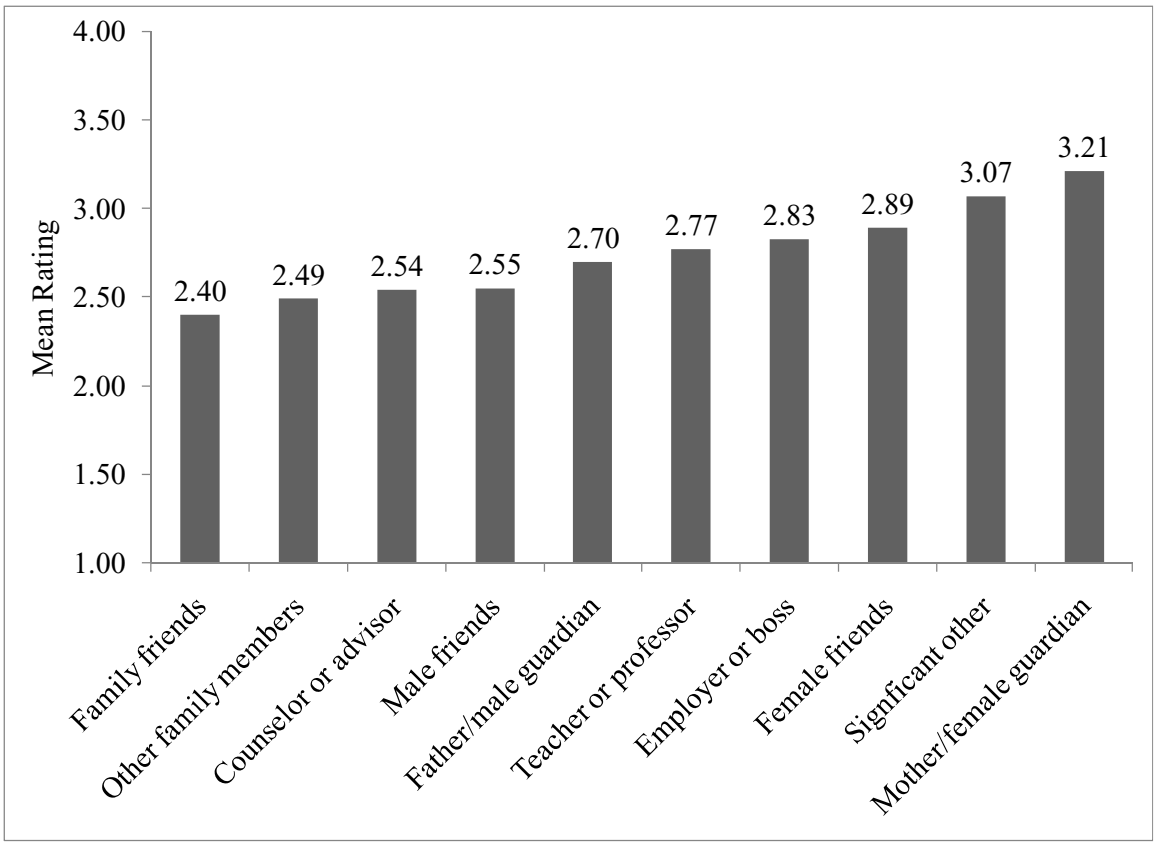

Figure 8. Ranked mean ratings for item 20

Item 21 asked participants if they knew someone who has a position in a computer field similar to what interests them, and if so, who that person was in relation to them. Participants were supplied with a list of people and asked to select all that applied. The summarized responses in Figure 9 indicated 80.0% of the participants responded that they knew a friend or acquaintance who was in a computer field that interests them. None of the other people was selected by a majority of the participants. The least likely to be in a computer field of interest to the participant was the mother (7.0%), followed by the father, and a female family member other than the mother (11.0%).

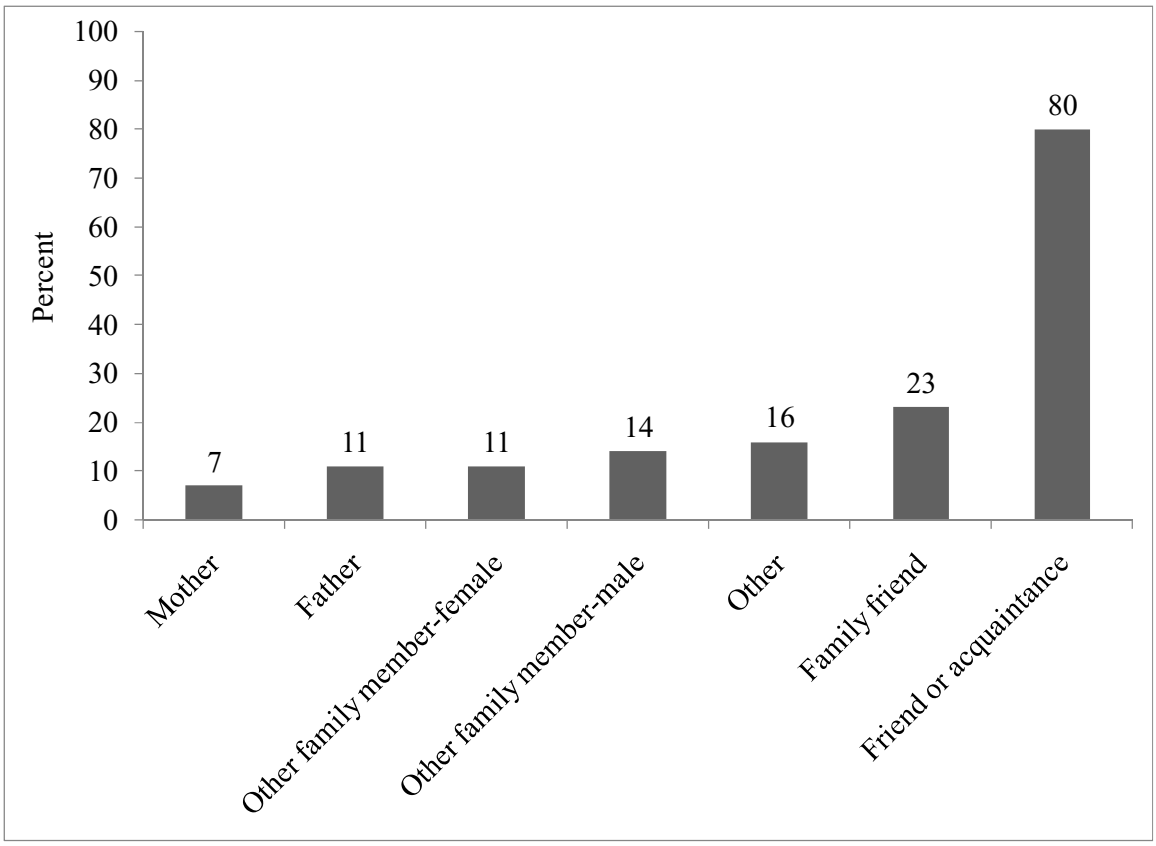

Figure 9. Know person in a computer field of interest to you

Section 9 of the survey explored the way in which participants' motivation and goals could influence their career choice. Items 22 and 23 were addressed in this section of the survey. Item 22 asked participants to rate the importance of a list of work-related factors with regard to selecting a career with, 1 = *completely unimportant* and 4 = *very important*. The summarized ratings in Figure 10 indicated that ability to balance work and family was rated as most important (3.74), followed closely by having a pleasant work environment (3.72), and having the opportunity to solve interesting problems (3.72). On average, all of the factors were rated as more than *somewhat important* (e.g., mean rating of 3.00), but less than *very important* (e.g., mean rating of 4.00), with the exception of having high status or prestige (2.64).

