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WHAT WOMEN WANT (AND DON'T WANT) IN THE CYBERSECURITY PROFESSION: AN EXAMINATION OF WHY THE INDUSTRY LACKS WOMEN AND HOW TO INSPIRE GENDER DIVERSITY IN THE WORKPLACE

by

Princess C. Young

A thesis

submitted in partial fulfillment

of the requirements for the degree of

Master of Business Administration in the College of Business

Idaho State University

Spring 2014

Committee Approval

To the Graduate Faculty:

The members of the committee appointed to examine the thesis of PRINCESS YOUNG find it satisfactory and recommend that it be accepted.

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HUMAN SUBJECTS COMMITTEE APPROVAL PAGE

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March 20, 2014

Princess Young
Stop 8332
Pocatello, ID 83209

RE: Your application dated 3/20/2014 regarding study number 4065: Opinion of Women in Cybersecurity

Dear Ms. Young:

I agree that this study qualifies as exempt from review under the following guideline: 2. Anonymous surveys or interviews. This letter is your approval, please, keep this document in a safe place.

Notify the HSC of any adverse events. Serious, unexpected adverse events must be reported in writing within 10 business days.

You are granted permission to conduct your study effective immediately. The study is not subject to renewal.

Please note that any changes to the study as approved must be promptly reported and approved. Some changes may be approved by expedited review; others require full board review. Contact Tom Bailey (208-282-2179; fax 208-282-4723; email: humsubj@isu.edu) if you have any questions or require further information.

Sincerely,

Ralph Baergen, PhD, MPH, CIP
Human Subjects Chair

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WHAT WOMEN WANT (AND DON'T WANT) IN THE CYBERSECURITY PROFESSION: AN EXAMINATION OF WHY THE INDUSTRY LACKS WOMEN AND HOW TO INSPIRE GENDER DIVERSITY IN THE WORKPLACE

Thesis Abstract - Idaho State University - 2014

The field of cybersecurity is an ever-growing industry, filled with numerous job opportunities in both private and public sectors. However, current research reports that women make up only 11 percent of the entire cybersecurity industry at this time. A number of reasons for this low statistic have been posited over years of research and discussions. The purpose of this research is to identify the probable causes for women's lack of interest in entering the vocation as well as possible causes for women leaving the industry.

Quantitative and qualitative research has been completed to examine current professionals' opinions covering workplace diversity and reasons for gender discrepancies in the industry (from perspectives of men and women). Subsequently, a pilot survey was conducted and preliminary analysis of the survey assisted to provide recommendations for moving the industry forward and motivating women to consider cybersecurity as a long-term career path. Final recommendations include implementing STEM education into earlier K-12 grades as well as creating a more positive culture in which both genders can prosper.

INTRODUCTION

Cybersecurity is a young and emerging field. The market is growing so rapidly that there may not be enough cybersecurity professionals to meet demand in coming years. A recent study conducted by the largest international organization certifying cyber security professionals, $(ISC)^2$, found that women make up 11 percent of the global cyber workforce at this time, and this is a percentage that has remained static over past years (ISC^2 2013)**.** The relatively small percentage of women in this field is the foundation of the thesis.

More research covering gender issues within the industry is necessary to determine how to make the career path more stimulating for current professionals to aid retention in addition to successful recruitment of future cyber professionals. There has been limited research conducted in this young industry, and there are questions revolving around the reasons *why* the percentage/proportion of women in the industry has remained so low.

This thesis will first provide information pertaining to the problem statement and the significance of the problem. Next, background information and a literature review will be provided to establish context to the issues of women in cybersecurity. This identify reasons for why women are leaving the industry and/or why there is lack of interest in the field. A pilot survey has been conducted to gain current perceptions of the industry. Final recommendations are based on the research reviewed as well as the analyzed pilot survey results. The suggestions will provide practical ways to motivate young women to consider a career in cybersecurity as well as ways to retain current talent, thus adding diversity and strength to the cybersecurity industry in the future.

CHAPTER 1

DISCUSSION OF RESEARCH AND BACKGROUND

1.1 TITLE

This master's thesis is entitled: "What women want (and don't want) in the cybersecurity profession: An examination of WHY the industry lacks women and how to inspire gender diversity in the workplace."

The title's intent is to inform readers that the content and research of the thesis have identified reasons why women cybersecurity professionals may be leaving the industry and why other women are not interested in pursuing a cybersecurity career. As a result, this research will also identify opportunities for the industry to consider pursuing in order to increase gender diversity in the cybersecurity workforce.

1.2 STATEMENT OF THE PROBLEM & PURPOSE

While the information assurance/cybersecurity industry has continually expanded over time, the latest research concludes that the number of women in the industry remained at a proportionate 11 percent of the total number of cyber professionals from a global perspective (ISC^2 2013). This suggests that either: 1) very few women are entering

the industry each year as the industry grows, or 2) the same percentage (and proportion) of women enter and depart the industry annually so there is not true growth.

Anyone can bring a new perspective to organizations and work groups in any industry, thereby increasing diversity. In a male-dominated industry, women also provide unique suggestions to projects that others may not have considered. In a technology-driven environment, the global workforce should be increasingly diverse by including all cultures, ages, and genders.

This thesis aims to identify *why* static growth for women in cybersecurity has occurred and discusses the problems based on quantitative/qualitative data found from a variety of sources. Questions that will be considered include: What can be done to solve this problem? Are the current, "most popular" methods of solving this issue working? Is there something better? How can these problems be quantified?

Qualitative data will be reviewed to first understand current and past issues faced by the industry. Research from the last 15 years, including articles, case studies, other research, and more will be examined. Next, primary research will be conducted to convert current opinions and perceptions of the industry into quantitative form and statistics. Figure 1 below represents the problem at hand, and this figure will be expanded upon throughout the thesis.

