Spring 2011

A Qualitative Study To Explore The Low Number Of Women In Information Technology In The United States

William Baker
Regis University

Regis University
College for Professional Studies Graduate Programs
Final Project/Thesis

Disclaimer

A QUALITATIVE STUDY TO EXPLORE THE LOW NUMBER

OF WOMEN IN INFORMATION TECHNOLOGY IN THE UNITED STATES

A THESIS

SUBMITTED ON THE 5th DAY OF APRIL, 2011

TO THE DEPARTMENT INFORMATION SYSTEMS OF

SCHOOL OF COMPUTER AND INFORMATION SCIENCES

OF REGIS UNIVERSITY

IN PARTIAL FULFILLMENT OF THE REQUIREMENTS OF MASTER OF SCIENCE IN

INFORMATION TECHNOLOGY MANAGEMENT

BY

_____

William Baker

APPROVALS

_____

Dee Bilo, Thesis Advisor

Shari Plantz-Masters

_____

Stamos Karamouzis

Abstract

The number of women in Information Technology in the United States has historically been lower than the number of men in the field. This study explores the reasons behind this disparity and recommends steps that can be taken to increase the number of women in the field. This qualitative study examines why women are not attracted to the Information Technology field and examines reasons why women leave the field. Surveys were conducted with two populations, (1) women who currently work in Information Technology and (2) Information Technology recruiters. The results of these surveys were analyzed to see if there were trends that confirmed why women are not attracted to Information Technology careers or tend to leave the field early. Several barriers were discovered during data analysis which corroborated prior researchers' findings that work-life balance, lack of mentors and working alongside the Information Technology male stereotype are reasons why there are fewer women in the field.

The study concludes by offering suggestions on how generating more interest in the Information Technology field can be accomplished by better defining what Information Technology is and also by engaging women who currently hold Information Technology positions to support young women to become interested in the field.

Keywords: women, Information Technology, gender, stereotypes

Acknowledgements

Table of Contents

List of Figures

Chapter 1 – Introduction

The number of women in Information Technology (IT) in the United States has historically been lower than the number of men in the field. According to McKinney, Wilson, Brooks, O'Leary-Kelly and Hardgrave (2008), women accounted for 26% of IT professionals in the United States and are outnumbered six to one in Information Technology leadership positions. This thesis, titled *A Study to Explore the Low Number of Women in Information Technology in the United States*, will examine the reasons behind this disparity in the percentage of female to male employees in Information Technology job roles.

While many organizations have not acknowledged this disparity, women currently comprise only 20% of the technology sector workforce (U.S. Bureau of Labor Statistics, 2011); the ramifications of not addressing this situation can be damaging to organizations. According to Ashcraft and Blithe (2009), there are three potentially significant impacts to organizations if more women are not attracted to Information Technology careers. First, interest in IT careers is declining for both genders which will result in a shrinking IT labor pool. Second, and more concerning, is that the industry is failing to capitalize on the talent of women, who make up half of the U.S. workforce. Third, teams comprised of only male workers tend to be less innovative, "In a study of more than 100 teams at 21 companies, teams with equal numbers of women and men were more likely (than teams of any other composition) to experiment, be creative, share knowledge and fulfill tasks" (Ashcraft and Blithe, 2009). This study illuminates the fact that diversity of the sexes is important and can allow companies to potentially increase their edge over competitors provided they have teams with diverse members. Additionally, the low number of women now entering the field of Information Technology may send a variety of messages to young women considering the IT field. These messages may range from reinforcing the stigma

that Information Technology is a male dominated field with a real or imagined glass ceiling. Regardless of the message being sent, the field may be missing out on some great minds who may introduce new technologies or breakthroughs in the way products are developed or support issues are handled. For example, in the 1940's, a group of women developed the ENIAC computer but did not receive the proper credit for their work for 50 years (Todd, Mardis, & Wall, 2005). The industry must do its best not to let a 50 year lack of acknowledgement occur again.

The low number of women in Information Technology positions in the United States can be attributed to perceptual, cultural, and social factors. The perception that many people have of Information Technology workers is one of a male employee who prefers to work in isolation, has limited social skills, and wears a pocket protector. This perception is accurate in some cases but this is one reason that many women are not attracted to positions in Information Technology. The reality of working alongside one of these stereotypical male Information Technology workers is not that appealing to most women.

Socially and culturally, women are not expected to hold positions in Information Technology since these positions are filled by men in most organizations and these positions usually require long hours, travel, and on-call responsibilities. These position requirements make it tough for women who want to start families or be the primary caregivers for their children. This issue is referred to as the work-life balance and is a primary cause of why there are fewer women than men in Information Technology positions.

Colleges are also experiencing a decline in women enrolled in Computer and Information Science programs since the cultural and societal expectations are that men fill Information Technology positions due to the technical nature of these positions. Fewer women in these

programs is resulting in fewer women in the Information Technology recruiting pool further exacerbating the issue of fewer women than men in Information Technology.

Research Questions

The study will examine the reasons behind the low number of women, relative to men, in Information Technology in the United States. Questions that were researched and will be discussed are:

1. What specific barriers do women face in Information Technology careers?
2. Does the IT male gender stereotype cause women to steer clear of the field?
3. Are there fewer women in the IT recruiting pool?
4. How can interest in careers in Information Technology for women be increased?

These questions are integral to studying this disparity between the number of men and women in Information Technology positions. By analyzing the results of these questions, potential solutions to increasing the number of women in Information Technology will be discovered and discussed.

Chapter 2 – Review of Literature and Research

With the amount of Information Technology the world uses today, there are many job opportunities for individuals who want to start a career in Information Technology. Ashcraft and Blithe (2009) demonstrate that the number of occupations held by women in computing occupations has been declining since 1991.
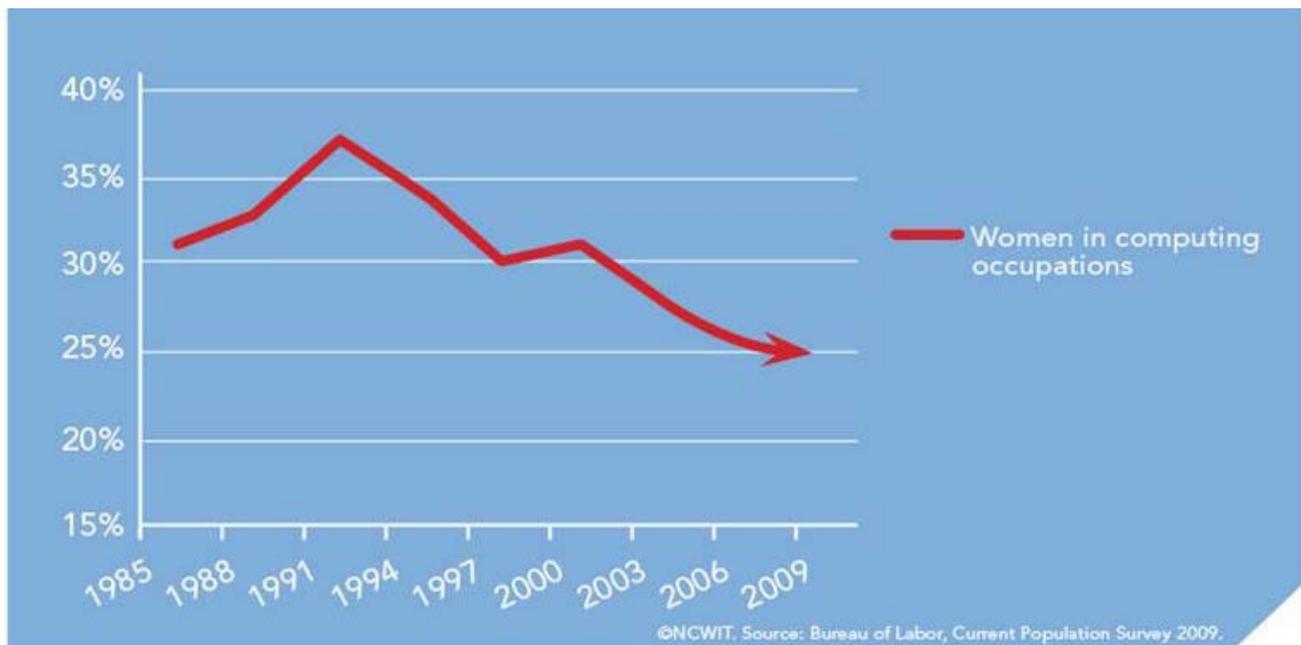
Figure 1. The percentage of computing occupations held by women has been declining since 1991. Adapted from the National Center for Women & Technology. (2010) Women in IT: The Facts. Retrieved from www.ncwit.org/pdf/NCWIT_computing_jobs_women.jpg

Women are underrepresented in Information Technology roles for several possible reasons. Gender differences or preconceptions may be one barrier which steers women away from IT careers. Similar to the low percentage of men in a historically female dominated profession such as nursing, most women view Information Technology as a male dominated field full of IT geeks who have poor social skills, wear pocket protectors, and spend their free time playing computer games or hacking into computer networks. While Randall, Price and Reichgelt

(2003) and Todd et al (2005) reinforce this notion describing computer science as nerdy and IT professionals working in isolation with little contact with others, Lemons and Parzinger (2007), discuss an item called gender schemas. These schemas point to cognitive structures of organized prior knowledge regarding the role expectations of individuals based on biological sex. The authors discuss biases that control behavior of men and women and the authors point out that "employees are more aware of the sex of their co-worker than any other characteristic." The article also points out that young girls imagine people who work in business as being white and male.

Melymuka (2008) found that 63% of women in Information Technology have experienced some form of sexual harassment which may contribute to women not remaining in the field. Riemenschneider, Armstrong, Allen and Reid (2006) discovered that the work-family conflict may also factor into women not entering the Information Technology field where long work weeks and on-call support responsibilities can affect time with one's family. The glass ceiling may also play a role. Todd, Mardis and Wyatt (2005) found women may have a hard time climbing the corporate ladder of their profession even if they are more talented than their male co-workers. These reasons may all contribute to the lack of women entering or remaining within Information Technology. With a shrinking labor market, it is important to examine these reasons why women are not entering or remaining in Information Technology to see if we can improve these numbers. Women make up 26% of the current Information Technology workforce (McKinney et al., 2008), so any small improvements that can be made should be able to increment this number.