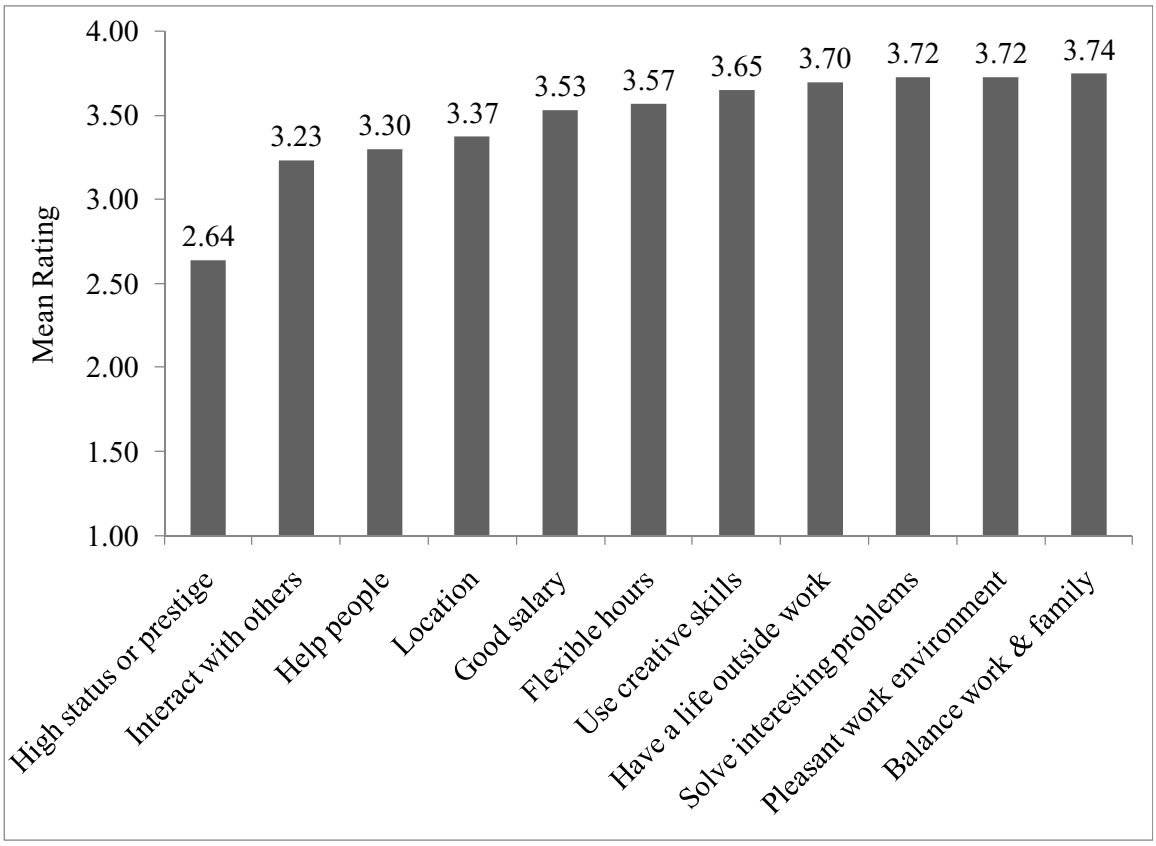

Figure 10. Importance with regard to selecting a career

Item 23 asked participants to select the factor that was the most important with regard to influencing their career. The participants were given a list from which to select the most important factor. The participants' selections are displayed in Figure 11. The results indicated that participants' selections were broadly diverse, and 20.0% did not respond to the question. Of those who did respond, the two most important factors included ability to balance work and family (15.0%) and quality of the work life environment (15.0%).

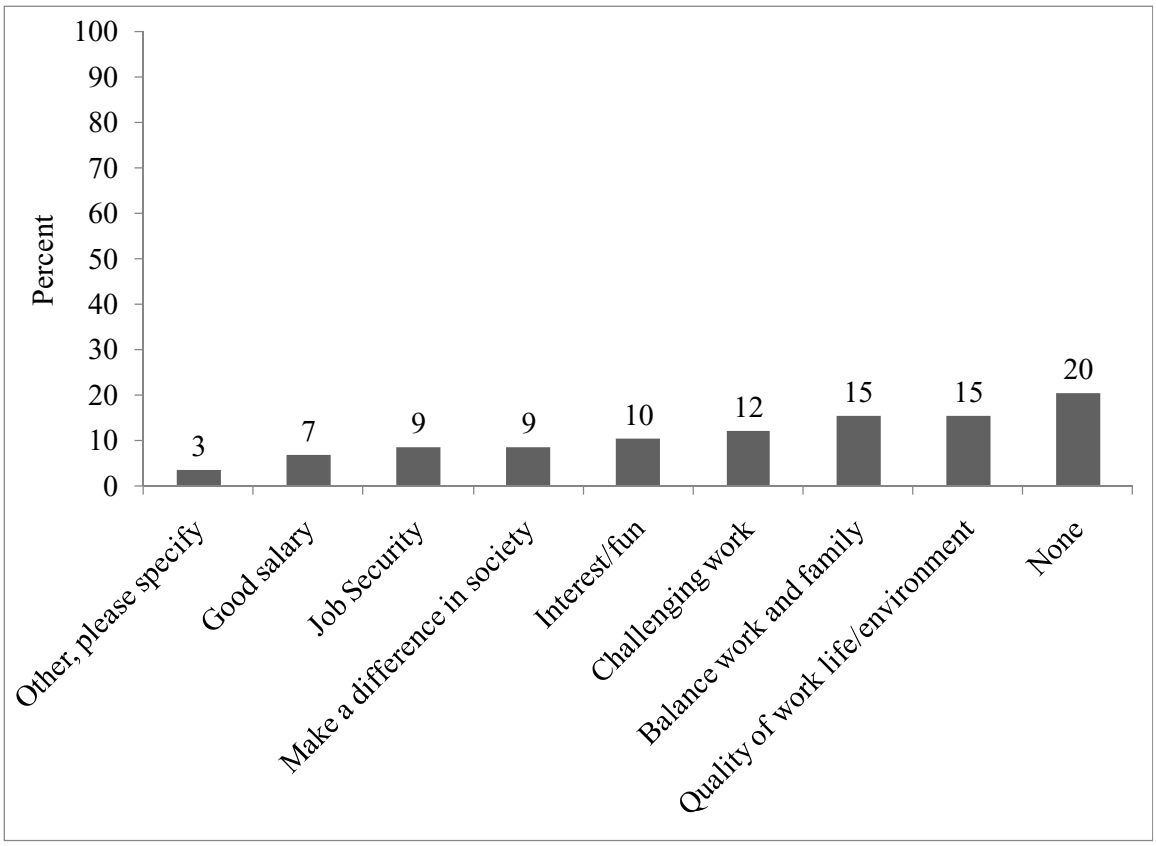

Figure 11. Most important factor in selecting a career

The descriptive survey item analyses based on Sections 2 through 9 of the survey provided a summary of the participants' experiences, attitudes, and behaviors. The results of these analyses indicated that the majority of the participants had not had access to computers with a connection to the Internet in the classroom and did not participate in a computer-related program. The main reason for the lack of access and/or participation was that computers and/or the Internet were either not developed or were in their infancy at that time. The results also indicated that the main reasons for having taken a computer course, or for planning to take one in the future, included enjoyment and/or a general interest in computers.