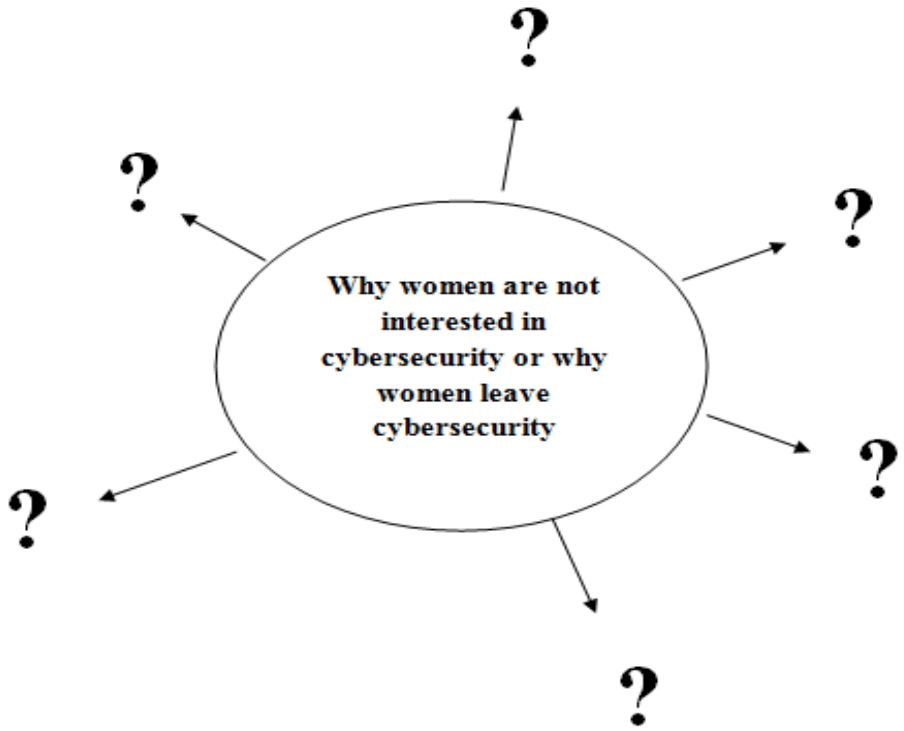

Figure 1: Why women are not interested in cybersecurity-Stage 1

1.3 JUSTIFICATION OF THE PROBLEM

Many of the current reasons defined for why a majority of women are disinterested in cybersecurity resonate from personal opinions, from media, and current/past industry professionals. Although research from such sources are useful for initial research and review, further research needs to be conducted. Opinions develop from perceptions and specific situations people have encountered; these views do not accurately portray the cybersecurity industry and industry opinion as a whole in most cases.

Due to the infancy of this industry, limited quantitative research has been completed. Therefore, this research will take opinions and observations of current

industry perceptions and convert this information into quantitative data through the use of a quantitative survey analytic methods. Such results can then be used to determine where additional primary research should be accomplished.

The researcher believes that it is problematic for only 11 percent of the industry to be women. As the industry continues to grow, the proportion of women entering as cybersecurity professionals needs to grow as well to meet forecasted job demand in the industry. Recently, it was reported that the demand for cybersecurity professionals has grown 3.5 times more than any other IT-related field (Rosenbush 2013). In order to have a more gender diverse workplace, potential or perceptual barriers to entry for women require further examination.

Economic Stability

An assumption of this paper is that cybersecurity will be discussed from an American viewpoint since a majority of the research came from American sources. However, some international research/discussion will be provided.

With this in mind, more women need to join the cyber profession in order to assist in the economic stability of the industry and society in general. According to the United States Department of Labor, it is "estimated that between 2010 and 2020, there will be more than 1.4 million computing-related job openings nationally, and at current graduation rates, only about 30 percent of those jobs can be filled" (Labor 2014).

This means that 30 percent of IT jobs are going unfilled because there are not enough qualified professionals to fill these positions; cybersecurity is found within IT and thus contributes to this statistics. The lack of professionals is problematic long-term because if there are not enough people filling these jobs, IT and cybersecurity positions

will have to be outsourced. American money would instead add economic stability to other countries. In order to keep Americans employed and the economy (as well as the industry) as stable as possible, it is necessary to market the professions needed and facilitate Americans' desire to seek out education in the fields currently open and needing employees.

Other Considerations

Although the data found in the industry is currently limited, from initial research and review there appears to be a number of issues that contribute to the lack of women in cybersecurity. Many of the problems currently examined by other research tend to fall under perceptions/misperceptions, sociology and culture of the cybersecurity industry, and the lack of education for women in the field or those interested in the field. It is important to examine each issue contributing to the problem at hand to determine which issues are most problematic and how those most pressing issues can be solved in order to move the industry forward.

CHAPTER 2

REVIEW OF LITERATURE

The following section examines the background and history of cybersecurity, both genders and their contributions/roles in the field, as well as other information that establish context of this research. Through the literature review, issues surrounding the thesis topic were identified. The review was also useful in providing areas where research was found lacking and hence this thesis's research could be of great use to move the industry forward.

2.1 CYBERSECURITY/IT SECURITY

Cybersecurity is currently considered a sub-category of Information Technology (IT) by Bureau of Labor Statistics standards. Since the Internet is still young, *cybersecurity*, *information assurance*, and *information security* are all somewhat new terms to the world today. Cybersecurity emerged from the necessity for businesses, various infrastructures, and people to be "cyber secure" by providing confidentiality, integrity, and data availability (Conklin 2012).

As the cybersecurity profession evolves, it is apparent that cybersecurity is substantially different from IT. Agencies within the federal government want cybersecurity to be distinguished from IT and given it its own occupational category.

A challenge with this research and literature review was that there are different definitions within each organization as to how “cybersecurity professionals” and “IT professionals” differ. Confusion occurs because some employees strictly work on cybersecurity projects and tasks, while other IT professionals do work within IT as well as cybersecurity. To address these research concerns, some statistics and discussion will deal with more generalized information from the IT industry. Other data will be retrieved from cybersecurity-specific data.

The word "Cybersecurity" was first coined as a term in 1994 (Merriam-Webster Dictionary 2014), but a streamlined definition has yet to be accepted over the entire industry (between public and private sectors as well). This in turn makes it difficult to communicate about the topic, because professionals have their own opinions on what defines the industry and profession as a whole. There are also a number of different terms for cybersecurity such as information security and information assurance. For the purpose of this paper, “cybersecurity” is the primary term.

The White House definition of "cybersecurity" is used when discussing "Information Assurance," "Cybersecurity," or "IT Security." Cybersecurity is defined by the White House as: *"The activity or process, ability or capability, or state whereby information and communications systems and the information contained therein are protected from and/or defended against damage, unauthorized use or modification, or exploitation."* (NIST Special Publication 800-53 Revision 3 2009).

Additionally, cyberspace is defined by the National Institute of Science and Technology (NIST) as: *"The interdependent network of information technology infrastructures, that includes the Internet, telecommunications networks, computer*

systems, and embedded processors and controllers" (NIST Special Publication 800-53 Revision 3 2009).

The requirement for increased awareness and security of cyberspace has grown recently as cyber terrorism has gone from fantasy to an adverse reality in a number of situations throughout the years through various sectors from financial to healthcare. United States President Barack Obama stated, “Cyber threat is one of the most serious economic and national security challenges we face as a nation,” and that “America's economic prosperity in the 21st century will depend on cybersecurity" (Foreign Policy-Cyber Security 2014).

Additionally, because many lives revolve around technology, it is imperative that every business and person gain cybersecurity knowledge and education. Learning about cybersecurity can help people throughout the world understand the importance of safeguarding their digital information and make wiser decisions when they utilize computers and the Internet.