Lemons and Parzinger (2007) discovered concrete evidence to the male bias in regards to Information Technology being a male dominated field. In reality, this bias exists in most peoples' minds and plays out in everyday life. For young girls and women who have an interest in the IT career field and can see beyond the gender issue, the next hurdle they face is in college where there are few women in Computer Science programs and the number of women has been declining for the last ten years. Randall et al. (2003) point out the fact that in 2003, women accounted for 21 percent of the number of students pursuing Computer Science degrees. Additionally, Randall et al. (2003) and Ashcraft Blithe (2009) demonstrate that the pipeline for women enrolling in Computer Science programs has steadily declined over the past 10 years.
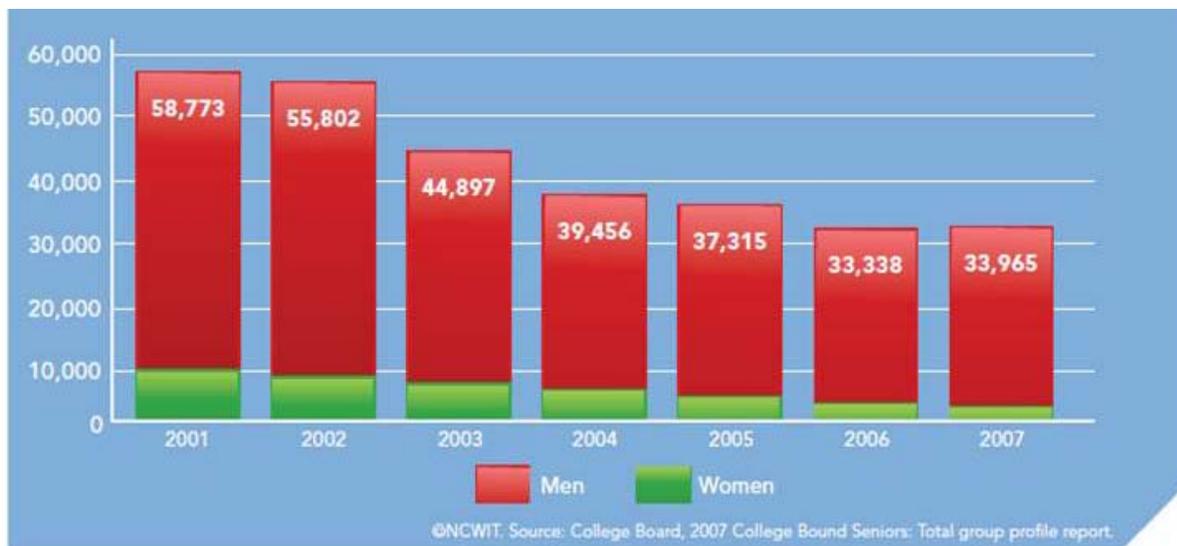
Figure 2. Students indicating computing and Information Sciences as intended major on SAT. Adapted from the National Center for Women & Technology. (2010) Women in IT: The Facts. Retrieved from www.ncwit.org/pdf/NCWIT_computing_intended_majors.jpg

Even if women can accept the fact that they will be in the minority, perceived as nerdy, and be one of the few women with a degree in Computer Science, there are additional hurdles to face in the daily work life of a woman in Information Technology. Reimenschneider et al. (2006)

describe some of these barriers in their paper entitled "Barriers Facing Women in the IT Work Force". This paper describes a "glass ceiling" which limits how far women can advance in organizations; while not just limited to IT, this glass ceiling can play a role in women's IT career endeavors. Their report also goes on to mention a similar gender socialization issue such as the gender schema one that Lemons and Parzinger (2007) described previously. Work-family conflict is also another large issue that women face; most IT positions require long hours, frequent travel and continual skill refinement. In the McKinney et al. (2008), Riemenschneider et al. (2006) and Melaymuka (2008) articles, these were commonly mentioned as to possible reasons for women being under-represented in the IT field. Interesting enough, McKinney et al. (2008) did note that these reasons affected men in IT as well but pointed out that women's support perceptions from their supervisor did vary. These items usually conflict with some women's goals of starting a family and raising children.

The number of women in IT has remained low in the United States for a number of years. There are several possible reasons for women not being drawn to the field, including certain stigmas such as IT being the "Boys Club" filled with introverts who sit in their cubicles each day with no human interaction. The basis for many of these stereotypes is undoubtedly gender based. Unquestionably there are gender differences between men and women but for IT, these gender differences become more apparent. These gender stereotypes may also dissuade many young women from looking to go to college to major in Computer Science knowing that they will be a minority in most Information Technology departments once they graduate. Information Technology still is not a draw for many women who have overcome the predisposed barrier of what Information Technology really is or what kind of people work in the Information Technology field. Finally, for women in the field, there are real or imagined hurdles they face

such as bumping against the glass ceiling, wage disparity, lack of mentors, etc. These reasons

may cause women to leave the field once they have entered it never realizing their full potential.

Mix these scenarios up in any variety and we have a recipe for women to stay away from

Information Technology until potential solutions to some of these barriers are available.

Chapter 3 – Methodology

In exploring the low number of women in Information Technology in the United States, four basic questions were investigated: 1) What specific barriers do women face in Information Technology careers? 2) Does the IT male gender stereotype cause women to steer clear of the field? 3) Are there fewer women in the IT recruiting pool? 4) How can interest in careers in Information Technology for women be increased?

To answer these questions, two electronic surveys was created using Zoomerang.com. One survey focused on women in Information Technology and the other survey focused on recruiters who recruit for positions within Information Technology.

Participants

The participants for this study were drawn from a pool of personal business contacts and individuals from the Technology Professionals of Colorado LinkedIn group. The first set of survey participants were women employed in Information Technology positions. The second set of survey participants were recruiters who either recruit for general business positions which include Information Technology positions or are specifically Information Technology recruiters.

Materials

Two different surveys were administered for this study. The first survey was directed towards women in Information Technology and is located in Appendix A. This survey was available electronically on www.zoomerang.com and consisted of a total of 12 open ended and multiple choice questions. Appendix B contains the survey that was directed towards recruiters and was also available on www.zoomerang.com. This survey consisted of a total of 12 open ended and multiple choice questions.

Procedure

The Women in Information Technology survey, found in Appendix A, was created using the online survey tool, www.zoomerang.com. Once the survey was available, the researcher emailed the survey link to seven business contacts. In addition, the survey link was posted on the Anita Borg, Regis SCIS and Regis Alumni groups on LinkedIN. The IT recruiter survey was also created using the online survey tool, www.zoomerang.com. Similarly, once the survey was available, the survey link was emailed to 30 recruiters. Additionally, the survey link was posted in the IT Recruiters, Information Technology Networking Forum and Jobs and the Jobs groups on LinkedIN.

These surveys were available for one month and at that point, both surveys were closed. The researcher then joined a local technology association and the marketing director for this association agreed to send out the survey links to members of this organization. The researcher then re-opened the surveys in anticipation of getting more survey participants. The marketing director communicated the reasoning behind the survey links and sent out the survey links. The surveys were available for two more weeks before the researcher closed the surveys and began the data analysis.

The researcher noted that one male did complete the survey and there were two additional inquiries, one from a potential participant in Canada and one from a potential participant in the Ukraine. The researcher informed these potential participants that the survey was directed towards women in Information Technology positions in the United States only.

Chapter 4 –Results

The initial data analysis began with the researcher logging into www.zoomerang.com and printing out both surveys and the free text survey responses. The researcher then examined each survey question and looked for patterns in the survey answers for potential answers to the researcher's four research questions.

Results for women in Information Technology

The women in Information Technology survey had 112 visits and 37 completions for a 33% completion rate. The complete survey results for the women in Information technology can be found in Appendix C. The first question on the survey was a consent question following the IRB process and informed participants on the intent of the survey and how the data gathered would be handled.

When asked "How many years have you been employed in an Information Technology position?" 70% of the participants had 10+ years of experience in Information Technology and no participants were in the zero to two year experience range. By having such an experienced group of participants, they should be able to provide information as to whether they are seeing fewer women in Information Technology positions since their careers started. When asked, 46% of participants said they have not witnessed a change in the number of women in Information Technology positions while 30% said that there are more women. This finding contradicts what Riemenschneider et al. found in 2003. In their 2003 findings, Riemendschnedier et al. discovered a decline in women in Information Technology from a rate of 41% of women employed in 1996 to just 34.9% in 2003. From the participants' point of view, they are not experiencing a lower number of women co-workers. Participants provided several general comments on these numbers

including some saying they believe women will work for less money than men and there continues to be fewer women than men in the field. One participant said that in most system and network groups she was in, there have only been one to two women system administrators. Even if there are no changes or even more women in Information Technology according to the participants responses, the more technical roles such as system administrators or network engineers are still showing low numbers of women in these positions.

Career progression satisfaction could be one potential area that could be examined to see if women in Information Technology are leaving due to dissatisfaction. This does not seem to be the case since 80% of respondents said they were either "very satisfied" or "somewhat satisfied" with their career progression. If individuals are happy with how their careers have progressed, the likelihood of those individuals wanting to leave a career would be less likely than someone who is unhappy with how their career had progressed. These participants may also be more willing to encourage women to enter the Information Technology.

Education is a key pipeline to get women interested in Information Technology careers and 81% of survey participants had an Information Technology-related degree with 11 participants having an advanced degree. With the substantial time, effort, and money involved in obtaining a college degree, most people would not abandon careers in Information Technology after this investment. The majority of these responses indicated degrees in Computer Science which prepare graduates for programming and engineering types of careers. These career fields tend to have workers who work in isolation and do not require many social interactions since they are considered behind the scenes roles. These roles are also more likely to place women working amongst the stereotypical Information Technology male co-worker.

Participants were asked about the barriers which may make a career in Information technology less attractive than other career fields. Several researchers such as Paul (2001), Levinson (2008) and McKinney et al. (2008) list the work-life balance, long hours, being on-call, the glass ceiling, working alongside the Information Technology male stereotype, lack of mentors, work related travel, and lack of training as top issues that steer women clear of the field. Three of these items listed garnered the largest percentage of choices from participants. These responses were working alongside the Information Technology male stereotype, lack of mentors, and the work-life balance. These three responses can map directly to three of the researchers research questions which are "What are the reasons that Information Technology careers are less attractive to women?", "What IT male gender stereotype issues might be steering women clear of the field?" and also "Do work-life balance issues prevent women from entering the field?"

Working alongside the IT male stereotype was an Information Technology career barrier for 70% of survey participants. While this barrier may exist today, Orlov (2007) predicts that this male image, which defined the image of the profession in the 70's, one of inarticulate men wearing pocket protectors, should soon be reaching retirement age. Whether this prediction will come true or not is yet to be seen but if it does occur, that should open the door for more women to fill open positions. Todd et al (2005) also describes the common stereotypical mindset which may not entice women to want to work in IT. This mindset reinforces what the survey says describing the nerdy male working in a solitary, desk-bound occupation. Women, and most other men, obviously do not want to work in an environment like this or with co-workers like this.

Similarly, 70% of participants stated that the lack of mentors was a large barrier in their IT careers. By not having someone to look up to or to ask for guidance, many women are not able to find someone who can help their career progression. Wentling and Thomas (2004)

discuss this in their paper titled *Women in Information Technology* which says that "mentors and role models are of vital importance to women's advancement in IT".

The work-life balance was an issue that 59% of participants had experienced. Wentling and Thomas (2004) reference long hours and heavy workloads not being ideal conditions for women interested in combining work and family responsibilities. While not just an issue in Information Technology careers, today's fast paced business climate has also demanded that the work-life balance be a factor in other careers as well. Most workers in all careers do not have enough time to have a full-time career, be a spouse, or attend their children's sporting events without feeling like something is being sacrificed. This is a larger issue for women in Information Technology who may take time off to raise a family and find it difficult to re-enter the workforce due to how rapidly technology changes. Being away from technology for one to two years and not staying current can potentially make it difficult to be able to get back up to speed on the latest technology and be able to find employment.