With regard to attitudes, participants were most likely to agree that people who chose careers in computers are smart, creative, and hard-working. Participants were most likely to agree that they found it helpful to listen to the input of others before making an important decision. Participants were most likely to agree that they seek the input of family members when making an important decision, such as a career choice. In a similar vein, participants also indicated that it was important to their parents that they have a career and that their parents encouraged them to make their own career decisions, to explore a variety of careers, and to talk to others about career options. In addition, participants indicated that their parents would listen to their point of view when they disagreed. Participants rated their significant other and their parents as the most credible sources of information, given that they were most likely to take career advice from significant others and parents.

With regard to participants' experiences, family was rated as the most supportive of their interest in computer science and as having the most positive views regarding the recruitment and retention of females in computer science. The participants received career information most often from their parents, followed by their significant other. The most common suggestions for encouraging recruitment and retention of females in the computer science field was to provide role models and mentors and to expose girls to the enormous possibilities that the IT field has to offer, such as business capabilities and financial independence. Finally, with regard to motivation and goals, participants were most likely to be motivated by an ability to balance their work and life, followed by the quality of their work environment and having the opportunity to do interesting and/or fun things.

Research Hypothesis Results

This section of the chapter provides the data analysis results specific to each of the three research hypotheses. In addition, the decision to reject or retain each research hypothesis is determined in this section. The results for each research hypothesis are presented independently.

Research Hypothesis 1

The first research hypothesis states that females in IT careers report the utilization of role models affected their career choice. Based on the open-ended survey responses, role models play a critical role in the recruitment and retention of females in the computer science field. In fact, it was the most common theme identified in the participants' open-ended responses when asked to provide suggestions to help encourage the recruitment and retention of females in the computer science field. When asked about their reaction to advice of others or the influence of others, participants were not likely to agree that when they make an important decision, they seek the input of a role model or mentor. When asked who was most supportive of their interest in computer science, only 12% of the sample indicated that it was a role model or mentor, and only 22% indicated that a role model or mentor had the most positive views regarding the recruitment and retention of females in computer science.

With regard to the credibility of information sources, counselors or role models were viewed as credible (participants were likely to consider their advice about careers), although they were ranked sixth from a list of 10 sources. In addition, when asked about

how often they had discussed career information with those 10 sources, counselors or advisors (mentors) were ranked eighth out of 10.

In order to determine how the level of support (Item 14) and the degree of positive views that role models or mentors provided (Item 15) were related to participants' degree of seeking their input (Item 13), a two-sample chi-square analysis was conducted. Prior to conducting the cross-tabulation and the chi-square, participants' responses to Items 14 and 15 were dummy coded so responses selecting role models as the most supportive or as having the most positive views were coded as 0 and responses not selecting role models or mentors were coded as 1.

Table 58 shows the cross-tabulation table with participants' responses to Item 14 (supportive) cross-referenced with responses to Item 13 (sought their input). The results indicated that those who rated their role model or mentor as the most supportive of their interest in computer science were also more likely to show full agreement that they sought the input of their role model or mentor than did those who did not rate their role model or mentor as most supportive. The overall chi-square analysis was statistically significant, $\chi^2(3) = 9.09$, $p = .03$, and therefore the researcher can conclude that a true relationship exists between ratings of role models or mentors as being most supportive and participants' level of agreement that they often seek their input.

Table 58. *Cross-Tabulation: Role Models Support and Seeking Their Input*

		Role model/mentor was most supportive	
Seek input	Statistic	No	Yes
Disagree	*f*	4	1
	%	9.1%	20.0%
Slightly disagree	*f*	10	0
	%	22.7%	0.0%
Slightly agree	*f*	20	0
	%	45.5%	0.0%
Agree	*f*	10	4
	%	22.7%	80.0%

The cross-tabulation results for Item 13 (sought their input) and Item 15 (most positive views) are provided in Table 59. The results indicated that participants who rated their role model or mentor as having the most positive views regarding the recruitment and retention of females in computer science were more likely to agree that they would often seek their input than participants who did not rate them as having the most positive views. The chi-square result just missed reaching statistical significance, $\chi^2(3) = 7.77$, $p = .05$. Therefore, the researcher cannot conclude that a true relationship exists between ratings of role models or mentors as having the most positive viewpoints and participants' level of agreement that they often seek their input.

Table 59. *Cross-Tabulation: Role Models Most Positive Views and Seeking Their Input*

		Role model/mentor most positive views	
Seek input	Statistic	No	Yes
Disagree	*f*	3	2
	%	7.9%	18.2%
Slightly disagree	*f*	10	0
	%	26.3%	0.0%
Slightly agree	*f*	17	3
	%	44.7%	27.3%
Agree	*f*	8	6
	%	21.1%	54.5%

In order to determine whether participants' perceptions of their role models or mentors were related to participants' degree of considering their input (i.e., role model credibility), Kendall's tau was used to correlate the role model/mentor statements for Items 13 and 19. Kendall's tau is used when correlating two ordinal level variables and is therefore a non-parametric measure of association. The results indicated stronger agreement that the participant often seeks the input of his/her role model/mentor was moderately associated with stronger agreement that the participant would consider the advice of his/her role model or mentor. The correlation coefficient was statistically significant ($r = .33$, $p = .01$) and the researcher can conclude that a true relationship exists between participants' perceptions of their role model or mentor and participants' level of agreement that they would consider the advice of their role model or mentor. More credible role models/mentors are more likely to be counseled for decision making than are role models/mentors who are not seen as credible.

The final analysis for Research Hypothesis 1 examined the relationship between participants' responses to Item 19 (credibility of information sources) and their responses to Item 20 (sources of career information) using Kendall's tau. This analysis tested whether a relationship existed between the perceived credibility of a counselor or role model as a source of information and participants' use of counselors or advisors as actual sources of information. This analysis was limited to ratings of counselors/role models. The results indicated that credibility ratings (likelihood of considering advice) were weakly associated with the frequency with which the participant sought the input of his/her role model or mentor. Results showed the correlation coefficient was not statistically significant ($r = .15$, $p = .28$) and therefore the researcher cannot conclude that a true relationship exists between participants' perceptions of their role model or mentor's credibility and participants' frequency of seeking advice from that role model or mentor.