2.2 STEM CAREERS

STEM stands for "Science, Technology, Engineering, and Mathematics." Similar to the term "cybersecurity," there are a number of definitions various organizations use when identifying STEM. Many organizations utilize the definition provided by the National Science Foundation (NSF). The broad definition from NSF now also includes some of the social sciences such as anthropology and sociology (NSF 2014).

Examples of STEM careers include technologists, biologists, programmers, statisticians, and engineers. Due the importance of the STEM fields, STEM specialists are vital to the world's evolution. Billions of dollars are being spent by the government

and various companies to fund students' educational and career goals in STEM. Information technology—and subsequently cybersecurity—are found within STEM. STEM career holders also enjoy high-paying salaries in excess of $60,000 that with experiences and time can increase over time to six figures along with distinguished job titles (Bureau of Labor Statistics STEM 2014). Figure 2 below, from the Bureau of Labor Statistics STEM 101 report, shows several STEM occupations with high projected growth. Note in Figure 2 that information security analysts, often considered an entry-level position in cybersecurity industries, has projected growth of 37 percent from 2012-2022 (Vilorio 2014). Cybersecurity has a bright job outlook for those interested in pursuing the field.

Occupation	Employment growth, projected 2012–22 (percent)	Employment		Median annual wage, May 2013	Typical entry-level education[1]
		2012	Projected 2022		
Information security analysts[2]	37%	75,100	102,500	$88,590	Bachelor's degree
Operations research analysts	27	73,200	92,700	74,630	Bachelor's degree
Statisticians	27	27,600	34,900	79,290	Master's degree
Biomedical engineers	27	19,400	24,600	88,670	Bachelor's degree

Figure 2: Selected STEM occupations with fast growth (Source: Vilorio 2014)

Cybersecurity is becoming an increasingly diverse career because of the variety of skills sets required in different arenas. Cybersecurity professionals no longer come from solely computer science backgrounds. Individuals with degrees in psychology, medicine, law, and business are valuable and successful in the industry. For example, digital forensics requires professionals who are well-versed in legal matters, since some of a digital forensic examiners work is used in the court of law. The industry needs a variety of personalities and expertise to complete the complex and time-sensitive projects present in the industry.

2.3 NECESSITY FOR CYBERSECURITY PROFESSIONALS

Today, a wide variety of information is stored on servers around the world. From credit card numbers used with e-commerce to health information and financial records, information is available with the simple click of a button. With all the digitized information, safeguarding information from criminals and unauthorized users is vital.

By using technology and the Internet users accepts the risks associated with the Internet. Computer security company McAfee reports that in the United States alone, $100 billion dollars is lost to cybercrime annually. Cyber breaches of intellectual property, a business's reputation, sensitive information, stolen money and data, as well as the costs required to secure a system after a breach can all be costly (McAfee 2013).

Cybersecurity officials are tasked with keeping three things in mind with their daily tasks: confidentiality, integrity, and availability of information. First, confidentiality means that only users that are authorized to see, use, and modify information have access. Integrity indicates that there must be reasonable assurance that an unauthorized user has not changed the data. Hence if a change has occurred or data has been modified by a unauthorized user, it is a breach in integrity. Lastly, availability means that a system must be accessible to authorized users. If a website experiences downtime for too long, availability has been lost (Conklin 2012).

Because cybersecurity stemmed from information technology, much of the cybersecurity industry is perceived to be highly technical and in many ways, it still is. However, cybersecurity is a cross-functional industry where different skill sets and knowledge bases are necessary for successful teams. The industry now requires

professionals that possess more diverse skills beyond networking, programming, or software engineering. Cybersecurity diversity requires professionals who have technical, interpersonal, managerial, and expert communication skills. Information needs to be safeguarded in all areas of business and as a result, cybersecurity officials are employed in all industries, including government, healthcare, education, and financial institutions. In Figure 3, the pie chart shows industries in which cybersecurity professionals can now be placed (Cares 2014).

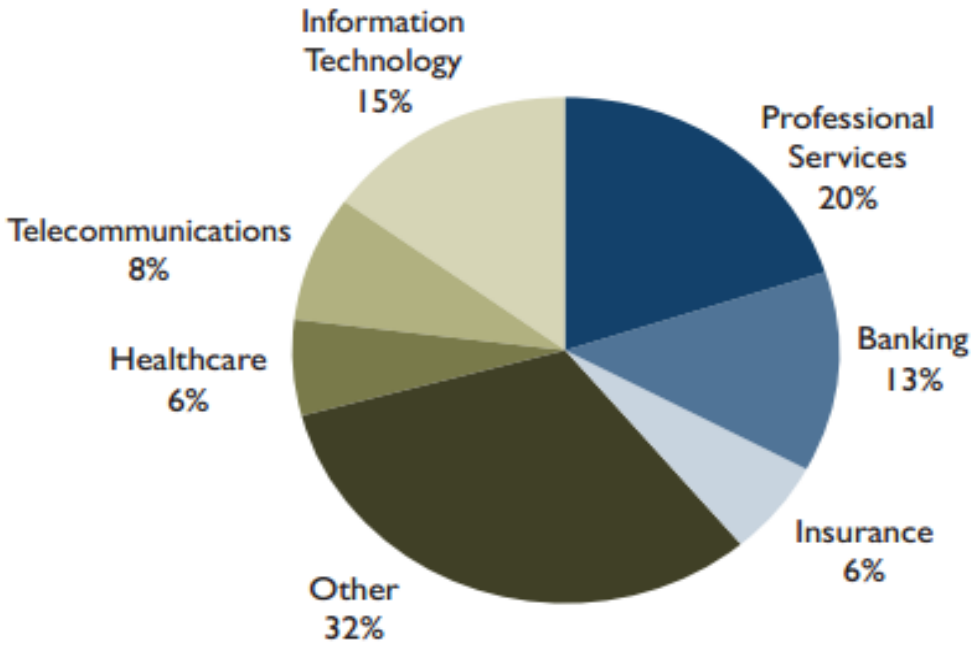

Figure 3: Distribution of Security Professionals across Industries (Source: ISC^2)

As a result of the growth and scope of the cyber industry, it is imperative to recruit the millennial generation (people reaching adulthood by the year 2000) and employ them as cybersecurity professionals because they are becoming the "technology experts" compared to other generations (Mlot 2013). This also means, however, that

millennials are becoming targets of cybercrime. Figure 4 shows information about the millennial generation and how they are most affected by cybercrime (Mlot 2013).