How are women dealing with these barriers when they are encountering them? One participant said she has experienced each of these barriers and "developed two ulcers and gained 100 pounds. I also trained myself and pushed onward even when the environment or barriers were negative in nature." While not on the top three barriers list, one participant identified the work-life balance as a big issue for women who are trying to raise children while still being the primary parent role in the family while still trying to maintain work standards. The work-life balance also affected another participant which resulted in a failed marriage with no kids. Some participants did not identify the lack of mentors as being a barrier; one participant said she had started in the field when there were very few mentors, male or female, so that issue did not impact her. Other participants experienced women managers who were threatened by women

Information technology employees and feared that these employees were out to get their jobs. This resulted in some participants being treated badly for no apparent reason. Working alongside the Information Technology male stereotype co-worker struck a chord with many participants and many said that men are very egotistical and condescending and can be difficult to deal with. Some participants said that they dressed down in order to fit in.

While many participants identified barriers that they had encountered, only 14% said that they have considered leaving the field or have left the field and since returned. Some of their reasons were identified previously as barriers and some were not. Participants mentioned not being able to manage work after having two kids, the glass ceiling, comments about not being technical, and lack of mentors. With our poor economy today, many workers are putting up with much more at work and not searching for other employment. Levinson (2008) said that 56% of mid-career women decide to leave to pursue new opportunities. Depending on what is considered mid-career; that number is very high and would make for a difficult career transition into a different field.

One of the key ways to increase the women in Information Technology careers is to encourage women or young girls to get interested in Information Technology careers. Many participants, 95% in fact, said that they would encourage women to enter the IT field. Most stated getting young girls interested in Information Technology in high school or earlier would be a good way to spark this interest. This is a key area of focus to get more women into Information Technology and to avert a predicted labor shortage if more women choose not to enter Information technology careers. Ashcraft and Blithe (2009) show that students, both male and female, majoring in Computing and Information Science has declined since 2001 as shown in Figure 2. If this trend continues and we experience not only fewer women but also fewer men

entering the Information Technology field, we may have a critical shortage of Information Technology workers.

Participants were very candid with ideas on how to create more interest in Information Technology careers for women. Several participants said that IT needs to work on dispelling the image of the socially-awkward, nerdy male who we typically envision as working in Information Technology roles. With the recent explosion of technological advances in our society, one participant said that many women are not expected to be interested or knowledgeable about technology in general.

Results for recruiter survey

The recruiters for women in Information Technology in the United States survey had 28 visits and eight completions for a 29% completion rate. The complete survey results for the recruiters for women in Information Technology can be found in Appendix D.

The first question on the survey was a consent question following the IRB process and informed participants on the intent of the survey and how the data gathered would be handled.

The participants who completed this survey were very experienced; 62% had been recruiting for 10+ years and that same percentage reported that they are seeing more women in the recruiting pool. No participants responded that they were seeing fewer women in the recruiting pool. While there may be more women in the pool, this should help to increase the number of women in Information Technology if they can land the jobs. Recruiters should be on the front line and have a very good feel about what candidates they are seeing in the job market.

Recruiters responded that the jobs with the soft skills such as database administrators, programmers, and business analysts were the positions they thought attracted more women than

men. While women may fill these positions more than others, they are not able to progress their careers into higher level positions in management. Wentling and Thomas (2004) discovered that women hold only 8.1% of executive positions at most companies. If the common thought process of many employees is to pick a career field and then work their way to the top, why should women pick a career in Information Technology if they know it is going to be nearly impossible to get to the top?

The participants in the recruiter survey also verified that the male stereotypical Information Technology employee still exists. Several recruiters described males in Information Technology as introverted, quirky, and smart with mediocre communication skills. By having more women fill Information Technology positions, perhaps these employees can modify their behavior, become less quirky, and also become better communicators in the process.

Participants in the women in Information Technology survey felt that getting more women interested in careers in Information Technology should start in high school or earlier. Survey participants are not seeing women with non-Information Technology degrees recruited for Information Technology positions; 62% of participants responded in this manner. This response indicates that the majority of recruiters are not targeting women who do not hold Information Technology degrees.

While there may be a bias towards how women in Information Technology view their male co-workers, what did recruiters say about male Information Technology workers? The responses varied but included Type A personalities with mediocre communication skills as well as introverts with quirky senses of humor and a willingness to work long hours. These responses almost mirror how women Information Technology employees view their male counterparts.

Recruiters were also asked about how to encourage more women to enter the Information Technology field. Their responses also echoed what the participants from the women in Information Technology survey said in response to this question. Responses included starting girls very young to get them interested in Information Technology. Awareness in middle and high school, as well as at the undergraduate level, were also areas to start to promote Information Technology to young women.

Chapter 5- Conclusions

The number of women in Information Technology roles has historically been lower than men and this trend continues to this day. With a potential shortage of workers in Information Technology, businesses need to address this issue and start to take steps to reverse this trend. Career satisfaction was reported at 80% from participants in the Women in Information Technology survey and many of these women have been in the field for 10 years or greater. This means that women can find enjoyment in Information Technology careers if they desire to do so. These women are also willing candidates to encourage young women to enter into Information Technology careers given the opportunity or the proper medium. Additionally, these women might act as mentors which was an area that many women identified as a barrier in their current Information Technology career.

Several barriers to women in Information Technology have been identified and substantiated. Lack of mentors was a large barrier that many participants identified. By not having someone to look up to or to ask for guidance, many women are not able to find someone who can help their career progression which may cause women to start looking for careers which attract more women who can serve as mentors. Business, and the economy in general, cannot afford to have women become disenchanted with careers in Information Technology and enter other fields. The pipeline for both women and men pursuing degrees in Computer Science is on a decline as illustrated in Figure 2. Fewer men and women obtaining degrees may result in fewer qualified candidates to fill open positions. Open positions may then be eliminated or the positions may be offshored if this scenario does occur.

A second major barrier that women identified was working alongside the stereotypical male Information Technology worker. Orlov's (2007) prediction of men retiring en masse may or may not become a reality but either way women must learn to adjust to these co-workers. If this mass exodus of male Information Technology workers does occur, combined with fewer men and women entering Information Technology careers, the prediction of a labor shortage in IT may become a reality. Women can bring different values to organizational teams and fresh ideas that a team of all male employees may never dream of. These mixture of male and females on organizational teams can allow organizations to develop new products or different solutions to existing problems.

The work-life barrier was also a top item identified by women in the Information Technology survey. This barrier is not strictly limited to women though. With our fast paced, high technology society today, most employers expect their employees to be "connected" around the clock and to deal with issues as they arise. It is true that women may shoulder more of the burden with raising children and having differing expectations than their male counterparts but the workload expectations of both male and female employees in most organizations today is tremendous. Many employers are starting to allow for telecommuting, flex time, and onsite or subsidized child care which may help to alleviate some of these work-life balance issues.

Ways to get more women interested in Information Technology careers

One of the research questions that the researcher looked to answer was how can we get more women interested in Information Technology careers? While we know that there are several barriers to working in Information Technology, including working alongside the Information Technology stereotypical male, the work-life balance, and lack of mentors, how can we proactively work on increasing the number of women in Information Technology?

There a number of possible solutions to this question. Orlov (2007) suggested defining the field better by being able to answer the question of, what does IT mean and what do people in IT do? While most of people who work in IT know that IT stands for Information Technology, not everyone outside the field understands this acronym. Similarly, if someone knows what IT stands for, what does it mean to hold an IT position? If we can communicate to young girls and women what IT stands for and what people in IT do, there may be less of a mystery about this career field which may foster more interest.

There are also many good organizations such as Women in Technology International, Anita Borg Institute for Women and Technology, and the National Center for Women in Information Technology. These organizations provide a tremendous amount of information and presentation material to foster the growth to get women more involved in Information Technology. We need business leaders to become aware of these organizations and to foster the support of women working in Information Technology.

There are also many positive reasons to get young women interested in IT including the fact that salaries are going to climb, companies want a diverse workforce, and enterprise IT is about business and not just technology (Orlov, 2007). Klawe, Whitney and Simard (2009) suggest starting to expose girls at the K-12 level to positive role models, dispelling computing career myths and stereotypes and also providing accurate information to key influencers of girls.

While Todd (2005) describes "IT as a lonely and limiting place", this picture is not accurate in all organizations. There is tremendous potential for women to work in Information Technology to create cutting edge technology, solve difficult solutions, and increase workforce diversity. Industry leaders, not only women but also men, need to become aware of this shortage of technology workers in general and take steps to reverse this trend. Without their leadership

and support, the number of women in Information Technology may continue to decline in the future.

Conclusion

While there are many prior research articles on the research topic of the disparity between the number of women and the number of men in Information Technology, this trend appears to be continuing by having women who are not interested in beginning careers in Information Technology. There are substantiated barriers that women in Information Technology face; some can be overcome, such as getting along with your quirky, nerdy, male Information Technology co-worker, while others require women to work harder than men to get to the top and break through the glass ceiling. The number of women in the recruiting pool does not appear to be a factor that is contributing to this disparity. Many companies may not choose to hire a female candidate, compared to an equally qualified male candidate, since they know that most of their Information Technology staff is male, especially for positions such as network administrators, PC Technicians and help desk support. Organizations should take a closer look at this historical practice and realize that having a greater number of women in their Information Technology department can be beneficial to the organization. Prior research has also provided a variety of solutions to this disparity as well, but are these messages getting to the right individuals or organizations? If we can educate young girls and women about what Information Technology is and does, minus the barriers already identified to remove any pre-conceived notions, we have a very good possibility of increasing the number of women in the field and averting a shortage of Information Technology workers.

Limitations and Future research

Several limitations to this research were noted by the researcher. The first limitation was being able to narrow down the scope of the research to include women who were employed in technical "hands on" roles in IT. Such roles would include Network Administrators, Network Engineers, PC Techs, and Help Desk Personnel. These types of positions typically have very few women performing these types of jobs on any given day. Being able to target the women for the Information Technology survey proved difficult because of the lack of contacts that the researcher has with women in these roles.

Another limitation of the research was that due to the nature of the survey design and completion process, the survey did not preclude males from participating in the survey. While one would think that a survey entitled "women in IT in the United States" would preclude a male from completing the survey, the researcher is aware of at least one male who did complete the survey. One possible way to preclude this from happening in future research would be to ask an initial question if the respondent was a male or female; if the respondent answered male, the survey would end.

Future research could include narrowing the survey scope to the technical women in Information Technology such as network administrators, PC Technicians, and network engineers but also to narrow the scope to a specific city or state. Conducting this research on a global basis may also provide interesting results. The researcher was contacted by several Information Technology women from outside the United States who were interested in participating in the study which demonstrates a global interest in this issue.

References

Ashcraft, C. & Blithe, S. (2009). Women in IT: The facts. Retrieved from

http://www.ncwit.org/pdf/NCWIT_TheFacts_rev2010.pdf

Lemons, M. & Parzinger, M. (2007). Gender schemas: A cognitive explanation of

discrimination of women in technology. *Journal of Business Psychology Vol. 22, No.*

1, 91-98. Retrieved from Academic Search Premier database.

Klawe, M., Whitney, T. & Simard, C. (2009). Women in computing – take 2.

Communications of the ACM, February 2009, Vol. 52, No. 2. Retrieved from Academic

Search Premier database.

Levinson, M. (2008). Women in IT delay marriage, motherhood to advance careers but still

miss top jobs. *CIO*. Retrieved from

http://www.cio.com/article/455184/Women_in_IT_Delay_Marriage_Motherhood_to_Ad

vance_Careers_But_Still_Miss_Top_Jobs_

McKinney, V., Wilson, D., Brooks, N., O'Leary-Kelly, A. & Hardgrave, B. (2008).