The results of Research Hypothesis 1 indicated that, although role models and mentors were considered to be important for the recruitment and retention of females in the field of computer science, they were not found to be prominent sources of information, and they were not found to be particularly supportive or to have particularly positive viewpoints with regard to females pursuing computer science careers. Based on the data analysis results, Research Hypothesis 1 has not been fully supported and is rejected. However, it is important to note that for the few participants who did view their role models or mentors as most supportive, as having the most positive viewpoints regarding the recruitment and retention of females in computer science, and/or as being

highly credible sources of information, the participants tended to seek the input of their role model or mentor.

Research Hypothesis 2

The second research hypothesis states that females in IT careers report the use of computer technologies in home and school environments affected their career choice. Based on the participants' responses, the immediate family played a critical role by being the most supportive of their interests in computer science, by having the most positive views regarding the recruitment and retention of females in computer science, by playing one of the biggest roles in the decision making of the participants, and by encouraging them and discussing their career options and plans with them. Parents were the least likely to be the reason for participants taking a course in computers.

In order to determine if the level of support and the degree of positive views that parents provided was related to participants' degree of seeking their input, a two-sample chi-square analysis was conducted. Prior to conducting the cross-tabulation and the chi-square, participants' responses to Items 14 and 15 were dummy coded so that responses not selecting family as the most supportive (Item 14) or as having the most positive views (Item 15) were coded as 0 and responses selecting family were coded as 1.

The cross-tabulation results in Table 60 indicated that participants were more likely to agree than disagree that they sought the input from their family regardless of whether their family was the most supportive of their interest in computer science. Participants who rated their family as most supportive were somewhat more likely to agree that they sought family input than participants who did not rate their family as most supportive. The chi-square results indicated no significant relationship was found, $\chi^2(3) =$

2.73, $p = .26$, and therefore the researcher cannot conclude that a true relationship exists between ratings of family as being most supportive and participants' level of agreement that they often seek family input.

Table 60. *Cross-Tabulation: Family Support and Seeking Their Input*

		Family was most supportive	
Seek input	Statistic	No	Yes
Disagree	*f*	0	0
	%	0.0%	0.0%
Slightly disagree	*f*	4	2
	%	22.2%	6.5%
Slightly agree	*f*	6	11
	%	33.3%	35.5%
Agree	*f*	8	18
	%	44.4%	58.1%

The cross-tabulation results in Table 61 indicated that those who did not rate their family as having the most positive views regarding the recruitment and retention of females in computer science were almost as likely to agree that they would often seek family input as those who did rate their family as having the most positive views. In fact, the chi-square result was not statistically significant, $\chi^2(3) = 0.48$, $p = .79$. Therefore, the researcher cannot conclude that a true relationship exists between ratings of family as having the most positive viewpoints and participants' level of agreement that they often seek family input.

Table 61. *Cross-Tabulation: Family Most Positive Views and Seeking Their Input*

		Family most positive views	
Seek input	Statistic	No	Yes
Disagree	*f*	0	0
	%	0.0%	0.0%
Slightly disagree	*f*	5	1
	%	14.3%	7.1%
Slightly agree	*f*	12	5
	%	34.3%	35.7%
Agree	*f*	18	8
	%	51.4%	57.1%

In order to determine the relationship between participants' ratings of their parents' opinions or views and their own perceptions about their parents' credibility as sources of information, Kendall's tau was used. The results in Table 62 indicated that the following significant relationships emerged.

1. The correlation between having a career is important to the mother and mothers' credibility ratings was positive and statistically significant (r = .29, p = .04). Therefore, the more important having a career was to the mother, the more credible the mother was rated.

2. The correlation between having a career is important to the mother and fathers' credibility ratings was positive and statistically significant (r = .40, p = .01). Therefore, the more important having a career was to the mother, the more credible the father was rated.

3. The correlation between having a career is important to the father and mothers' credibility ratings was positive and statistically significant (r = .30, p = .04). Therefore, the more important having a career was to the father, the more credible the mother was rated.

4. The correlation between having a career is important to the father and fathers' credibility ratings was positive and statistically significant (r =

.55, $p < .01$). Therefore, the more important having a career was to the father, the more credible the father was rated.

5. The correlation between the father having a clear idea about careers that would suit the participant and fathers' credibility ratings was positive and statistically significant ($r = .34$, $p = .02$). Therefore, the more participants agreed that their father had a clear idea, the more credible the father was rated.

6. The correlation between the parents' levels of encouragement of the participant to make his/her own career decisions and the mothers' credibility ratings was positive and statistically significant ($r = .42$, $p < .01$). Therefore, the more participants agreed that their parents encouraged them to make their own career decisions, the more credible the mother was rated.

7. The correlation between wanting parental approval of career choice and fathers' credibility ratings was positive and statistically significant ($r = .36$, $p = .01$). Therefore, the more participants agreed that they wanted their parents' approval of their career choice, the more credible the father was rated.

8. The correlation between the level of encouragement that parents gave the participants to explore career options and the mothers' credibility ratings was positive and statistically significant ($r = .30$, $p = .03$). Therefore, the more participants agreed that their parents encouraged them to explore career options, the more credible the mother was rated.

9. The correlation between the level of encouragement that parents gave the participants to explore career options and the fathers' credibility ratings was positive and statistically significant ($r = .29$, $p = .04$). Therefore, the more participants agreed that their parents encouraged them to explore career options, the more credible the father was rated.

10. Finally, the correlation between the degree to which parents listened to the participants' views when they disagree and the mothers' credibility ratings was positive and statistically significant ($r = .35$, $p = .02$). Therefore, the more parents listened to their children's views when they disagreed, the more credible the mother was rated.

These results indicated that the relationship between a mother's and father's credibility as a source of career information and the participants' perceptions of and experiences with the mother and father was well supported. For mothers, the biggest

factor influencing their credibility ratings was the degree to which parents encouraged participants to make their own career decisions. For fathers, the biggest factor influencing their credibility ratings was the degree to which the fathers felt that having a career was important for their daughter.

Table 62. *Kendall's tau: Views of Parents and Parental Credibility*

	Mother/ female guardian		Father/ male guardian	
Source	*r*	*p*	*r*	*p*
Important to mother	0.29	0.04	0.40	0.01
Important to father	0.30	0.04	0.55	< .01
Mother has clear idea	0.25	0.07	0.00	0.99
Father has clear idea	0.08	0.56	0.34	0.02
Encourage-make own decisions	0.42	< .01	0.09	0.54
Want parental approval	0.22	0.13	0.36	0.01
Encourage-talk to others	0.13	0.37	0.07	0.62
Encouraged to explore	0.30	0.03	0.29	0.04
Listen to my views	0.35	0.02	0.17	0.23

The final set of analyses for Research Hypothesis 2 examined the relationship between participants' ratings of their parents' opinions or views and the degree to which participants discussed career options with their parents. The Kendall's tau results are presented in Table 63 and indicate that only two significant relationships were found, which are summarized below.