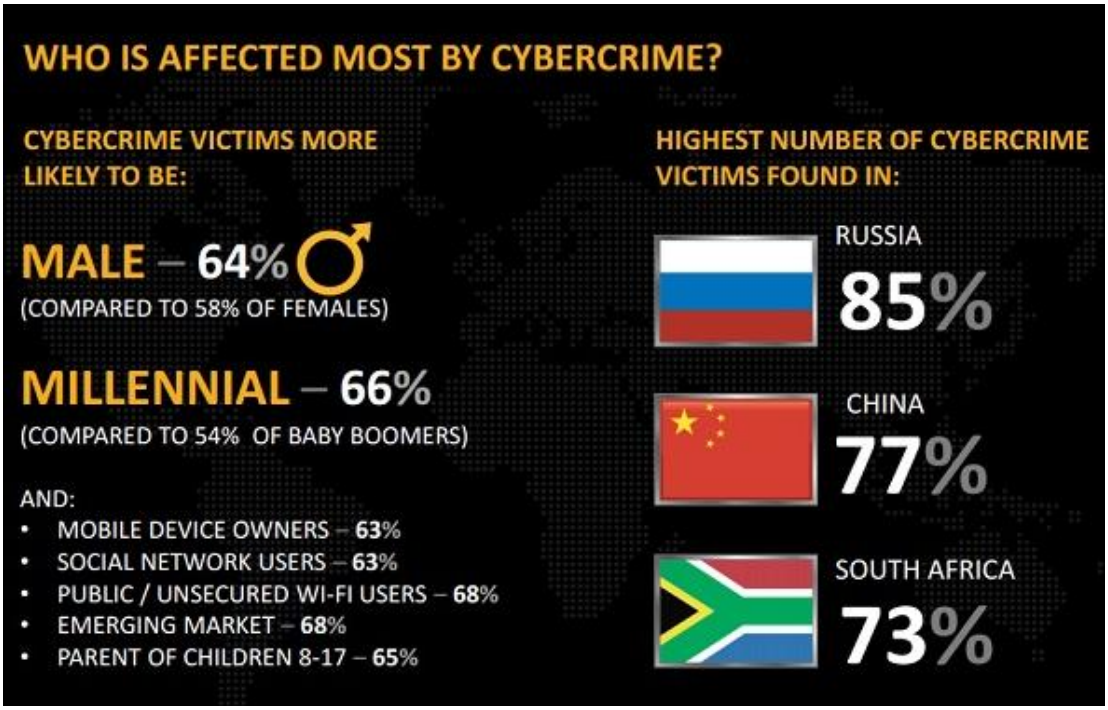

Figure 4: Millennials are affected most by cybercrime(Source PC Magazine 2013)

2.4 MALE-DOMINATED/WOMEN-DOMINATED INDUSTRIES

A male-dominated industry is defined as an occupation or sector where females comprise 25 percent or less of the total employees. Examples of male-dominated fields from the top 10 male-dominated fields list in the United States are brickmasons/stonemasons with one-tenth of one percent (.1 percent) of the 162,000 employees being women, and female roofers being one (1) percent of the roofer profession (214,000 in total employment). Other popularly known male-dominated occupations include engineers, mechanics, and information technology (Catalyst 2013).

Women however also dominate a number of industries and occupations. For example, in 2010, 96.1 percent of the secretarial and administrative assistant industry

were women. Women currently make up 88.2 percent of the nursing and home aide industry. However, many of the female-dominated industries also yield the lowest salaries.

2.5 MEN IN CYBERSECURITY

Men make up 89 percent of the cybersecurity industry, according to the $(ISC)^2$ Global Information Security Workforce Sub-Report from 2013 entitled "Agents of Change: Women in the Information Security Profession" (ISC^2 2013). According to the National Center for Education Statistics (NECS) in 2011, 35,478 bachelor-level degrees were earned within computer and information science disciplines by men. Additionally, 13,956 master's degrees and 1,267 doctoral degrees were conferred to men in the same year (NCES 2014). Technology is a male-dominated field. Apple, founded in 1975, and Microsoft, established in 1976, were both established and developed by men. Information Technology/Cybersecurity falls under the top male-dominated careers along with stereotypical careers such as engineering, law enforcement, and emergency services (such as firemen, etc.).

Since its beginnings, the computer technology industry has been considered the playground for the stereotypical computer geek or nerd. These “nerds” are often characterized as introverted males who enjoy computers, numbers, coding, video games, science fiction or fantasy movies, and spending time alone (Nasser 2012). Independent of stereotypes however, men have inspired the industry to help it move forward.

2.6 WOMEN IN CYBERSECURITY

Although the cybersecurity industry is dominated by men, women have played important roles, despite their small numbers in the field. Many women assisted the World War II effort by working in cryptography; women soon became known as "code breakers" (Lytton 2013).For example, not only did many women enter this field as analysts during World War II, but Grace Hopper in the 1950s developed the COBOL computing language.

Women contributed in STEM-related projects as well during World War II. The Manhattan Project employed over 300 women to assist with the atomic bomb creation. Many women were employed during the war since most men were in combat. Women became doctors, engineers, scientists, researchers, and more. Elizabeth Friedman was a noteworthy cryptanalyst who began working with the United States Navy in 1923 and made exceptional advances in the field (NSA 2014). Despite the fact that many females were employed during the war, when the soldiers came home, most women returned home to continue their regular household duties.

Not only are there not many women in the cybersecurity industry; but many are not seeking education to pursue such careers. In 2011, 7,594 women received bachelor degrees in computer and information science. Men earned almost five times that many computer science degrees in the same year. The number of women receiving degrees in CS only accounted for 17.6 percent of the total (of the slightly over 43,000 diplomas given) in the 2010-2011 academic year (NCES 2014).

2.7 ORGANIZATIONS & PROGRAMS MOTIVATING WOMEN

In an effort to motivate women to consider information technology and cybersecurity careers, a number of organizations and chapters within organizations have been established. The following are a few examples of organizations that focus on motivating women to consider and pursue instruction and careers in Information Technology and/or Cybersecurity.

The National Center for Women and Information Technology (NCWIT) is an organization that strives to incentivize and teach young women about the IT career field. Awards and other programs within NCWIT are meant to help women see their potential within IT (NCWIT 2014). NCWIT additionally conducts research that is then published and available to the public.

Another organization that supports women in cybersecurity is the Women's Society of Cyberjutsu. This society is a non-profit organization hosted in northern Virginia that empowers women to "succeed in the Cybersecurity field." This society has career planning opportunities, mentorship programs, internships, and many other resources for women. The mission of Cyberjutsu is "to advance women in cybersecurity by providing programs and partnerships that promote networking, education, mentoring, resource-sharing, and opportunities" (Cyberjutsu 2014).

In addition, large public companies have also built programs with the intent to help young girls understand STEM and technology before they start their college careers. Microsoft hosts a national and international program called DigiGirlz Day. These events are sponsored throughout the country as well as internationally. Girls in high school can attend a one-day event that provides them with hands-on opportunities utilizing

technology and other equipment. This event has proven useful since some of the girls attending may not have been exposed to the variety of topics at DigiGirlz Day during their regular school curriculum and activities (Digigirlz Day 2014).