Women and men in the IT profession. *Communications of the ACM, February*

2008, Vol. 51, No. 2. Retrieved from Academic Search Premier database.

Melymuka, K. (2008). Why women quit technology careers. *Computer World*. Retrieved from

http://www.computerworld.com/s/article/319212/Why_Women_Quit_Technology?sourc

e=rss_news10

Orlov, L. (2007). How to attract women to enterprise IT jobs. *CIO*. Retrieved from

http://cio.co.nz/cio.nsf/focus/657CBAEDB11DFA8DCC25735E00374CC2

Paul, L. (2001). Careers: Why IT hates women (and the women who stay anyway). *CIO*.

Retrieved from

http://www.cio.com/article/30528/Careers_Why_IT_Hates_Women_and_the_Women_W

ho_Stay_Anyway_

Randall, C., Price, B. & Reichgelt, H. (2003). Women in computing programs: Does the

incredible shrinking pipeline apply to all computing programs?

Inroads – The SIGCSE Bulletin, December 2003, Vol. 35 NO. 4. Retrieved from

Academic Search Premier database

Riemenschneider, C., Armstrong, D., Allen, M. & Reid, M. (2006). Barriers facing

women in the IT work force. *The DATA BASE for Advances in Information*

Systems – Fall 2006, Vol. 37 No. 4. Retrieved from Academic Search Premier database.

Todd, K., Mardis, L. & Wyatt, Patricia (2005). We've come a long way, baby!

but where women and technology are concerned, have we really?

SIGUCCS'05, November 6-9, 2005. Retrieved from Academic Search Premier database.

U.S. Bureau of Labor Statistics (2011) Occupational outlook handbook. Retrieved from

http://bls.gov/bls/cpswomendata.htm

Wentling, R. & Thomas, S. (2004). Women in information technology. Retrieved from

http://www.eric.ed.gov/PDFS/ED492126.pdf

Appendix A

1) How many years have you been employed in an Information Technology position?

☐Less than 2 years

☐3 to 5 years

☐5-9 years

☐10 -19 years

☐20+ years

2) How has the number of women in Information Technology positions changed since your Information Technology career started?

☐There less women

☐There has been no change

☐There are more women

3) In regards to how you answered the previous question, what do you believe is the reason behind your answer?

4) What is your current job title?

5) How satisfied are you with the progression of your IT career?

a. ☐Very Satisfied

b. ☐Somewhat Satisfied

c. ☐Neutral

d. ☐Somewhat Dissatisfied

e. ☐Very Dissatisfied

6) Do you have an Information Technology related degree? If so, what is your degree in and what type of degree is it?

7) Do you feel that women face any of the following barriers in Information Technology?

☐The work-life-balance

☐Long hours

☐On-call

☐The glass ceiling

☐Working along-side the Information Technology male stereotype

☐Lack of mentors

☐Work related travel

☐Training

8) Have you experienced any of these barriers and if so, how did you deal with them?

9) If you have considered leaving Information Technology, or have left the field and have since returned, were the barriers mentioned in Question 8 one of the reasons for your departure?

☐Yes and if so, please list which ones?

☐No

10) Would you encourage women to enter the Information Technology field? Why or why not?

11) Future labor market projections point to an overall shrinking pool of available talent which will require more women to enter the Information Technology field. What ideas would you suggest to create an interest in Information Technology careers for women?

Appendix B

1) How many years have you been recruiting for positions in Information Technology?

    ☐Less than 2 years

    ☐3 to 5 years

    ☐5-9 years

    ☐10+ years

2) How has the number of women in the recruiting pool changed?

    ☐Seeing less women

    ☐No change

    ☐Seeing more women

3) In regards to how you answered the previous question, what do you believe is the reason behind your answer?

4) Historically there have been specific job roles such as programmers, database administrators, PC technicians; that seem to attract more women than men. Please list the top three roles that you see attracting more women and explain why you feel that these positions are a draw for women?

5) What would you say your ratio is between placing women in non-management (PC Technician, Help Desk) versus management (Supervisor, Director, CIO) positions?

    ☐25% non-management/75% management

    ☐50% non-management/50% management

    ☐75% non-management/25% management

As a follow up, have you seen these numbers change within the last several years?

    ☐Yes

    ☐No

If you answered Yes, which way have they changed?

6) The number of women graduating with college degrees in some type of Information Technology discipline has been on the decline for the over the last decade. Do you see women with non-Information Technology degrees recruited for Information Technology positions?

☐No

☐Yes

7) If you answered Yes to question 6, are these recruitments a success and can you explain why?

8) What are the characteristics of men that you see in the Information Technology talent pool?

9) What are the characteristics of women that you see in the Information Technology talent pool?

10) Future labor market projections point to an overall shrinking pool of available talent which will require more women to enter the Information Technology field. What ideas would you suggest to create an interest in Information Technology careers for women?

Appendix C

The women in Information Technology positions in the United States survey had 112 visits and 37 participants completed the survey. The survey results start with question number two, "How many years have you been employed in an Information Technology position?" The response breakdown was as follows:

Options	Frequency	Percentage
Less than two years	0	0%
Three to five years	5	14%
Six to nine years	6	16%
Ten to 19 years	14	38%
20+ years	12	32%

Question three: How has the number of women in Information Technology positions changed since your Information Technology career started?

Options	Frequency	Percentage
There are fewer women	9	24%

There has been no change	17	46%
There are more women	11	30%

Question four was a follow up to question three and asked the participant "In regards to how you answered the previous question, what do you believe is the reason behind your answer?"

#	Response
1	It hasn't been long enough to notice a change as most of the same people are still employed.
2	There was already a relatively low amount of women in the IT positions at my company, and that hasn't changed. I believe that computer science and programming is to women as nursing is to men, in the sense that the fields of computers and technology in general have a social stigma attached to them. Furthermore, the field of computer science and programming has a reputation of being filled with "computer nerds" and other people who have a lack of social skills.
3	There is less visible push, from academic institutions, foundations, women's rights groups, etc., for young females in high school and college to get into a degree program that would lead to an IT career.
4	My answer is based on my experience. I work with more women in IT that I used to. I think it is because women will work for less and IT is paying less as an industry.
5	Because now more woman are getting education of IT
6	Increased awareness. More women are taking up engineering degrees so the inflow is more.
7	I have about the same number of women working with me now as when I started – still fewer than men of course.
8	I can't say I have seen more or fewer women in IT. However, men outnumber the women considerably in the engineering dept. where I work. I don't have a good answer to why this is.
9	Most of my managers and co-workers have been women over the last five to seven years.
10	Not sufficient female IT candidates in the Buffalo area.

11   Honestly, I have no clear answer. In part, less people no matter what their sex are going into IT these days due to the threat of offshoring, the loss of job security and the lowering of wages this has caused.

12   Coming from a telecommunications background, I have worked with many women. Some as peers and other as management. I see that there are just as many women in the field as men, at least in the telco side I was in.

13   There are several forces driving the fact that fewer women are entering the IT field. First, the equal rights movement that was launched in the 1970's has lost momentum. Equal rights in the workplace is less enforced that it was even 10 years ago. Thus, the IT field is still heavily dominated by males. And the current situation sadly encourages males hiring and promoting males. Also, women are unwilling to take IT jobs because many jobs in the field demand either a high amount of travel, lots of after-hours work, or both. Women under thirty seem less willing to take on learning the technical aspects of IT, I am not sure why.

14   People do not realize the different opportunities available in the IT world.

15   We see more women in functional, support, and quality roles, but we do not see a lot more women in technical roles. The paradox is that women with math and computer skills make great managers and leads for technical teams, but the college programs and the entry level positions do not necessarily call for collaborative, empathic skills required at higher levels. Being a team player is always valuable, but we all still believe the industry requires the heroic and often eccentric coder who works all night…that image inherently does not speak to women.

16   I think that women do not see IT as a good career choice for them. This could be because there are so few women in the field. This is daunting because there is no one who is similar to you and often the men are not welcoming or disparage the woman's efforts.

17   I think more women are going into the IT field and I believe that more companies are employing them.

18   Open misogyny in the workplace.

19   Women are overtly discouraged from pursuing careers in IT.

20   Probably the economy, there are fewer men there too

21   I am unsure, but I believe there is more interest as the age of the women is now younger

than those who were employed before. Another idea is the pay – where I work we are payed[sic] well.

22   There continue to be fewer women. Most System and Network groups I've been in only have 1-2 sys admins.

23   I've only been out of grad school for a few years, so I haven't seen much change yet.

24   I have a female manager and I feel that it makes a difference. i.e., getting hired & feeling welcome in the workplace

25   More men choose science, engineering, and math as majors in college.

26   more acceptance of women; more women with technical degrees and demand exceeding supply for quite a few years

27   Technology is like many hard sciences and mathematical fields which don't typically attract women.

28   With the level of IT staff and industries I work with, I haven't noticed much turnover. It still seems to be men who work in IT management positions.

29   When I started college in the mid-80's girls weren't being encouraged to go into the sciences. I know I wasn't. I just found the area fascinating. I got a B.S. in Applied Biology first. I wanted to go to Med School but was actually discouraged from going, although I could have academically. I just happened to take a BASIC programming class in my final quarter (1986). I love it, so I went back 18 months later and got a B.S. in CIS (1989) I think the problem has changed since then. Now it's more of the general impression that "IT people are all geeks". The last thing a teenage girl wants to be is a geek. So unless she already excels academically (and doesn't care that she's a bit geeky), she'll choose something else. Now that you have me thinking about it, in the last 10+ years I've worked with two female Software Developers (one under 30, and the other over 40), a technical Systems Analyst (over 40) and a couple of DBA's. The rest of the technical staff (70+ people) have all been guys. I'm so used to being one of the guys that I don't even notice anymore.

30   There is no substantial increase in females seeking STEM education to IT sector jobs.

31   There is a need for nurses to work in healthcare technology and many nurses are women.

32   Women are being actively recruited.

33   Women used to be discouraged from many scientific fields, but are less so now. I still think

that young women don't receive as much encouragement in the sciences as they should. This change needs to start early in their education – grade school, middle school, high school.

Question five: What is your current job title?

#	Response
1	Software Developer
2	Principal Developer I
3	Faculty and Entrepreneur/President
4	Systems Analyst
5	Senior Software Engineer
6	Computer teacher
7	Director, technical information
8	Database Administrator
9	Software Configuration Analyst
10	IT Manager
11	Senior Vice President, Citigroup Operations Center - Retired
12	Senior Software Architect
13	Tier 2 Skype Connect Technical Support
14	Adjunct Professor at Regis University
15	Senior Java Consultant with the Dakota Consulting, Inc.
16	Vice president software development
17	Data Compliance Manager
18	Director of Management Information Services

19	Sr. Software Engineer
20	Computer Forensics Expert
21	I was a software Administrator until last week, now I'm a freelance web developer & designer
22	System Application Specialist (technician)
23	Program manager
24	Visiting Assistant Professor
25	Lead Business Analyst
26	Marketing Manager
27	Managing Director
28	President/IT Consultant
29	Business Development Manager
30	Sr. Solutions Consultant
31	Regional Director Business Development
32	Business Analyst
33	Application administrator
34	Dean, Computer Science/IT
35	SAP Consultant
36	Director of Planning & Projects for ITS
37	Account Manager

Question six: How satisfied are you with the progression of your Information technology career?