Table 63. *Kendall's tau: Views of Parents and Discussing Career Options with Parents*

	Mother/female guardian		Father/male guardian	
Source	*r*	*p*	*r*	*p*
Important to mother	0.19	0.18	0.07	0.64
Important to father	0.12	0.40	0.26	0.08
Mother has clear idea	0.38	0.01	-0.04	0.79
Father has clear idea	0.23	0.10	0.35	0.01
Encourage-make own decisions	0.09	0.55	-0.14	0.33
Want parental approval	0.05	0.75	0.21	0.14
Encourage-talk to others	0.22	0.13	0.12	0.39
Encouraged to explore	0.06	0.66	0.18	0.19
Listen to my views	0.08	0.57	-0.10	0.49

The first significance was found in the correlation between the degree to which mothers have a clear idea about careers that would suit their daughter and the degree to which participants have discussed career options or plans with their mother was positive and statistically significant ($r = .38$, $p = .01$). Therefore, the more participants agreed that their mother had a clear idea, the more often participants discussed career options or plans with their mother.

The second significant result was the correlation between the degree to which fathers have a clear idea about careers that would suit their daughter and the degree to which participants have discussed career options or plans with their father was positive and statistically significant ($r = .38$, $p = .01$). Therefore, the more participants agreed that

their father had a clear idea, the more often participants discussed career options or plans with their father.

The results for Research Hypothesis 2 indicate that the females in this study were most influenced by family members, and by parents in particular, with regard to their career choices and plans. In addition, participants tended to rate their parents and/or family members as very encouraging and as someone that they would want input from the most. In fact, participants indicated that they discussed their career options and plans the most with their mothers/female guardians. Based on these results, Research Hypothesis 2 is supported by the data and is not rejected.

Research Hypothesis 3

The third research hypothesis states that females in IT careers report male-dominated industries affected their career choice. According to the open-ended responses in Section 5 of the survey, male domination and gender bias in the field of computer science is a deterrent for females with regard to the recruitment and retention of females. When asked if they thought people who chose careers in computers were likely to be male, the mean rating (2.84) suggested that participants did not necessarily agree.

In order to provide additional clarification with regard to the role that male domination in the field of computer science may have had with regard to participants' career choices, at least early on, participants' responses to Item 8 (have access to computers in classroom) and Item 9 (participate in a computer-related program in high school or college) on the survey were cross-referenced with participants' responses to Item 12 (likely to be male). Table 64 provides the cross-tabulation results for the relationship between Item 8 and Item 12 on the survey. The results indicated that those

who had access to computers in the classroom were not necessarily less likely to view computer science as a male-dominated field. In fact, the chi-square result was not statistically significant, $\chi^2(3) = 2.56$, $p = .47$, and therefore the researcher cannot conclude that a true relationship exists between having access to computers in the classroom with an Internet connection and whether or not participants agree that computer science is a male-dominated field.

Table 64. *Cross-Tabulation: Computers in Classroom and Male Dominated Field*

		Access to computers in class	
Male dominated	Statistic	No	Yes
Disagree	*f*	10	1
	%	23.8%	14.3%
Slightly disagree	*f*	4	0
	%	9.5%	0.0%
Slightly agree	*f*	12	4
	%	28.6%	57.1%
Agree	*f*	16	2
	%	38.1%	28.6%

Table 65 provides the cross-tabulation results for the relationship between Item 9 and Item 12 on the survey. The results indicated that those who participated in computer-related programs in high school or college were not necessarily less likely to view computer science as a male-dominated field. In fact, the chi-square result was not statistically significant, $\chi^2(3) = 2.55$, $p = .47$, and therefore the researcher cannot

conclude that a true relationship exists between having participated in a computer-related program in high school or college and whether or not participants agree that computer science is a male dominated field.

Table 65. *Cross-Tabulation: Participated in Computer Program and Male-Dominated Field*

		Participate in computer program	
Male dominated	Statistic	No	Yes
Disagree	*f*	9	2
	%	24.3%	15.4%
Slightly disagree	*f*	4	0
	%	10.8%	0.0%
Slightly agree	*f*	11	6
	%	29.7%	46.2%
Agree	*f*	13	5
	%	35.1%	38.5%

The results for Research Hypothesis 3 do not fully support the hypothesis that females in IT careers report male-dominated industries affected their career choice and Research Hypothesis 3 is rejected.

CHAPTER 5. DISCUSSION, IMPLICATIONS, AND RECOMMENDATIONS

Introduction

This chapter contains an introduction and summary. Discussion is presented regarding research questions, hypotheses, limitations, recommendations for future research, and conclusions. The research used the mixed method approach. The purpose of the research was to identify challenges and factors that have led some females to pursue career opportunities in the computer science field. The social factors were role models/mentors, family, peer groups, and teachers. The four challenges that contributed to reasons why IT is a field dominated by men included risk concerns such as gender, discrimination and unfairness, diversity, and stereotypical beliefs regarding female professional behaviors. The study identified the findings of this research and those from the literature review.

Descriptive Characteristic Results

The current study contained 50 participants who provided complete survey data, although 59 participants provided at least some data. The majority of the research sample was 41 years of age or older (55.9%). There was a nearly equal split of African American or Black participants (47.5%) and Caucasian or White participants (45.8%). The participants' current job positions ranged greatly and included positions such as school teacher or professor, information technology positions (e.g., systems analyst,

programmer, software developer, etc.), engineering, quality assurance, graduate student, self-employment, and retirement. Almost all of the participants in the study had at least a bachelor's degree (91.5%), and the most common educational level was to have a master's degree (42.4%). Most of the participants held a degree in information technology (55.9%). The participants' mothers tended to be highly educated, with 30.5% having master's degrees and another 10.2% having doctoral degrees. Many of the fathers had a post-baccalaureate degree (32.2%). Fathers tended to be less educated, on average, than the participants' mothers were. The Cronbach's alpha was used in order to determine the inter-item reliability of the survey items. In some cases, cross-tabulation and chi-square or Kendall's tau were used to test relationships between variables. Statistical significance was determined by an alpha ≤ .05.

Research Questions

Research question 1: What factors are identified by females currently in IT that influenced their decisions to pursue a career in the IT field?

According to Item 22, participants were asked to rate the importance of a list of work related factors with regard to selecting a career, with 1 = *completely unimportant* and 4 = *very important*. The summarized mean ratings in Figure 10 indicated that ability to balance work and family was rated as most important (3.74), followed closely by having a pleasant work environment (3.72) and having the opportunity to solve interesting problems (3.72). Item 23 asked participants to select the factor that was the most important with regard to influencing their careers. The two most important factors included ability to balance work and family (15.0%) and quality of the work life

environment (15.0%). In both questions, item 22 and item 23, the most important factors were the ability to balance work and family and quality of way.

Cornell University found that women don't choose careers in math-intensive fields, such as computer science, physics, technology, engineering, chemistry, and higher mathematics, because they want the flexibility to raise children, or because they prefer other fields of science that are less math-intensive—not because they lack mathematical ability, according to a new study (Cornell University, 2009). Another study pointed out that female college students were concerned about finding a career, adequate job performance, and balancing work and family responsibilities. These personal responses to perceived barriers are important research outcomes because they show why some students might shy away from certain career choices (McInerney, DiDonato, Giagnacova, & O'Donnell, 2006). The findings of this research are similar to Cornell University's discoveries and to results from McInerney et al., and confirmed that balancing work and family is the most influencing factor in career decisions in pursuit of a career in the IT field.