2.8 STUDIES OF WOMEN IN CYBERSECURITY

The $(ISC)^2$ Cares Foundation in conjunction with Frost and Sullivan marketing/consulting firm published a report on a survey of the cybersecurity industry. The survey sought to determine which skills were needed in the cybersecurity profession. This document addressed why more women are needed in the cybersecurity industry, based on the quantitative results of the pilot survey.

The $(ISC)^2$ data is divided into two categories: 'Leaders' (CEO, top executives, etc.) and 'Doers' (those who do most of the hands-on, technical work). The report then discussed what skills are necessary in both categories. The report also described the job functions of women/men professionals in the industry and provided information on annual median/average salaries. This research findings suggested that organizations need to push for more gender diversity in the workplace and identify the positive attributes and contributions that women bring to the industry (Cares 2014).

Sharmistha Bagchi-Sen, H.R. Rao, and Shambhu Upadhyaya conducted a research study in 2009 that provided insights into why more women are not entering into the cybersecurity field and why more women should be recruited into high-ranking positions within the IT/IT Security fields. The research study discussed the difference between IT and cybersecurity, barriers to entry, method, research, data, and results. Their report identified the lack of opportunities and skills gained for women at the early stage in their careers (including the education/college area of life). At the time of its

publication, this was the first research paper conducted on the subject of women in cybersecurity (Sharmistha Bagchi-Sen 2009).

2.9 STATISTICS & OPINIONS

A study conducted by the National Center for Education Statistics reported that over the last 40 years the number of women receiving degrees in computer science rose to about 35 percent in the 1980s; however, that number experienced a large decline after 2000. The reason for the decline was not stated but it could have been due to a response after the Internet boom (such as perhaps women's interests changed). In 2010-2011, the number of women receiving degrees in CS only accounted for 17.6 percent of the total (of the slightly over 43,000 diplomas given) (NCES 2014).

	Bachelor's degrees					Master's degrees			Doctor's degrees		
	Total										
Year	Number	Annual percent change	Males	Females	Females as a percent of total	Total	Males	Females	Total	Males	Females
1	2	3	4	5	6	7	8	9	10	11	12
2010-11	43,072	8.8	35,478	7,594	17.6	19,446	13,956	5,490	1,588	1,267	321

Figure 5: Degrees in computer science conferred in 2010-11 by gender (Source: NCES 2014)

Gene Spafford, a professor and leader in the cybersecurity industry, shared his opinions on the lack of women in cybersecurity and stated that talent can be found in anyone and that diversity is critical to the workplace, especially in IT security. He urged men to become more aware and to ensure that sexual harassment is never a problem for either gender in the profession (Spafford 2014).

McCann reports on a round table discussion by professionals that took place in May 2013 in the United Kingdom. Perceptions of cybersecurity were discussed and considerations of what kind of people are drawn to a more "geeky" profession. The paper

discussed that mentors and helping women with self-confidence in their jobs could prove successful (McCann 2013).

2.10 ISSUES WOMEN FACE IN THE INDUSTRY

A *Harvard Business Review* article found that family issues are still considered primarily the "woman's problem." Author Jessica Grose discussed the article in greater detail in *Slate Magazine*. When it comes to home-work conflicts, a male professional is more likely to choose work over the home problem because he is perceived to be the "breadwinner" for the family. The article poses the question: how can men be more empathetic to women's goals combined with a woman's desire to take care of their families? Perhaps organizations need to provide more flexibility in work schedules to assist men *and* women in succeeding in their professional careers (Grose 2014).

Mike Cassidy wrote an article for *The Mercury News* entitled "Women missing out on lucrative careers in computer science." He discussed the problem that not enough women are in cybersecurity. Although there are many available jobs in cybersecurity, the jobs go unfilled because not enough people have the cybersecurity knowledge and education required of the position. As the article states, "Without U.S. workers to fill those jobs, employers will face three choices: export the work, import the workers or leave the positions empty" (Cassidy 2014).

Katherine Marrone of the University of Oregon newspaper wrote an article about women being underrepresented in STEM careers. Her article was based on a study completed at the University of Oregon in 2013: "34.2 percent of [UO] undergraduates majoring in mathematics are female, while 42.8 percent of chemistry majors are female.

Females make up 20.9 percent of physics majors, while computer science undergraduates have the lowest percentage with an unsettling 14.1 percent" (Marrone 2014).

The article continued to discuss how existing stereotypes of a particular field may be a reason why women select certain fields. For example, psychology had a majority of women in its field which could be attributed to the fact that many people consider it to be a "softer" science and easier for women to handle. The stereotype then develops into a belief that a majority of STEM careers are too difficult for women to be successful. This is not true, it has also been shown that women in STEM career-types of majors do just as well as men, if not better.

A difference between men and women is also identified in this research. When women are the only female in their course or major, women tend to demonstrate a higher level of self-doubt. Women question themselves more when they receive a B on an exam than if a male student was to receive a C on his exam (Marrone 2014).

Colin Wood discussed the deficiency of women entering the cybersecurity profession in a recent *Government Technology* article. It stated that "...57 percent of all undergraduate degrees going to women. It is not that women aren't technically minded either, as 52 percent of all math and science undergraduate degrees are attained by women." This article also discussed the stereotypes and perceptions of the industry are somewhat to blame. Therefore, it is critical that programs within organizations be set in place to inspire women and minorities to learn about STEM and technology careers. The article also reiterated the importance of avoiding "dry facts" lectures and instead creating informative discussions to share subject matter for students. In addition, having positive mentors of the same nationality or ethnic background are even more effective because it

demonstrates to the student that if the mentor can make it, so can the student (Wood 2014).

2.11 EFFORTS TO MOTIVATE WOMEN/YOUNG WOMEN

Verton reports that a recent survey conducted in 2013 reported that 82 percent of U.S. millennials stated that no high school counselor ever discussed a career in cybersecurity with them. This suggests that high school students are undereducated regarding the post-graduation opportunities available to them. Currently about 43,000 students graduate with degrees in computer science; public and private sectors will battle with each other to recruit the top talent (Verton 2013).

This study also showed that young men (35 percent) are far more interested than young women (14 percent) in a career in cybersecurity. The article does not expand on the reasons why women are less interested; this is where additional research is needed. Figure 6 below shows the decline of technology interest from high school students (Ashcraft and Blithe 2009).