Options	Frequency	Percentage
Very Satisfied	11	31%
Somewhat Satisfied	17	49%
Neutral	1	3%
Somewhat Dissatisfied	5	14%
Very Dissatisfied	1	3%

Question seven: Do you have an Information Technology related degree? If so, what is your degree in and what type of degree is it?"

#	Response
1	Computer Science undergrad Masters in Computer Information technology from Regis
2	Not yet. Finishing my computer science degree at Regis University.
3	Masters of Science in Management Information Systems
4	Not yet. Working on my master's at Regis in Computer Science.
5	MSCS
6	yes, Currently doing MSc(IT) from KSOU Masters degree in computer science and information technology.
7	I have a Bachelors degree in Electrical Engineering
8	I have a BS in Computer Science and am almost complete with my MS in Database Technologies.
9	BS in Computer Information Systems
10	Yes, BS Computer Science
11	Regis MSIT – Networking, IT Management SUNY at Buffalo – Certification – Networking
12	I have an undergrad degree in computer science and am 3 classes away from my master's in software engineering at Regis.
13	I do not currently hold a degree. I have multiple years in the field and I am currently working toward a graduate a degree. I am still listed as an under grad and close to the end

of that journey.

14   I have a Bachelor's Degree in Computer Information Systems from Regis University, 2006.

15   MSCIT

16   BS Computer Science and MS Computer Science

17   Ph.D. Information Systems

18   Yes, AS in Computer Programming and Analysis, BS in Computer Information Systems, and a MS in Computer Information Technology

19   PhD in Computational Geophysics – I completed all of my degrees before there were even CS programs available at my undergraduate and graduate institutions. I worked my way through engineering school as a programmer, and programmed early UNIX systems doing numerical simulations of geophysical phenomena – through the 70's, 80's and early 90's.

20   I have a Ph.D. in Computer and Information Science.

21   Yes. I have a Bachelors of Science in Computer Information Systems with a specialization in Enterprise and Web Application Engineering

22   No, working on my Masters in Systems Engineering, almost completed.

23   No

24   Ph.D. in computer science (area: computer architecture)

25   Yes, Master's in Information and Learning Technology

26   n/a

27   No

28   BS of Computer Science with a Mathematics minor

29   No

30   B.S. Computer Information Systems. It was from the School of Business, and I spent the first 12 years of my career with the guys letting me know that my degree was "less than" their Computer Science degree because they had the heavy Math background, and I had only gone through Analytic Trig. It gave me a big chip on my shoulder. So after all that time in IT, I went back and took those heavy Math classes (through three levels of Calculus and Differential Equations), for the sole purpose of being able to prove I was an equal to the guys (sad… I know). I now have not only a solid business background but also the Math. I still get the occasional "oh… so you have a Business-based degree, but now I can

counter with a friendly "Yeah … plus a 4.0 in Math through Calc III and Diff Equations."

It has honestly changed how the guys view me. That's probably another reason women

don't enter IT (or that they leave it after a few years). You need to learn to be "one of the

guys", and you will always be proving to someone that you are an equal to the boys. You

just have to be up for the challenge.

31   No

32   Management information Systems – Bachelors

33   No, not yet.

34   PhD in Information technology-Communications technology

35   Not Yet – 3 classes to go to complete my masters of Science in IT Management at Regis

     University.

36   MS in Computer Information Systems

37   Yes, Telecommunications

In question eight, the participants were asked "Do you feel that women face any of the

following barriers in Information Technology"? The responses are below:

Options	Frequency	Percentage
The work-life Balance	22	59%
Long Hours	12	32%
On-Call	9	24%
The glass ceiling	15	41%
Working alongside the Information technology male stereotype	26	70%
Lack of mentors	26	70%
Work related travel	6	16%

Lack of Training	11	30%

Question nine was a follow up to question eight and asked "Have you experienced any of the barriers from question eight and if so, how did you deal with them?"

#	Response
1	I don't have any children yet, but it is harder for women to balance. Even if the husband takes care of the kids equally, they still want "mommy."
2	I have worked alongside many females in IT, and without fail, almost none of them are what I would call your "stereotypical" female. In other words, it has been my experience that women that are attracted to IT are not your "normal" women. Additionally, I have noticed that the females that I have worked with in similar positions to my own have exhibited many unfortunate behaviors that are directly related to the male stereotype issue. One example is a woman that I work with that is very emotional, expresses feelings of oppression and seems to have a general distrust and borderline disdain for men. Another woman that I work with in IT exhibits extreme disdain for those she works with and frequently has emotional breakdowns when working with people in difficult situations. Yet another woman has broken down in tears in meetings. Several other women in various IT departments at my work have taken on male appearances and affectation. These kinds of behaviors are the rule rather than the exception.
3	I started my own consulting firm due to the lack of quality of life at a large consulting firm and the class ceiling. I also started teaching at the university level to cut down on travel and balance consulting with teaching.
4	I have experienced all of those barriers. I developed two ulcers and gained 100 pounds. I also trained myself and pushed onward even when the environment or barriers were negative in nature.
5	It's quite hard to make them (males) realize that woman can also be good at this side. We have to work very hard to prove ourselves.
6	lack of training but I try to manage on my own according to the circumstances.
7	Yes. It is very important to have a good support system in place. My husband supported

me in everything and my manager guided me that I can do it.

8   Most of the other barriers don't seem specific to women (men and women both have to work long/on-call hours in this field), but I do see some issues affecting women differently. Hitting the glass ceiling, for example, occurs a lot faster for women than men. I do not know of any women at a technical director level or higher within my enterprise size company yet there are several qualified females below manager level in these roles. It's hard to tell if it's an issue for all women or just me, but I know for a fact that I am underpaid compared to men in my field (my boss has been working on the issue for a few years but percentage limit raises make it difficult to get past that). The work-life balance can be a big issue to, as women with children often take on the primary role of parenting while still trying to maintain work standards. I have personally experienced the male stereotype as well – some men frankly don't offer women the same respect that they would give their mail[sic] counterparts. It can be rather difficult getting your job done when the person you are working with obviously feels that you are beneath them.

9   Work-life balance. I enjoy working but trying to keep a house and family in good condition and working a 40 hour week takes a large toll.

10   All of what I checked in question 8 would be the same for anyone in IT. All of these are part of the job.

11   there a very few if any female mentors in a technical role. Some in management but few that do not look like jabba the hut in a true technical position. Training in IT must be constant and can impact the work life balance. Most companies these days don't offer time on the job for training so that leaves only taking time away from the family to learn. There are other fields like this so I'm not sure if that is a real problem or not. But, in medicine, most women, even doctors, don't work the normal 50-60 hours I week that I do. They have lots of off time for studying.

12   I have not experienced any of these, but I am male.

13   I simply worked the long hours and performed the on-call alongside all of my male colleagues. As far as the glass ceiling and the 'male stereotypes', I can say that the glass ceiling is lower and thicker than it used to be. I have stayed competitive by obtaining IT certifications and learning as much as I could in the fastest possible time frame.

14   I hire a housekeeper, a yard assistant, ask my neighbors to help. I seek mentors through the

various Meetup groups, LinkedIN, Twitter, FaceBook.

15   The glass ceiling is full of holes…we just have to find them and get through without cutting ourselves too badly in the process… But working with mostly men has required a lot of self-observation in terms of language and behavior in meetings where ideas are discussed and decisions are made. I had no female mentors…but I found several good male mentors.

16   I've experienced all of them unfortunately. Honestly I just keep plugging along hoping that I will break through one day while also being realistic to that happening. In the meantime, I enjoy learning new technologies and helping the companies for which I work.

17   Life Balances

18   The work-life balance resulted in a failed marriage and no kids. The glass ceiling resulted in my retreat from careers in industry and academia to running my own business in order to have any hope of job advancement. The IT male stereotype resulted in my "dressing down" in order to fit in. And the lack of mentors included the rare woman manager who would come into my career path and fear that I wanted to get her job (some even explicitly expressed this and treated me poorly because of it).

19   Well once I hit the glass ceiling I decided to change jobs. Now I'm a freelance designer/developer working for myself. Although I have more education and am all around a better choice for some of the positions in the company I worked for previously they almost always chose male candidates over female.

20   Training is a big one for me as well as the work/life balance…making sure you have time for your family is important, but to move up in IT you also need to go outside for education.

21   I've dealt with annoying male stereotypes, but less so in the Linux community than in others. I just ignore them or challenge them.

22   work-life balance especially. I quit my full time job at Intel and started working part time for a university.

23   Not much, there's no forum for communication or tolerance for consideration there may be a problem

24   Working in an environment that is all male can be hard when being a female

25   Lack of Mentors – few/no women to look to or talk to. All the execs are men.

26   Lack of Mentors: I started in the field when there were very few mentors, male or female, so that issue didn't impact me. Male stereotypes: Men in this field can be very egotistical and condescending and be difficult to deal with. I started in the field with a company that hired a much higher percent of women than what's typically in the field. I also happen to be very good at dealing with those personality traits but it can easily impact women's self-confidence, especially when just starting out in the field.

27   I have lacked mentors inside my own organization so I have needed to go outside (mentors in other companies) my organization to get the support that I need.

28   Lack of mentors (either male or female), and the male stereotype, which I mentioned above. I like to say that I've successfully avoided going into management. I want to stay technical. I'm good at it, and being a female with a lot of technical experience makes me very marketable.

29   Defying the stereotype by continuing education opportunities.

30   yes. there was little that could be done proactively. either the organization was aware of its cultural challenges or it wasn't. if it wasn't, the only solution is to plan for eventually moving on. it has become worse since the influx of other cultures within the U.S.

31   Not personally.

32   Glass ceiling- just keep applying for positions and show worth in interviews.

33   Yes –all – Lack of mentors is huge, because of the low number of women in senior positions. Working alongside the IT Male requires us women to be "one of the boys" …which is hard to be seen as in the workplace. This has been a constant struggle.

34   Yes, all of the above. Work-life balance is still more difficult for women, but that's slowly changing. I was always the on-call parent when my kids were growing up. I have had to seek out mentors through mentoring programs and sometimes simply by asking people I admire. After I received a promotion, I had a man quit who couldn't take direction from a woman. I had to point it out to my boss when he suddenly said he was giving a promotion to a man, after he had promised it to me. I did get that promotion, but I had to fight for it.

35   Lack of Mentors – must seek out those that can help you develop your talents and ideals inside of a male dominated industry.

Question ten: If you have considered Information technology, or have left the field and since returned, were the barriers mentioned in question nine one of the reasons for your departure?

#	Response
1	I have not considered leaving as I love what I do.
2	I have not seriously considered leaving IT.
3	NA
4	I have considered leaving IT, but not for the reason of the barriers.
5	yes, I thought of quitting when I was not able to manage my work after having two kids.
6	Not applicable - haven't considered leaving. :)
7	I have no plans to leave IT. However, I have felt the pressure to leave.
8	No
9	I went into management for 5 of years and had a difficult time going back to a technical role. My skills were outdated and no one wanted to take a chance on me.
10	I have not left the field yet, I have begun to see that in many cases one of the main reasons I would leave is due to people stating they have skills they do not. Many times I have found that gender is not the biggest factor, it is who you know and how well you can BS your way through a situation. I have seen many times men are better at it.
11	I left the field of IT temporarily in order to further my education by getting a Masters Degree. The male manager where I was working did not support my education at all. The bad economy has hampered my return to IT.
12	I only plan to leave when I retire from the industry
13	I am still employed in IT
14	I will never stop programming. They can't make me stop. I can pull computers out of the *garbage* and make them run, and I will work on open source software while living on food stamps if I have to.