Research question 2: What impacts do social influences such as role models and mentors, family, peer group, and teachers play on career choices of females in IT?

According to item 14 on the survey, participants were asked, "Which one of the persons listed below was the most supportive of your interest in computer science?" The participants were given four choices from which to select their most supportive source. The participants' summarized responses in Table 25 indicated that the majority of the participants selected family as the most supportive (63.3%), while teachers or counselors

were selected least (10.2%). Participants were most likely to agree that they seek the input of family members when making an important decision, such as a career choice.

Family was one of the most influential contexts of socialization in childhood and adolescence. Family members motivated career choices indirectly, equally persuasively. For instance, a parent may not have been an IT professional but may have encouraged girls to pursue or actively compete in careers perceived to be masculine (Adya & Kaiser, 2005). Adya and Kaiser suggested that women who entered male-dominated fields such as science often came from families where mothers were working, both parents were highly educated, and success was considered critical. They also found that 73% of working women indicated their fathers as strongly having influenced their career choice. Findings of the current study are consistent with the research, and with Adya and Kaiser, that family was one of the most influential in a career choice, and that between the mother and father, the father was the most influential on career choices for females in IT.

Research question 3. What factors discourage recruitment and retention of females in the IT field?

Item 17 was an open-ended item that asked participants if there were any suggestions that may discourage recruitment and retention of females in the computer science field. The results indicated that a continuation of male domination in the field was the most commonly reported theme (n = 6). For example, one of the participants explained, “Too few women in the class has a chilling effect.” In addition, another participant indicated the “portrayal of computer science as a male field, e.g., through use of males exclusively in books, posters, career talks, etc.” Other themes that emerged pertained to the failure to confront stereotypes associated with the IT field, the

continuation of gender biases such as lower pay for women and a lack of promotion, having no flexibility in work hours or having to work unrealistic hours, discontinuing programs, and a lack of role models for girls.

After college, females still believed that a computer scientist lived in a solitary, antisocial world and had a lack of diverse interests (Leever et al., 2002). According to Leever et al., Margolis found that the stereotype was more a cause of distress for women because they did not see themselves as fitting the hacker image. According to a report released by National Center for Women & Information Technology (NCWIT), the study stressed the role of encouragement, particularly written and public forms of encouragement, to motivate female student to pursue STEM-related fields. The encouragement apparently hasn't happened very often, judging from the number of STEM-related degrees awarded to women (Nagel, 2007). Findings of the current study are consistent with those of Leever et al. and Nagel, who claimed that stereotype and role of encouragement are some of the factors that can discourage recruitment and retention of females in the IT field.

Hypotheses

The research hypotheses were tested by analyzing the survey responses with frequency distributions and bar charts. In some cases, cross-tabulation and chi-square or Kendall's tau were used to test relationships between variables. Chi-square was used when examining the relationship between two nominal variables or a nominal variable with an ordinal variable. Kendall's tau was used when examining the relationship between two ordinal variables.

Hypothesis 1

The first research hypothesis stated that females in IT careers report the utilization of role models that affected their career choice. Based on the open-ended survey responses, role models play a critical role in the recruitment and retention of females in the computer science field. Based on the data analysis results, Research Hypothesis 1 was not fully supported and was therefore rejected.

Hypothesis 2

The second research hypothesis stated that females in IT careers report the use of computer technologies in home and school environments affected their career choice. Based on the participants' responses, the immediate family played a critical role by being the most supportive of their interests in computer science. Based on these results, Research Hypothesis 2 was supported by the data and was therefore not rejected.

Hypothesis 3

The third research hypothesis stated that females in IT careers report male-dominated industries affected their career choice. According to the open-ended responses in Section 5 of the survey, male domination and gender bias in the field of computer science is a deterrent for females with regard to the recruitment and retention of females. The results for Research Hypothesis 3 did not fully support the hypothesis that females in IT careers report male-dominated industries affected their career choice, and therefore Research Hypothesis 3 was rejected.

Limitations

Some of the limitations were outlined in chapter 1. The limitations included some that the researcher encountered after conducting the survey. The first limitation was getting qualified participants to agree to take the survey. The second limitation was that many of the participants did not complete the survey for a variety of reasons. The third limitation was not having direct contact with the participants. The fourth limitation for this survey was based on women in the information technology career.

Recommendations

Recommendations Developed Directly from the Data

The purpose of this study was to identify the factors that have led females to pursue IT careers. Two factors that were of interest to scholars and practitioners were concerned with this trend. The first problem was entry into the field and the second was retention within the field (Riemenschneider et al., 2006). The researcher recommends the following steps to increase the number of women who select information technology as a career choice.

1. Provide female and male role models. It is important to note that men, as well as women, can be effective role modes (Norby, 1997).

2. Balance work/career and family. A survey Rosser conducted in 2004 found that among 450 female scientists and engineers employed at research universities, more than 70%cited the need to balance career and family as the most significant challenge facing their professional advancement (Rosser & Taylor, 2009).

3. Provide work–from-home programs.

4. Provide more exposure to computing research.

5. Provide outreach for middle and high school female students and establish girls' computing clubs.

6. Broaden the school curriculum for undergrad and graduate students in computer science and IT.

7. Stop the negative stereotypes and misperceptions of computer science and IT.

8. Have a Pioneers' Day for Women in IT in middle school and high school, honoring those such as Ada Lovelace and Grace Hopper.

9. Invite women's organizations from local computer chapters to the middle and high schools.

10. Provide more grants and scholarship programs for females in IT.

11. Be more proactive in recruiting women in the IT field.

12. Invent animation games and or computer games that are directed toward math and science for females.

Recommendations for Future Research

The purpose for conducting this study was to explore the challenges and factors that determined career choices for women in the IT arena. The study intended to promote and encourage more females to go into the area of IT. Based on the findings of this study, the following recommendations are included for future research. The first recommendation is that this study should be replicated in the next 5 years to determine if any changes were made that address the challenges and social factors issues or other findings of this study. The second recommendation is to conduct a comparison study among different ethnic groups that addresses the challenges and social issues to women in IT professions. The third recommendation is to determine strategies for motivating women in IT professions. The fourth recommendations is to determine whether gender

and computer games influence young females' perceptions and attitudes toward computer science in the elementary or middle level schools.

Conclusion

The current study explored the challenges and factors that have led some females to pursue career opportunities in the IT field. This study consisted of 50 participants. The literature review provided an overview of women in the IT field. The participants provided several answers to the open-ended questions that were relevant to this study. A variety of inquiries was performed in order to reveal findings behind the lack of females in information technology. Three findings from the study stood out.

One of the findings suggested was the influence of family. The participants were most likely to agree that they sought input from family members when making an important decision, such as a career choice. From this study, having a flexible work schedule allowed women to manage and juggle their home and work lives; this was a key issue (Riemenschneider et al., 2006). Another survey of almost 5,000 tenure-track faculty members at nine California universities revealed that family issues affected women's success and satisfaction more than it affected men's (Ceci, Williams, & Barnett, 2009).