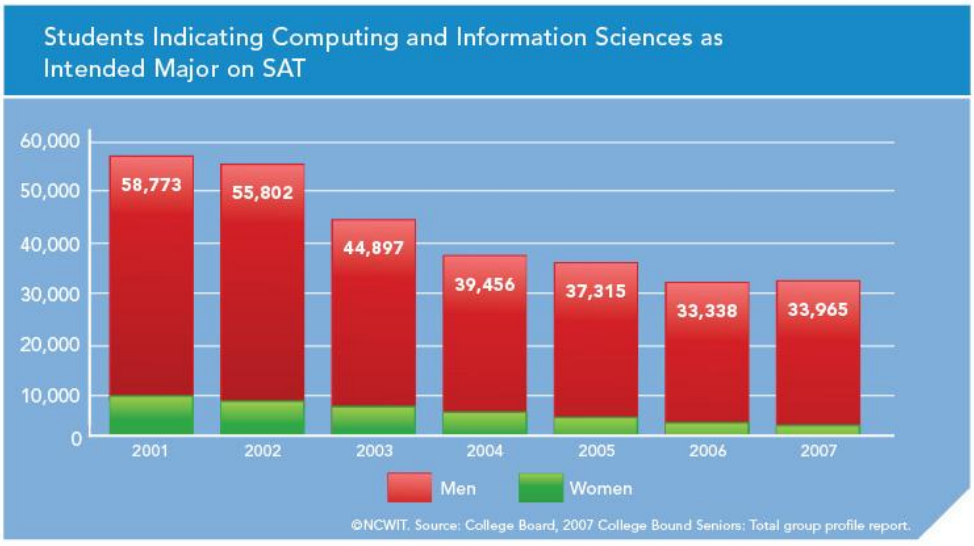

Figure 6: From 2001 to 2006, studies show that fewer students were indicating interest in Computing and Information Sciences (Source: NCWIT 2014)

Another problem is that many young people have been "raised" on technology and social media; therefore, they trust all technology, perhaps more often than they should. Many are not interested in or enthusiastic about a cybersecurity career because they do not see the need for it. Wide use of technology in their daily lives leads them to miss the risks and the cybersecurity threats that exist. For instance, many do not change their various passwords often enough or only use a single password for all their needs (Verton 2013).

In a response to the lack of young women in STEM careers (and subsequently cybersecurity), some students from New Jersey school Jefferson Middle School recently created a smart phone application that allows girls to learn about STEM careers. Through this application, it was the hope of the student designers that girls would become more excited about STEM careers and would want to pursue them as they get older (Jefferson 2014).

Waldman reports that a commercial was recently created by toy company "Goldieblox" to raise awareness for young girls to interest them in pursuing STEM careers, specifically engineering. The commercial focused on how girls do not necessarily want to play with exclusively princesses and ponies but also want to be challenged and create things (Waldman 2013).

Another example of organizations working to motivate women to consider STEM careers is the Science Foundation Ireland. They offer grants of 175,000 Euros—which equates in the United States to approximately $234,000)—over two years to successful applicant researchers, which allowed them to work on research in the STEM field or to continue existing STEM research. Currently, only a quarter of STEM researchers are

women so this grant motivates more women researchers into the field (Funding Programme to Encourage Women to Enter 'STEM' Careers 2014).

A unique initiative that took place in early April of this year was the 1st National Women in Cybersecurity conference (WiCyS) in Nashville, Tennessee. This two-day conference strived to promote a network of women currently in cybersecurity or those interested in cyber. This conference was created because women need more mentors and confidence within the cybersecurity field.

2.12 WICYS 2014

At the Women in Cybersecurity (WiCyS) 2014 Conference, a unique opportunity was created for interested attendees. The conference was sponsored through a grant funded by the National Science Foundation (NSF) which seeks to expand the knowledge and interest in STEM. This event allowed women from all industries, age ranges, and skill sets to participate in a conference that focused on the issues women face in the cybersecurity industry. The conference was also a networking event to learn more about the cybersecurity industry. A number of workshops scheduled at the conference took additional time to discuss thoughts on women in cybersecurity.

At this conference, many women agreed that cybersecurity can be a difficult industry to enter because due to the lack of women, many feel the pressure of having to be immensely qualified in order to compete with men for jobs. A few of the women discussed how family issues can make it difficult to work in such a competitive industry because they feel as though they need to stay at work in order to be consistently perceived as a reliable member of the team. If they are absent for any reason, some feel that it is harder to be accepted (WiCyS 2014).

A pertinent question asked at the conference was: "Is there a difference between Information Technology/Computer Science and Cybersecurity? If so, how should each be marketed?" The majority of respondents stated that in general, yes, there is a difference. There are apparent similarities between the two programs as they both heavily deal with technology and computers; however, the consensus was that there are enough differences that such distinctions should be marketed to influence more people to join their program of choice. For instance, although both jobs/education paths require knowledge of technology, cybersecurity has become more diverse. In addition, many of the attendees have found that their backgrounds in marketing or business have helped them be successful in the field.

CHAPTER 3

METHODOLOGY

3.1 THEORETICAL FRAMEWORK

Because the percentage of women in the industry remains at 11 percent each year in a high-growth industry, the major question is why women are leaving the cybersecurity industry and/or why women are choosing not to enter the field. Based on a number of informal discussions with professionals and the literature review, there are a number of arguments to be made that are related to this issue.

Potential issues and concerns driving the research are discussed below:

- The cybersecurity industry is not interesting to most girls and women (i.e., it does not sound like a "fun" job to pursue for young women in comparison to more stereotypical professions for women such as a teacher or working in the fine arts).
- The cybersecurity industry is male-dominated and women would not enjoy working in the area would prefer working in a more even-numbered environment or a more female-dominated industry.

- A majority of women do not know much about the industry and/or have not received much education and information to help make their final career decision or to select a college major (i.e., lack of awareness and education).
- Women working in the industry (or who have left the industry) have had bad experiences and this has contributed to negative "stereotypes" of the industry.
- Most women do not feel that they meet the stereotypical criteria of an IT professional (and therefore do not meet the criteria of a cybersecurity professional).

It is critical to discuss these issues with cybersecurity professionals to get an accurate perception of these issues. What were potentially issues in 1990 in regards to women's disinterest in the field could be dramatically different today. Additionally, many of the issues could also be the same. Through surveying cybersecurity professions, one can seek out similarities and discrepancies. It is then possible to make recommendations that the industry should take in order to create a more diverse, productive industry for everyone.