15	Nope, I'm in it for the long haul
16	Yes. I've recently left the corporate world to work on my own as a web developer/designer. I've often not been taken seriously as an IT professional because I am female.
17	not considering leaving
18	yes, the glass ceiling and comments about not being a technical person.
19	No
20	No
21	The only reason I thought about leaving IT was when I was working 70-80 hour weeks, and had no life (about 5 years ago). Since then, I mention it in interviews. If they are looking for the consistent 50+ hour week, I'm not the right person for them. I've been working a 40-45 hour weeks since then, and fell in love with IT again.
22	N/A
23	Yes
24	No
25	Nope
26	I have considered it, and for precisely those reasons. It's exhausting to have to not only do your job well, but do it better than your male counterparts, and feel like you're never quite measuring up.
27	Yes. Lack of mentors was a big reason for me leaving and opportunity for money was a big reason for me returning.

Question eleven: Would you encourage women to enter the Information Technology field? Why or why not?

#	Response
1	Same as anyone else. I think of a woman likes IT, she should pursue it.
2	I would certainly encourage women to enter IT. I think there is a dramatic shortage of

women in IT positions, and they bring a unique set of skills and balance to a team.

3   YES! The field provides some many incredible opportunities for women. The key is that you work the system to your advantage and understand what the "real world" of IT is all about.

4   I would not encourage all women to enter the field of IT. It is not for every woman. It is definitely an acquired taste.

5   Yea sure I'll encourage. Why,.. because I feel that its comparatively less difficult work then marketing etc.

6   Yes of course because I want that we women can do as better as man can but at the same time some resource must be there to help us out.

7   Yes.

8   I definitely would. I do enjoy my career and don't think that it would be too difficult for women trying to enter that field. We do face issues, but many of these problems can arise in other careers as well.

9   I would encourage any women to join this field if it is what calls them.

10   Yes. Overall it is a great field. Anyone with a good work ethic and an ability to learn and change can have a great career in IT.

11   Yes, of course. Why? Why not? There is absolutely no gender difference regarding competency in IT.

12   Yes, because you can make a good living and have stimulating work. Just be sure to have a broad skillset and be willing to move in case your job gets outsourced/offshored.

13   I would encourage women to enter the field if they feel it is a good fit. I have not looked at a woman and felt she could not do the same job I can; unless she proved, through action, she couldn't.

14   I would encourage women to enter IT because we need a different mindset. Women approach issued differently than men, and fresh ideas are needed.

15   Many IT jobs can be performed with options to work at home. The jobs are generally well-paying and enable a woman to support herself and her family. The work is interesting; the information is always changing. It's a challenge to keep up!

16   I would more likely encourage them to enter a field that is more balanced in terms of

people and technical skills. The first several levels of computers jobs emphasize technical skills and even assume technical brilliance in the absence of people skills. Women who may be more naturally team players can, by virtue of a logic fallacy, be considered not as technical...as if it were binary... It takes a lot of energy to hold onto your people skills while proving your way technically...

17   I would definitely mentor women in entering IT. I currently have a mentoring relationship. However, I am honest when I tell them about the challenges.

18   Yes, it is very challenging and rewarding

19   I would encourage women to program for a living because *someone* has to fight those bastards.

20   Yes, I still think it's a great field, the more women there are in IT the less problems we will have.

21   I think each individual should follow their heart. If working in IT makes them happy then that is what they should do.

22   Yes, I think it's a great field, women have just as much knowledge/ability in the IT fields as men - it's such a growing field that I think men and women fit the IT world as employees.

23   Some women but not all. They would have to be fairly self-sufficient people, and have the right attitude for the job.

24   yes. it is very flexible, exciting, and has great job security.

25   yes, if you like the type of work. it is not a hostile environment

26   Sure, more woman the less stereotypes will be a problem

27   yes. money. opportunity & future.

28   Yes. Women have better "soft" skills that can help when communicating with users and executives.

29   Yes. I think there are incredible opportunities to women in technology if there prepared for the barriers they will face. I think women mentoring groups are important to help build a strong community in IT.

30   Absolutely, but I would be honest with them about what to expect. Technically they'll need to be above average to the guys in their department. Prove your technical worth, and the

vast majority of guys will accept you.

31   I would encourage women to enter IT field but with any career choice you has to strive to be the best to yield the greatest success. Stay relevant meaning IT is constantly evolving so the need for continuing education is a factor of success. That is an additional time commitment you must identify when you select the industry.

32   no. I would advise them to start their own business instead.

33   Yes, good demand and the pay can be good.

34   Yes, it is a wide open field and there are plenty of opportunities for those willing to put up with the stereotypes and glass ceilings

35   Yes - we need more! Also - women may not be "superior" communicators, but communicate differently than men. This can be very valuable when operating such a dynamic field.

36   Absolutely. I think that the struggles are diminishing, and hope that I have played a part in that. Having a good mix of men and women is important in all fields.

37   I would to help foster the difference in relational and project vision aspects of IT that women bring to the table.

Question twelve: Future labor market projections point to an overall shrinking pool of available talent which will require more women to enter the Information Technology field. What ideas would you suggest to create an interest in Information Technology careers for women?

#	Response
1	Exposure while still in high school so more people (of both genders) realize IT is fun and doesn't involve sitting behind a computer and not talking to people all day. I had blogged about this in 2009; you might find some of my comments there relevant. http://www.selikoff.net/2009/12/18/female-programmers-and-programmers-to-be/
2	IT needs to dispel the image of the socially-awkward, nerdy male. It needs to be made more female-friendly. This could be especially tricky, since our society in general expects women to not be interested in or knowledgeable about technology in general.

3   Programs for the middle and high schools to get young girls excited about IT early AND
        then we must provide scholarship dollars for those interested young women to attend IT
        related university programs. Need a multi-prong approach.

4   Focus on work - life balance and how a position in IT can work with the balancing act of a
        personal life. Even in this enlightened age, women still hold very stereotypical duties and
        roles when it comes to hearth and home. Programs for the middle and high schools to get
        young girls excited about IT early AND then we must provide scholarship dollars for those
        interested young women to attend IT related university programs. Need a multi-prong
        approach.

5   A woman can understand a woman and can explore ideas by a team work if proper support
        is there.

6   Awareness when they are doing their graduation and formal mentorship programs at the
        workplace

7   Many technical careers can be performed remotely. For example, I am a remote DBA
        working from my home in Colorado for a company in Texas. The growing demand for
        remote positions can coincide with the increase of women in the field. Those with children
        would be able to work productively from the comfort of their home while being close
        enough to take care of family responsibilities as well.

8   Starting IT exposure to young girls early in life.

9   I not sure why we need to do anything special to entice anyone to consider this field. It is a
        great career. Doing something special for one group will hurt other groups. Everyone
        should be equal and follow the same process. If we do something different for women it
        would look like we did not pay the dues everyone else has paid. Keep the playing field
        level. If you single out a group base on sex or culture, even if it is for something that might
        seem positive, it is racist. Equal opportunity (which we have) is much fairer than equal
        outcome.

10   There seem to be plentiful female software program persons. However, on the other side of
        the fence, the ability to setup, manage and repair hardware necessary for LAN/WAN
        networks appears to be more rarefied. In addition, Disaster Recovery and Continuity of
        Business experts are always needed in corporate and academic environments.

11   I don't agree with the premise of a shrinking pool due to the growing use of indian, chinese, russian, etc. resources. The main thing that will entice any person to go into IT would be the prospect of a high paying job. When jobs in IT were actually growing, way back when I initially graduated with my BA, there were more women interested in studying computer science. While I make a great living, I know so many people that have lost their jobs and had to train a foreign replacement, I'm not sure I would recommend this line of work to someone I loved. Other than that, good role models would be useful. If young women could see what a great income you can make and see that you can be successful in this field without being a math genius, more would be willing to try. My niece studied computer science mainly because she had me as a role model. She saw what a great career I had, traveling all over the world for my work, if more women saw that and could be convinced of some kind of job security, it would be an easy sell.

12   I do not see anything that would be any more encouraging to women versus men. I feel that being upfront on everything would be the best approach. I feel that making sure they are aware of everything that is required of them and have the same avenues as anyone else has to achieve those ends would be huge. Basically if a person is expected to get a new IT cert every two years. Everyone who is in the job needs to be made aware of that and have the same access to the resources used to get that cert or certs. I feel that if you do not give everyone an equal chance, you will only be hurting the company as a whole.

13   I believe that women should have much, much more support structure than they have had previously. I have very often been the lone woman in groups of a dozen men or more. It's difficult being a loner. And, men find it difficult to be inclusive. Now they sometimes seem to deliberately exclude the women in technology.

14   Inviting high school teachers and students to JUG's and Open Source Meetup groups.

15   my experience is that the global pool is not shrinking...we are offshoring jobs everyday...

16   I think that the US in general is failing its students and, in the long run, itself. We are not going to be a competitive on a global scale if we do not step up our game and cull the talented student out there. There is no room for "this is a man's job". I would suggest telling women about the first programmers who worked on the ENIAC and the rich history women have in the current IT environment. Everyone has heard of Bill Gates (who isn't

      really an IT person, but a keen businessman), but who knows about Ada Lovelace?

17   I have no suggestions.

18   Making it easier to fire guys who sexually harass women? Duh?

19   Early intervention, like the Math Option program run by Penn State.

20   I don't know how to answer this question except that companies need to flush their stereotypes and truly hire the best candidate for the position.

21   Mentoring programs, discussing/sharing technology with girls before they are out in the workforce.

22   There is just a lack of critical mass right now. I would seed fields with women by targeting technical training to low income communities focused on women and really hand hold them to get them from school into the field. I guess affirmative action for women only in tech?? Once there are enough there, it will become self-sustaining.

23   get them into math/cs at a younger age (high school) before it's too late for them to choose such a field. offer social support for those just starting out (early college).

24   I feel that the IT field and leaders need to respect and support better inter communications within their[sic] departments

25   Have more examples of woman in high positions in the technology industry. Stop referring to the job at a company the IT "guy"

26   more PR around the women who are in it, also that it's not all geeks. encourage young women to study math.

27   Attracting/highlighting less "technical" positions such as business analyst, help desk support, etc.

28   I think we need to start at younger age--talking to school age students about the "fun" you can have in IT. By the time students reach college age, they have started to form some direction in the career path they want to take.

29   We need a more realistic impression of IT. That we aren't all introverts sitting by ourselves in a dark room hacking away, eating Cheetos and drinking Mountain Dew. Women need to realize that you can be very technical, and still have a social aspect to your job by working with business users. It's what I like most about IT. I can talk business with a CEO or tech with a developer. Being a woman in a male-dominated field with a solid skillset pretty

much guarantees employment.

30 Strong STEM education. Mentor Protege programs in the education.

31 restore the pay levels. carry through with the promises of training, leadership, and flexibility

32 Marketing aimed at women might help. Education about the types of careers available.

33 encourage more women to seek IT degrees or informatics/ business intelligence instead of MBA type of graduate degrees

34 That is a hard question. It does require a very strong personality to survive that is for sure. But, can be very rewarding. There is so much in store for the industry - woman can't be left behind!