The second finding was the influence of role models. The most common suggestions for encouraging recruitment and retention of females in the computer science field were to provide role models and mentors and to expose girls to the enormous possibilities that the IT field has to offer. It is recommended that this should start at primary school level and continue through graduate education and careers in business and industry (Center for the Advancement of Women, 2009).

The third finding suggested that job satisfaction might play a major role in the reluctance of women to enter the IT profession. The female IT professionals were not dissatisfied with their career choice, but it was clear that variables when choosing a profession included salary and benefits, family, geography, working conditions, opportunity, prestige, self-efficacy, and task value, among others (Geigner & Crow, 2002).

From this study, these were some findings that can contribute in promoting women in IT professions. Companies need to find ways to influence and promote more women and to recruit and retain qualified, as well as educated women in this time of employee shortages in IT professions.

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APPENDIX A. DATA COLLECTION INSTRUMENT

THE CHALLENGES AND FACTORS THAT DETERMINE FEMALE CAREER CHOICES IN THE INFORMATION TECHNOLOGY PROFESSIONS: AN EXPLORATORY INVESTIGATION

Capella University, School of Business & Technology 225 South 6th Street, 9th Floor, Minneapolis, MN 55402.

Dr. Charles Newman, Ph.D., Dissertation Mentor
Richelle Miles, Researcher

For purposes of this survey, the field of information technology includes careers like computer or systems engineer, programmer, web developer or designer, database or network administrator, and systems analyst.

The purpose of this research is to identify the factors that have led females to pursue IT careers. **This survey is limited to women only.**

DIRECTIONS: Please answer the following questions by clicking on the appropriate response or type in the correct answer, as you deem necessary.

Section 1: BACKGROUND CHARACTERISTICS

---

1. Please select the category that includes your age (in years).

A. Below 21
B. 21-30
C. 31-40
D. 41-50
E. Older than 50

2. Select your race/ethnicity?

A. African American
B. American Indian
C. Hispanic American
D. Asian or Pacific Islander
E. Caucasian
F. Other, please specify_____

3. Your current occupation_____

4. Your highest education/degree completed is:

A. Associate
B. Bachelor's
C. Master's
D. Doctorate
E. Other, please specify_____

5. Did you earn a degree in IT?

A. Yes
B. No

6. What is the highest educational level/degree completed by mother?
A. Associate
B. Bachelor's
C. Master's
D. Doctorate
E. Other, please specify_____

7. What is the highest educational level/degree completed by father?
A. Associate
B. Bachelor's
C. Master's
D. Doctorate
E. Other, please specify_____

Section 2:
BACKGROUND INFORMATION ON COMPUTER AND TECHNOLOGY USE

---

8. In the high school(s) you attended, did you have access to functioning computers with Internet access in the classroom and/or laboratories on a regular basis?
A. Yes
B. No
C. Additional Comment:_____

9. In high school or college, did you participate in a computer-related program, like an after school class, club or summer program? If yes, please give name of the organization or club name.
A. Yes
B. No
C. Additional Comment:_____

Section 3:
This section explores **REASONS FOR TAKING A COMPUTER COURSE(s)**

---

10. The following questions explore reasons why you may **have already taken** a computer course. Select the number that corresponds to your answer. **Have you taken a computer-related course for any of the following reasons:** Select a "1" for "yes" or "2" for "no."

	1	2
	yes	no

1. Required for my high school track or required by my college major or minor

	1	2
	yes	no

2. Possible major or minor

	1	2
	yes	no

3. Recommended by a parent/guardian

	1	2
	yes	no

4. Recommended by a counselor, advisor, or teacher

	1	2
	yes	no

5. Needed to get a better job

	1	2
	yes	no

6. General interest in computers and technology

	1	2
	yes	no

7. Enjoyment

	1	2
	yes	no

---

11. The following questions examine the reasons that you might have for **planning to take a computer course**. Select the number that corresponds to your answer. **Do you plan to take a computer-related course for any of the following reasons?** Select a "1" for "yes" or "2" for "no."

1. Required for my high school track or required by my college major or minor

1	2
yes	no

2. Possible major or minor

1	2
yes	no

3. Recommended by a parent/guardian

1	2
yes	no

4. Recommended by a counselor, advisor, or teacher

1	2
yes	no

5. Needed to get a better job

1	2
yes	no

6. General interest in computers and technology

1	2
yes	no

7. Enjoyment

1	2
yes	no

Section 4:
ATTITUDES ABOUT PEOPLE WHO WORK IN COMPUTER–RELATED FIELDS

---

12. The following questions explore what you think are the characteristics of people in computer-related fields. Select the number that indicates how much you disagree or agree with each of these statements. **I think people who chose careers in computers are:**

1	2	3	4
Disagree	Slightly Disagree	Slightly Agree	Agree

---

1. Geeks

1	2	3	4
Disagree	Slightly Disagree	Slightly Agree	Agree

2. Likely to be male

1	2	3	4
Disagree	Slightly Disagree	Slightly Agree	Agree

3. Loners/antisocial

1	2	3	4
Disagree	Slightly Disagree	Slightly Agree	Agree

4. Interesting

1	2	3	4
Disagree	Slightly Disagree	Slightly Agree	Agree

5. Hard-working

1	2	3	4
Disagree	Slightly Disagree	Slightly Agree	Agree

6. Smart

1	2	3	4
Disagree	Slightly Disagree	Slightly Agree	Agree

7. Creative

1	2	3	4
Disagree	Slightly Disagree	Slightly Agree	Agree

Section 5:
This section EXAMINES THE IMPACT OF INFLUENCE OR OTHER FACTORS.

---

13. The following questions are about **reaction to advice or the influences of others**. Circle the number that shows how much you agree or disagree with each of the following statements.

1	2	3	4
Disagree	Slightly Disagree	Slightly Agree	Agree

---

1. I find it helpful to listen to the input of **others** before I make an important decision.

1	2	3	4
Disagree	Slightly Disagree	Slightly Agree	Agree

2. When I make an important decision, I often seek the input of members of my **family.**

1	2	3	4
Disagree	Slightly Disagree	Slightly Agree	Agree

3. When I make an important decision, I often seek the input of my **peer groups.**

1	2	3	4
Disagree	Slightly Disagree	Slightly Agree	Agree

4. When I make an important decision, I often seek the input of my **role model/mentor.**

1	2	3	4
Disagree	Slightly Disagree	Slightly Agree	Agree

5. When I make an important decision, I often seek the input of my **teacher(s)/counselor(s).**

1	2	3	4
Disagree	Slightly Disagree	Slightly Agree	Agree

---

14. Which one of the persons listed below was the **most supportive** of your interest in computer science?

A. Role model/mentor
B. Family
C. Teacher(s)/Counselor(s)
D. Peer Group

15. Which one of the persons listed below had the **most positive views** regarding the recruitment and retention of females in computer science?