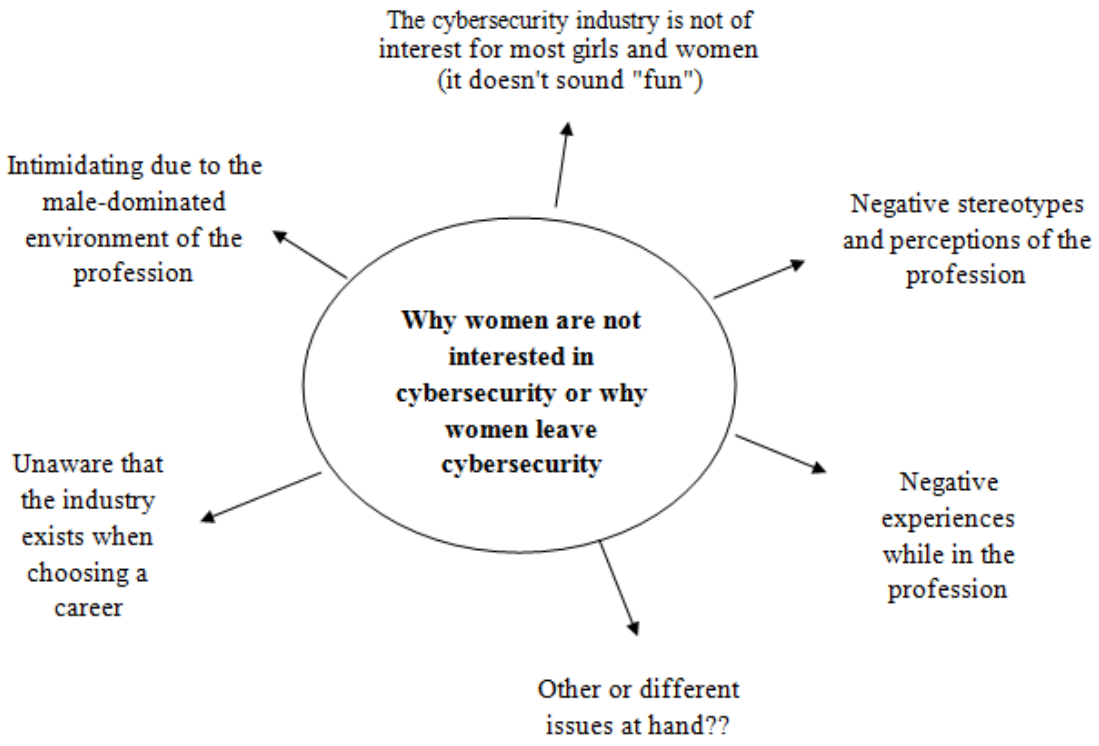

Figure 7: Why women are not interested in cybersecurity-Stage 2

Issues for Women in Cybersecurity

Each woman who is currently in the field of cybersecurity or has considered cybersecurity as a career has their own reasons why the field is interesting or no longer interesting to them. A component of this research is to discover the prevalent opinions and focus on solving those issues. The following are problem statements present in the preliminary research (including case studies) and discussions conducted.

- *"This job does not sound like 'fun' to me":* For a job to become a long-term career for someone, the job need to be entertaining, challenging, thought-provoking, and other requirements people may have for the job. When a young person determines whether a job is or is not "fun," it likely means that from a student's perspective, they are seeking a career path that will motivate them to complete their education.

After asking the current professionals about whether they think the industry is "fun" by their own standards, recommendations will be provided on how to create a marketing strategy to properly market cybersecurity to young people and specifically young women.

For example, a current cybersecurity recruitment method is through cyber defense competitions. In these competitions, individuals or teams compete against other individuals/teams or "red teams" (i.e., "hackers") to protect their systems and networks. However, a cursory examination of the marketing materials for these competitions shows that they can be perceived as a more male focused competition.

In past years, many of the marketing materials for the competition and for campus team recruitment have shown more war-like, militaristic images that in turn is more attractive to male competitors. Although many of the competitions now understand the perception of these materials, stigmas have now been set in place so it is a slow transition as they attempt to attract a more diverse competitor or team. The image below shows a cyber competition hosted annually called "Panoply" (Panoply 2013). It has a perceived male interest with the colors used and the graphics utilized.

Figure 8: A logo for a cyber competition called Panoply (Source: Panoply 2013)

- *"This profession is too male-dominated for me to be successful":* Again, perceptions can easily become reality, and a number of case studies and focus groups researched showed that many women are intimidated by male-dominated fields. A female cybersecurity professional said during an informal discussion, "You cannot miss work. You cannot be simply *as good* as the guys you work with. You have to be better" (WiCyS 2014). This can be a stressful situation, and many women believe that a job in a male-dominated career would be an uphill battle on a daily basis. Due to the lack of role models in the field, it is difficult for women to see their potential in a field that is heavily populated by men. If the survey findings demonstrate that women are still intimidated by the field, additional research would be necessary to discover ways of improving the work environment so women feel included.

- *"What is cybersecurity?":* A critical issue is that many young people, including girls *and* boys, do not know what STEM careers are or what is cybersecurity is. This is partially due to the fact that cybersecurity as a term is still new; however, it also seems to not be marketed very well. Some schools are more successful than others when it comes to teaching STEM and bringing awareness to students. Some private preparatory schools focus exclusively on STEM-related careers, while other schools do not focus on bringing STEM awareness to students.

- *"I am not smart enough for this career":* From an industrial psychology viewpoint, it is imperative to understand the dynamics of a team. As previously mentioned, men are quite successful in cybersecurity because of its current industry culture. If women lack the self-esteem needed to gain a feeling of success

in this industry, this could be a problem needing additional consideration. Team diversity is of paramount importance to deal with future cyber threats; therefore, there needs to be a feeling of acceptance for all skill levels and skill sets so that people can work together without preconceived ideas of how they might be negatively treated in the industry.

3.2 METHODS AND PROCEDURES

Type of Study

This survey study is focused on the collection of quantitative data. Currently, most of the problems related to the cybersecurity industry and the number of women in the field are based on opinion. Much of this research has used focus groups and case studies where opinions from men and women have been collected; however, there is little quantifiable research available.

Therefore, this research will identify the opinions of men and women regarding industry perceptions and then quantify them. In return, the results can be used to guide solutions to this problem and create a forward-thinking approach for solving the issues.

Data Collection Procedures

Discussions with the $(ISC)^2$ Foundation as well as the Women's Cyberjutsu organization were initiated. The $(ISC)^2$ Foundation is a network of cybersecurity professionals, male and female. The Women's Society of Cyberjutsu creates a useful network of women who are experts in the cybersecurity field or seek more information on the field to expand their interest in the field and find mentors in the industry as well.

After discussions with these organizations, it was decided that a pilot survey would prove beneficial to identify current opinions and perceptions within the industry and how those perceptions/opinions relate to the issues at hand. In this way, a quantitative survey could measure opinions, which could be statistically analyzed.

Originally the researcher had planned to survey young people (current high school students) as well in order to determine initial opinions and thoughts from them about their interest/disinterest in studying cybersecurity or seeking a profession in the cybersecurity post-graduation. However, due to time constraints and difficulty in surveying students under age 18, the targets for this survey was adjusted.

Instead of surveying young people, it was decided to survey current professionals in the industry and ask them questions related to young people's potential thoughts on the cybersecurity professional. This will help determine whether or not current professionals would consider being a role model for a young person considering cybersecurity and would answer related questions regarding a young person's acceptance of a cybersecurity career.