35 I think that the generation of digital natives will change that. I see a difference in the competencies of my older and younger children regardless of gender. The women will likely define a different set of needs and wants within technology.

36 get the idea that IT is a 'geek' man fest out of kids minds in high school and college. and that takes a HUGE switch in vocabulary and assumptions. Stop saying 'the IT guy' or the 'VP of IT guy' or the 'engineering guys' at my client. This is a HUGE contributor to the lack of women. it is ingrained in conversation that it's only men and vocabulary matters!

Appendix D

The recruiters for women in Information Technology positions in the United States survey had 28 visits and 8 participants completed the survey. The survey results start with question number two, "How many years have you been recruiting for positions in Information Technology?" The response breakdown is as follows

Options	Frequency	Percentage
Less than two years	1	12%
Three to five years	2	25%
Six to nine years	0	0%
Ten+ years	5	62%

Question three: How has the number of women in the recruiting pool changed?

Options	Frequency	Percentage
Seeing fewer women	0	0%
No Change	3	38%
Seeing more women	5	62%

Question four was a follow up to question three and asked the participant "In regards to how you answered the previous question, what do you believe is the reason behind your answer?"

#	Response
1	IT remains a male dominated industry. Those individuals who are experienced and savvy to the benefits of using recruiters in their job search tend to be men. Further, firms who tend to use IT Recruiters – do so for senior contract and / or perm hires – which tend to be male dominated. 10+ years of experience. I believe some of this ties to a natural departure from the workforce of females during childbearing years – which put them at a disadvantage as newer technologies emerge, for "seasoned and current" senior folks.
2	More two wage earners per household than there were several years ago.
3	It is suitable for women.
4	The programs / schools have not changed for women to get interested.
5	1. More women are getting degrees in the HR concentrations. 2. Many are getting involved with IT recruiting as part of their overall recruiting position descriptions. 3. IT Networking groups appear to be more accepting of women members. 4. Downsizing has meant everyone works on multiple tasks…so IT recruiting may just have landed on your desk as an additional task when the main IT recruiter was let go.
6	I don't think that women are encouraged or enlightened to the same degree that men are, in regards to pursuing careers in Engineering, the Sciences, or Mathematics.
7	As I do have 1.7 yrs of exp in technical hiring or recruitment, as per my exp in recruitment firm I saw a huge change in gender, females are mainly opting this field as a carrier and also in recruitment the ratio is 7/10 7 women out of 10 total emp in an org.
8	Doing this for over 20 years, so yes, more women, but nowhere near parity. I think because technology has become more pervasive in everyone's lives, so young women today grew up in homes using cell phones, PC's, VCR's, etc. and some of them realized that it wasn't all that difficult. Also, there has been more societal acceptance of women in roles such as technical sales, technician, etc.

Question five: Historically there have been specific job roles such as programmers, database administrators, PC technicians, etc. that seem to attract more women than men. Please

list the top three roles that you see attracting more women and explain why you feel that these

positions are a draw for women?

#	Response
1	Technical Help Desk, DBA, Technical Writers – often to military specs. These are a draw for women – as they in many instances have flexibility in schedules, and often are solid entry level (or re-entry) positions. After a number of years – many women tend to migrate out of "hardcore IT" and into mid-level management type positions, pre- / post sales as the "technical authority" whereby the educational time requirement of staying current, as well as the stability to prioritize other life factors - including family – are more flexible. Further, there are less requirements of client site travel (often required) and shift work.
2	Software Testers, Business Analysts and CAD Drafters. I think these attract more women because colleges and tech schools support women getting into these fields.
3	Their natural interest in the industry is not there. They feel it might do well.
4	1. Oracle Hyperion Engineers...It is a very individual role that can be studied, crossed over and concentrated in from the MBA/Finance or Developer roles. I am an IT Oracle Hyperion PM. 2. DBA Engineers...I see a few women learning the role on the job. 3. Project Managers...The role evolves over time as women take on more responsibilities. 3. IT Recruiters...have you seen the photos of the young cute women on LinkedIn? It is almost as if IT consulting companies are using bait. If you have it, use it.
5	I see more women in the following roles more than any others: Project Managers, Technical Writers, Database Administrators, (specifically) Java Programmers, and graphic designers.
6	I don't really know. But, I find it fascinating to go to SQL user group meetings that are 50% women and then SharePoint user group meetings where the only other women there are the other recruiters. Sometimes I just think it is because of lack of confidence on the part of the women that they are willing to settle for ancillary positions instead of something like team lead.

Question six: What would you say your ratio is between placing women in non-management (PC Technician, Help Desk) versus management (Supervisor, Director, CIO) positions?

Optionss	Frequency	Percentage
25% non-management/75% management	3	38%
50% non-management/50% management	2	25%
75% non-management/25% management	3	38%

Question seven was a follow up to question six and asked "As a follow up to question six, have you seen these numbers change within the last several years and if so, in which way have they changed?"

#	Response
1	No - even the ratio indicated above is too high. Perhaps closer to 80 / 20%
2	I've seen the number of management roles go up for women in the past 5 to 10 years.
3	I see more women in CIO's and CFO positions. CFO are now very IT centric in companies that use Oracle Hyperion for finance.
4	I'm not sure that I can fairly answer the question above because I don't work/fill a lot of Management level positions outside of Project and Program Managers. And, the percentage of Project and Program Manager positions that I work on are about 5% of what I place as a whole. I do feel that there are more women in these Project Management and Program Management roles though today than there were 10 years ago.

5	Yes, it seems it to be revolutionary manner.
6	no change

Question eight asked the participants, "The number of women graduating with college degrees in some type of Information Technology discipline has been on the decline over the last decade. Do you see women with non-Information Technology degrees recruited for Information Technology positions?" Responses to this question are below:

Response	Responses	Percentage
Yes	3	38%
No	5	62%

As a follow up to question eight, question nine asked "If you answered Yes to question eight, are these recruitments a success and can you explain why"?

#	Response
1	Yes - depending upon the function - more the "technical Authority" route - where a high level of communication skills are needed, and with training can me more valuable than the solid technical experience.
2	I answered "no" because it's definitely uncommon, but I do know of several women who have successfully transitioned into the I.T. field without a degree in an associated discipline. The most common way that I see is for women to transition into Technical Writing or into Project Management roles from other fields.
3	Recruitment is not related to IT or non-IT, its mainly required the screening skills graphology to understand the candidate, proper understanding of JD and last but not least the terminology of particular thing wheather[sic] it or non it, even I am also the non iT female working from last 1.7 yrs working as a technical recruiter.
4	Yes. Because they are smart cookies with math, biology, etc degrees and they just pick it

up.

Question ten: What are the characteristics of men that you see in the Information technology talent pool?

#	Response
1	Detail oriented, academics, with often type "A" personalities and mediocre communication skills.
2	With the economy we find a lot of men with many years of experience that have been laid off and looking for jobs.
3	They are mostly from India and have H-1 Visas or Green cards.
4	The men that I work with are passionate about their fields, naturally enjoy the nature of their work, and are successful in what they do.
5	good in coding, technically perfect, quantitative, qualitative etc.
6	Smart, introverted, quirky sense of humor, willing to work long hours,

Question eleven: What are the characteristics of women that you see in the Information technology talent pool?

#	Response
1	Detail oriented, often type "B" personalities with slightly better communication skills than above.
2	The women are equally talented and many are looking for jobs but there just are not as many women in IT as men.
3	They are mostly from India and have H-1 Visas and green cards.
4	I would say the same about the women as I did about the men. The women need to have the additional ability to work well in a male dominated field.
5	Managerial, trainer, dedication, patience, negotiating, soft spoken, listening skills etc.

#	
6	Smart, client oriented, patient (do they ever have to be patient to put up with what they do); willing to do what it takes. Compared to women in general, less concerned with things such as appearance, fashion. You will never find an IT woman who looks like a news anchor. They all pretty much look like they shop from the Land's End catalog on line. I knew one woman who hated shopping so much, she only went clothes shopping once a year, bought everything in Macy's in her size that would fit into the car, and then never did it again until those clothes were worn out and she just had to go again. She made good money, so it wasn't that. She just found it a colossal waste of time.

Question twelve: Future labor market projections point to an overall shrinking pool of available talent which will require more women to enter the Information Technology field. What ideas would you suggest to create an interest in Information technology careers for women?

#	Response
1	Communication of work life balance programs that Fortune 100 firms in this industry provide. Offer 3-5 year formal internship programs specific to women that factor in departures from the work world for a period of time during early child bearing years. Broker opportunities that allow for career progression to management for strong performers. As an industry align with local school boards - that as part of the technology curriculum for elementary school, showcase successful women in technology (the Charlie's Angels of the IT World), opportunities, and discuss the necessity for continued learning in math and sciences. Otherwise female students may migrate to other areas of interest - prior to being at an age where a technology career is even considered. If at the elementary level - math, sciences and technology are not taught as exciting and viable, this prospective future employee pool is already reduced in size. This is a 20 year fix.
2	It starts with the colleges and tech schools making sure women are encouraged to pursue information technology fields.
3	Start in jr high and high school. Design training towards women to how they think and process information. Create an all women program which allows them to have a more comfortable place to learn.

4   College campus education and awareness. More recruitment into the engineering schools on the High School level. I can remember being the only woman in every one of my engineering classes at the University of Michigan. I was one of the only women to be accepted into the Air Force Academy Engineering program the first year women were allowed to apply in 1976. I declined.

5   I think there needs to be more awareness in middle and high school as well as at the undergraduate level that explains to our younger generations what careers in the various I.T. fields exist and what they entail. We need to show our youth how varied and how interesting the individual fields are, and explain how critical it is that we have enough of a workforce for the future in these fields. I would think many of our youth may also feel that if they enter these professions, they are at risk of entering professions that could be outsourced.

6   I think it's the perfect thing to do, but also suggest that excess of everything is bad so also maintain the ratio of men and women.

7   Start very young. Grade school. Large companies who will need these workers need to reach out to schools and support clubs and career days. Support efforts of groups like Girl Scouts who have such programs. Companies need to structure work so that women in child bearing years can take advantage of things like virtual work so that they have work/life balance.

Annotated Bibliography

Ashcraft, C. & Blithe, S. (2009). Women in IT: The facts. Retrieved from

http://www.ncwit.org/pdf/NCWIT_TheFacts_rev2010.pdf

In 2009, the authors of this report compiled data from the National Center for Women &

Information Technology, which began collecting data from existing national sources and

projects in 2004. The authors' goals were to understand why participation is declining for

women in Information technology and how companies can reclaim this technical talent.

The key areas that the authors focused on were why companies should care about women

in Information Technology, the current state of affairs of women in Information

Technology, identifying current barriers to women in Information Technology and

finally, what companies can do to address these barriers. For each of these key areas, the

authors go into greater detail with five or six key points which they discuss. For example,

under the identifying current barriers, the authors examine whether a lack of role

models/mentors/sponsors are a barrier to women not entering or remaining in the

Information Technology.

Both authors of this report work for the National Center for Women & Information

Technology and are both female which may lead one to a feeling of bias in their findings.

Actually their findings are similar to what I have seen discussed by other authors and

their information goes into great detail on their key areas which is helpful for my thesis.

The authors use a number of charts along with solid information from 2009, which makes

this report very relevant since the information is current.