A. Role model/mentor
B. Family
C. Teacher(s)/Counselor(s)
D. Peer Group

16. Are there any suggestions that may **encourage** recruitment and retention of females in the computer science field? YES or NO and explain:

A. Yes
B. No
C. Additional Comment:_____

17. Are there any suggestions that may **discourage** recruitment and retention of females in the computer science field? YES or NO and explain:

A. Yes
B. No
C. Additional Comment:_____

Section 6:
YOUR PARENTS' OPINIONS OR VIEWS - This section explores how your parents or guardians influenced you to study IT or to pursue a career in IT.

18. The following questions explore **your parents' or guardians' attitudes regarding career and career choice.** Select the number that indicates how much you disagree or agree with the following items. Circle NA if the item does not apply to you.

1	2	3	4	
Disagree	Slightly Disagree	Slightly Agree	Agree	N/A

1. It is important to my mother/female guardian that I have a career.

1	2	3	4	
Disagree	Slightly Disagree	Slightly Agree	Agree	N/A

2. It is important to my father/male guardian that I have a career.

1	2	3	4	
Disagree	Slightly Disagree	Slightly Agree	Agree	N/A

3. My mother/female guardian has a clear idea about careers that would suit me.

1	2	3	4	
Disagree	Slightly Disagree	Slightly Agree	Agree	N/A

4. My father/male guardian has a clear idea about careers that would suit me.

1	2	3	4	
Disagree	Slightly Disagree	Slightly Agree	Agree	N/A

5. My parents/guardians encourage me to make my own decisions about my future career.

1	2	3	4	
Disagree	Slightly Disagree	Slightly Agree	Agree	N/A

6. I would like my parents to approve of my choice of career.

1	2	3	4	
Disagree	Slightly Disagree	Slightly Agree	Agree	N/A

7. My parents encouraged me to talk to others about career options.

1	2	3	4	
Disagree	Slightly Disagree	Slightly Agree	Agree	N/A

8. My parents encouraged me to explore a variety of career options.

1	2	3	4	
Disagree	Slightly Disagree	Slightly Agree	Agree	N/A

9. When we disagree, my parents listen to my point of view.

1	2	3	4	
Disagree	Slightly Disagree	Slightly Agree	Agree	N/A

Section 7: CREDIBILITY OF INFORMATION SOURCES

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19. The following questions explore how you judge the credibility of advice you receive. Select the number that shows how likely you are to consider advice about careers offered by different people.

1	2	3	4	
Very Unlikely	Unlikely	Likely	Very Likely	N/A

---

1. Mother/female guardian

1	2	3	4	
Very Unlikely	Unlikely	Likely	Very Likely	N/A

2. Father/male guardian

1	2	3	4	
Very Unlikely	Unlikely	Likely	Very Likely	N/A

3. Other family members

1	2	3	4	
Very Unlikely	Unlikely	Likely	Very Likely	N/A

4. Teacher or professor

1	2	3	4	
Very Unlikely	Unlikely	Likely	Very Likely	N/A

5. Counselor or role model

1	2	3	4	
Very Unlikely	Unlikely	Likely	Very Likely	N/A

6. Male friends

1	2	3	4	
Very Unlikely	Unlikely	Likely	Very Likely	N/A

7. Female friends

1	2	3	4	
Very Unlikely	Unlikely	Likely	Very Likely	N/A

8. Significant other

1	2	3	4	
Very Unlikely	Unlikely	Likely	Very Likely	N/A

9. Employer or boss

1	2	3	4	
Very Unlikely	Unlikely	Likely	Very Likely	N/A

10. Family friends

1	2	3	4	
Very Unlikely	Unlikely	Likely	Very Likely	N/A

Section 8: This section explores SOURCES OF CAREER INFORMATION

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20. The following questions explore your **sources of career information**. Select the number that shows how often you have discussed career options or plans with others.

1	2	3	4
Never	Once or Twice	Several Times	Many Times

---

1. Mother/female guardian

1	2	3	4
Never	Once or Twice	Several Times	Many Times

2. Father/male guardian

1	2	3	4
Never	Once or Twice	Several Times	Many Times

3. Other family members

1	2	3	4
Never	Once or Twice	Several Times	Many Times

4. Teacher or professor

1	2	3	4
Never	Once or Twice	Several Times	Many Times

5. Counselor or role model

1	2	3	4
Never	Once or Twice	Several Times	Many Times

6. Male friends

1	2	3	4
Never	Once or Twice	Several Times	Many Times

7. Female friends

1	2	3	4
Never	Once or Twice	Several Times	Many Times

8. Significant other

1	2	3	4
Never	Once or Twice	Several Times	Many Times

9. Employer or boss

1	2	3	4
Never	Once or Twice	Several Times	Many Times

10. Family friends

1	2	3	4
Never	Once or Twice	Several Times	Many Times

21. Do you know someone who has a position in a computer field similar to what interests you? If so, who is that person? Mark all that apply.

A. Mother
B. Father
C. Other family member-male
D. Other family member-female
E. Family friend
F. Friend or acquaintance
G. Other, please specify_____

Section 9: IT Attitudes - This section explores how your motivation and goals can influence your career choice.

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22. The following questions examine the factors that influence career choice. Select the number that shows how important each item is in your choice of a career.

1	2	3	4
Completely Unimportant	A little important	somewhat important	very important

---

1. Opportunity to help people

1	2	3	4
Completely Unimportant	A little important	somewhat important	very important

2. Good salary

1	2	3	4
Completely Unimportant	A little important	somewhat important	very important

3. Ability to balance work and family

1	2	3	4
Completely Unimportant	A little important	somewhat important	very important

4. Opportunity to interact with others

1	2	3	4
Completely Unimportant	A little important	somewhat important	very important

5. Time to have a life outside of work

1	2	3	4
Completely Unimportant	A little important	somewhat important	very important

6. High status or prestige

1	2	3	4
Completely Unimportant	A little important	somewhat important	very important

7. Opportunity to solve interesting problems

1	2	3	4
Completely Unimportant	A little important	somewhat important	very important

8. Opportunity to use creative skills

1	2	3	4
Completely Unimportant	A little important	somewhat important	very important

9. Pleasant working environment

1	2	3	4
Completely Unimportant	A little important	somewhat important	very important

10. Flexible hours

1	2	3	4
Completely Unimportant	A little important	somewhat important	very important

11. Location

1	2	3	4
Completely Unimportant	A little important	somewhat important	very important

23. Of the following factors that influence career choice, which is the most important one to you? (Mark only one).

A. Challenging work

B. Good salary

C. Ability to balance work and family

D. High status or prestige

E. Interest/fun

F. Quality of work life and environment

G. Opportunity to make a difference in society

H. Job Security

I. Other, please specify

Thank you for participating in this research. If you would like a summary of the survey results, please enter your email address in the space below. This email address will not be associated with your responses to this survey in any way.

Email:_____

This completes the survey.

Note. Adapted with permission from Creamer, E. G., Burger, C. J., & Meszaros, P. S. (2006, June 20). *Career decision-making survey* (PSU IRB No. 19998). Retrieved June 10, 2007, from http://www.wit.clahs.vt.edu/survey-06.pdf