Klawe, M., Whitney, T. & Simard, C. (2009). Women in computing – take 2.

Communications of the ACM, February 2009, Vol. 52, No. 2. Retrieved from Academic

Search Premier database.

In this article, the authors asses the changes that have occurred since a 1995 article that

Klawe and Nancy Leveson wrote about women in computing. Positive and negative

trends are described and new strategies are illustrated in an attempt to get more women

interested in computing. Not only is data from the United States and Canada is included

in this article, but also from other parts of the world. The authors describe the good news

and the bad news that have transpired since the 1995 article and reasons as to why these

events have occurred. The authors also discuss their feelings that government must play a

role in increasing the number of women in computing.

I found the authors interpretation of the good and bad things that have happened since the

1995 article very informative. Their approach to encouraging ways to get more women

interested in computing was very detailed in nature and it would be interesting to see if

any of these ideas would result in more women in computing if attempted.

Lemons, M. & Parzinger, M. (2007). Gender schemas: A cognitive explanation of

discrimination of women in technology. *Journal of Business Psychology Vol. 22, No.

1*, 91-98. Retrieved from Academic Search Premier database.

The authors use a theory called gender schemas to explain the discrimination towards women in Information Technology. This schema adds to the explanation of behaviors and attitudes towards women in Information Technology which may adversely affect them. The authors emailed a survey to a group of 2262 Systers, which is part of the Institute for Women in Technology and was established in 1987. The authors received only 218 responses to their survey and from those surveys; the information for their report was compiled. The focal point of their findings is that men dominate the IT field and that women who enter the field are viewed as a deviation and inferior which causes dissatisfaction for many of these women.

The authors utilized a psychology driven approach to their survey and data mining approach. While this approach took a much deeper look into the minds of women currently in the field, the results were similar to what other authors have reported which is men take a lesser view of women entering or currently in the field. I found the information that the authors presented interesting information but their approach was very scientific in nature and for the purpose of my thesis, I'd like to utilize a less psychological approach.

Levinson, M. (2008). Women in IT delay marriage, motherhood to advance careers but still miss top jobs. *CIO*. Retrieved from http://www.cio.com/article/455184/Women_in_IT_Delay_Marriage_Motherhood_to_Advance_Careers_But_Still_Miss_Top_Jobs_

The author describes the sacrifices that women in Information Technology face in their personal lives such as delaying having children and putting off getting married, in hopes of advancing their careers. Usually these delays do not help to improve their careers since men are three times more likely to hold an executive level job than women in most companies. The author also illustrates that 56% of women leave their Information technology careers mid-career to pursue new opportunities.

The author describes information from studies conducted by the Anita Borg Institute for Women and Technology and Stanford University's Michelle R. Clayman Institute for Gender Research. This approach and data provided key information on women delaying their personal goals in hopes of advancing their Information technology careers and small rewards of this approach typically are. The author demonstrated findings that other researchers have discovered about women taking on much risk in Information technology but there often being few rewards. I found this article to be interesting that many women leave the field mid-career, this trend is one that needs to be reversed.

McKinney, V., Wilson, D., Brooks, N., O'Leary-Kelly, A. & Hardgrave, B. (2008). Women and men in the IT profession. *Communications of the ACM, February 2008, Vol. 51*, No. 2. Retrieved from Academic Search Premier database.

The authors conducted a survey in 2003 of several large U.S. companies and targeted IT associations and received 815 responses. The goal of their survey was to answer the question of whether or not there was an input problem, women entering IT or a

throughput problem, women staying in the field or both. The questions posed were

whether women share the same motivation as men in IT? Is socialization the same for

men and women? And whether women have the same type of experience, in regards to

having a role model, in the IT workforce? Their findings to these questions were that

motivation was basically the same between both genders. The interesting response was in

regard to role models, while some other reports have shown a difference in this area with

women saying they have few or no role models, the authors reported that both men and

women have equal role model opportunities. The authors also discovered there are no

significant gender differences with the intention to leave the field between either gender.

The authors reported information in a scholarly format that contradicts many other

reports in regards to women leaving, or staying, Information Technology or motivation

factors. I found their findings interesting on these two topics. While I can't say that I

would dismiss their findings, it does give one something to analyze when reviewing other

authors findings.

Melymuka, K. (2008). Why women quit technology careers. *Computer World*.

Retrieved from

http://www.computerworld.com/s/article/319212/Why_Women_Quit_Technology?sourc

e=rss_news10

The author interviews Sylvia Ann Hewlett, founding president of the Center for Work-

Life Policy in New York about why women quit technology careers. Hewlett lists several

areas that could be responsible for women leaving Information Technology such as

sexual harassment, lack of mentors, long hours and the work-life balance. The author also

lists four companies, Cisco Systems, Intel, Johnson & Johnson and General Electric, who

have taken steps to retain or attract women to technology positions at their companies. As

an example, Intel has formed a women's engineering form where women can showcase

their research, relieve isolation, foster solidarity and support creativity.

The responses that Hewlett gave the author are very similar to other reasons why women

are not entering, or remaining, in Information Technology. The only finding in this

article, which I have not seen reported elsewhere, is the percentage of women who have

experienced sexual harassment, that percentage seems high to me. Hewlett also

comments on the fact the women in Information Technology problem is just not a United

States topic but it is almost a global problem in nature.

Orlov, L. (2007). How to attract women to enterprise IT jobs. *CIO*. Retrieved from

http://cio.co.nz/cio.nsf/focus/657CBAEDB11DFA8DCC25735E00374CC2

The author describes enterprise IT as being a fantastic field for women but why? The

author asked CIO's about why so few women worked in enterprise IT and found out that

the field suffers from an outdated image, inadequate promotion, and misperceptions

about what IT really is. The author also lists potential reasons that many attract women to

enterprise IT such as climbing salaries, work force diversity and several others. Potential

ways to change the image of IT are also described.

I found this article relevant because it describes potential items that make enterprise IT attractive to women. These items are not well known but once the author discussed them, it was clear to see that these are very real items that if addressed, could be ways to increase the number of women in enterprise IT roles. I also like the suggestions on changing the image of IT to attract more women, this is one area that could great be improved upon and potentially more women would want to fill roles in enterprise IT.

Paul, L. (2001). Careers: Why IT hates women (and the women who stay anyway). *CIO.* Retrieved from http://www.cio.com/article/30528/Careers_Why_IT_Hates_Women_and_the_Women_Who_Stay_Anyway_

The author describes the careers of three women who have successfully worked their way to the top of the career ladder, but did experience adversity and roadblocks along the way. The author also describes how each of these women overcame these roadblocks. These women faced the glass ceiling, the work-life balance, and other family burdens that married women in Information Technology face.

The author wrote this article by taking pieces of interviews that he conducted with each of these women and highlighting key responses. What I find interesting about this article is that it displays some real world example of women who have risen to the top of their

chose career field in Information Technology, despite barriers, and the steps they took

along the way.

Randall, C., Price, B. & Reichgelt, H. (2003). Women in computing programs: Does the

incredible shrinking pipeline apply to all computing programs?

Inroads – The SIGCSE Bulletin, December 2003, Vol. 35 NO. 4.

Retrieved from Academic Search Premier database.

The authors of this article examined if degree fields, other than Computer Science, such

as Information Systems and Information Technology, also suffer from a lack of women.

The authors focused on all public institutions and received 15 responses. Their findings

backed up their initial hypothesis, CS programs did have the fewest number of women

enrolled and the next populous was IS. IT programs lead the way. White females were

the most under-represented in all of these degree programs. The authors did state that

there data was only for one semester and that they intend to complete follow up research

in the future to substantiate these initial findings.

The authors did a scholarly job of exploring the percentage of women enrolled in CS, IT

and IS programs at Universities in the state of Georgia. Their work is very similar to the

type of survey that I would like to complete for Universities in the state of Colorado and

provided good examples of how to break down the data returned. I found their

conclusions very interesting especially the fact that white females were under-represented

in all computing degree programs. I will be interested to see if my findings mirror or differ greatly from theirs once my work is complete.

Riemenschneider, C., Armstrong, D., Allen, M. & Reid, M. (2006). Barriers facing women in the IT work force. *The DATA BASE for Advances in Information Systems – Fall 2006*, Vol. 37 No. 4. Retrieved from Academic Search Premier database.

The authors of this article conducted a study in the United States to examine female IT employees' perception of workplace barriers and whether or not these barriers influence voluntary turnover. Barriers that the authors identified include barriers to promotion, such as gender socialization; the work-family conflict, work schedule flexibility, job quality and stress. The authors then did a cognitive study of 39 women working in IT and then produced a causal map which demonstrated turnover as being linked to views on family perspectives. Their findings were that stress, job quality and work schedule flexibility definitely had the greatest impact on turnover and barriers to promotion.

The authors produced a scholarly article and their findings are what I expected them to be. While all workers experience issues with stress, job quality and work schedule flexibility, these were the top issues which caused turnover with female employees. I was surprised to learn that discrimination is not a central to this work force barrier to women in IT, according to these authors, while most other authors did find this to be true. Overall, I found most of the information the authors presented to be similar to other studies and found their information useful.

Todd, K., Mardis, L. & Wyatt, Patricia (2005). We've come a long way, baby!

but where women and technology are concerned, have we really?

SIGUCCS'05, November 6-9, 2005. Retrieved from Academic Search Premier database.

The authors start their article by discussing the women who programmed the ENIAC

computer in the 1940's and the lack of recognition that these women did not receive until

the 1990's. These early women in IT faced two issues which are still in existence today in

some organizations; gender bias and lack of role models. The authors proceed to question

whether we have made any progress in recognizing the potential of women in the IT

workforce in recent times and come to the conclusion that women have not made as

many advances as the authors would like to believe in regards to advancement in the

work place. Key areas, that the authors still see as areas for improvement include having

role models for women in IT as well as mentoring programs and better support

mechanisms.

The authors' discussion of the ENIAC computer development by a group of six women

and how these women were treated was sad to read. The fact that these women did not

receive credit for their work for 50+ years is unbelievable. While I do agree with the

authors that little progress has made for advancing women in IT, their findings echo those

of other research articles that I have reviewed. Support, mentors and role models are

described as possible methods to retain or attract women to Information Technology

careers. Time will tell if these methods will work but we have a long way to go before

women are viewed as equals, when compared to men, in the world of Information

Technology.

Wentling, R. & Thomas, S. (2004). Women in information technology. Retrieved from

http://www.eric.ed.gov/PDFS/ED492126.pdf

The authors start their article by discussing the number of women in the United States

workforce but then proceed to discuss the fact that women only comprise 20% of the

technology sector workforce. Barriers to women in Information Technology are

discussed such as the work-life balance, the glass ceiling and a vicious cycle which

happens when there are few women role models or mentors in the field. The authors then

discuss ways to recruit and retain women in the Information Technology workforce

which include increasing the number of mentors, potential solutions to the work-life

balance issue as well as encouraging organizations to establish policies and initiatives

that encourage and support the recruiting, hiring, retention and advancement of women in

Information Technology.

The authors' discussion of the barriers that women face in Information Technology

mirrors what other researchers have previously discovered. I do agree with the authors

possible solutions to increasing the number of women in Information Technology since

the provided solutions that the authors describe are all viable options that just require a

little bit of work to get implemented.   If organizations make the effort to implement

these changes, the number of women in Information technology positions should

increase.