Study Population Used: $(ISC)^2$/The $(ISC)^2$ Foundation

The $(ISC)^2$ Foundation is a non-profit organization that was created in 2011. It stands for International Information Systems Security Certification Consortium. Its mission is "Empowering students, teachers and the general public to secure their online life with cyber security education and awareness programs" (ISC^2 2014). This organization works to conduct studies in the cybersecurity industry and establishes programs that aid the United States and the international community by providing resources to help make everyone more cyber secure through awareness and education.

The $(ISC)^2$ organization currently has over 120,000 members, including both national and international members from private and public sectors. The year 2014 marks the 25th year of existence for the $(ISC)^2$ organization.

Additionally $(ISC)^2$ has created industry-standard certification assessments that are considered the paramount exams that cybersecurity professionals should take to further their careers. Examples of these tests include the Systems Security Certified Practitioner (SSCP) and the Certified Information Systems Security Professional (CISSP). These tests are globally recognized and are thus extremely important certifications for cybersecurity professionals to consider at some point in their careers. These tests examine the professional's proficiency levels in regards to a variety of cybersecurity topics from cloud computing to risk management (ISC^2 2014).

Survey Creation

The pilot survey consisted of 56 questions were estimated to take about 20-30 minutes to complete. This survey begins with demographic questions including age range, gender, and level of education. All responses in the survey were voluntary and anonymous. A goal of the survey was to present a proof of concept so that preliminary results could be examined and to determine if the survey could be effectively distributed on a larger scale as well.

Discussions with representatives of the $(ISC)^2$ Foundation included the ideal survey length. In the past, members of $(ISC)^2$ have received surveys that took up to an hour to complete, so the researcher's goal of this survey was to make it accessible for most of the population, and it was believed that a shorter survey would do that. Therefore, a survey size of 56 questions was created.

The survey's questions are based upon the following current topics; the graphic below also displays the information in an illustrative way:

- Current perceptions of the industry
- Current opinions of a male-dominated industry
- Existence of stereotypes or stigmas in the industry
- Positive/negative opinions of the industry
- What would motivate young people to consider cybersecurity

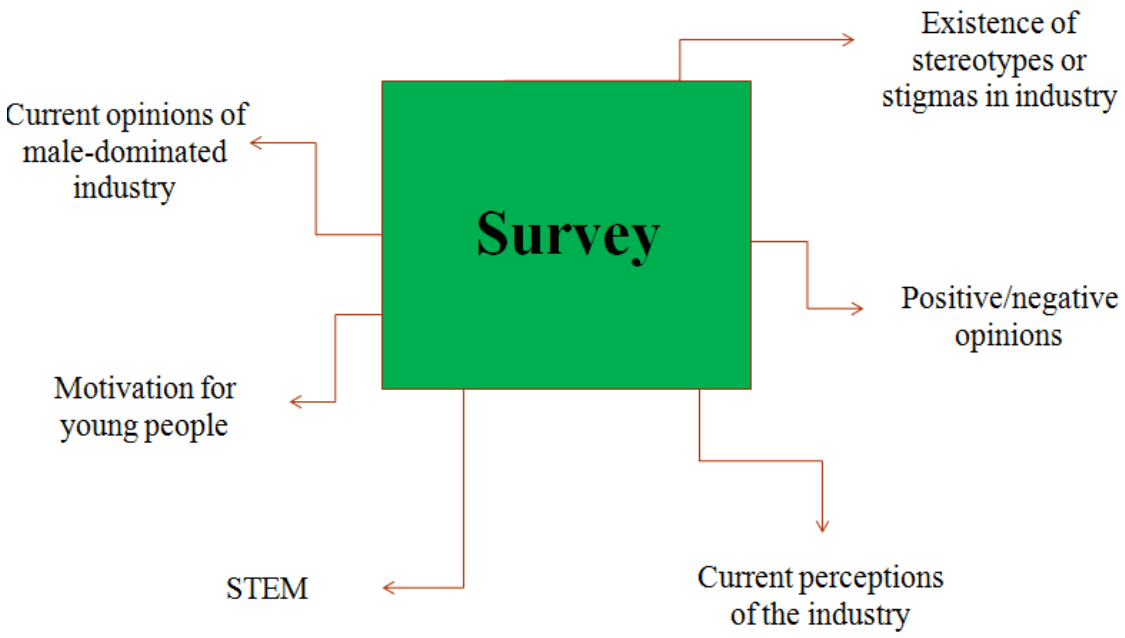

Figure 9: Illustrative representation of survey components

These questions were developed to address the problem statement discussed earlier in this paper as well as the issues raised from the literature review of various articles, informal discussions, websites, and online/print publications authored over the past 15 years. A number of unanswered questions were identified in the literature review. Due to the lack of research currently in the field on this topic, diverse survey content was

necessary. Members of $(ISC)^2$ will be asked questions and opinions through a voluntary survey hosted by online surveying tool SurveyMonkey.

Common survey questions seek to measure a person's behavior or attitude toward something and use a Likert-type scale answer option (SurveyMonkey 2014). The Likert scale was utilized for a majority of the questions in this survey. These questions used a 1 to 7 rating scale, with 7 representing "Strongly agree" and 1 representing "Strongly disagree."

After the survey was initially developed, it was distributed to a small number of current cybersecurity students and cyber security professionals for review. This allowed for comments and suggestions on how to improve the survey and verify that each question made sense in general. Minor adjustments were made to improve overall effectiveness of the survey. The survey was also approved for 'Exemption' status through the Human Subjects Committee (the 'Exemption' status form is attached with this research).

Table 1 below presents the survey questions along with their justification for inclusion. It was important to identify the reasoning for each question because first, it was a goal of the survey not to ask questions to respondents that wasted their time in any way but to instead ask questions of value and to increase the validity of the survey. A second goal for justifying each question was that it helped to discard any confusing or potentially problematic questions or questions that veered away from the research goals.

Table 1: List of Survey Questions & Justification

Question	Justification for Question
1. What is your age?	Demographic use
2. What is your gender?	Demographic use; important to see how each gender answers this question
3. What is your ethnicity?	This could be useful in that a minority may have differing opinions than a non-minority opinion
4. Do you currently work in the private or public sector?	Demographic use
5. In what region of the world do you reside?	Demographic use; are perceptions different around the world?
6. How many years have you worked in the IT/Cybersecurity field?	Provides insight to perceptions of newer employees in the industry versus those who have worked in the industry long-term
7. What is your educational level?	Demographic use
8. How many professional certifications do you currently have and maintain within the cybersecurity profession (such as a CISSP or CISM certification)?	Provides insight to perceptions of newer employees in the industry versus those who have worked in the industry long-term (more certifications likely mean more time spent in the industry)
9. What job title fits you best?	Provides insight into different perceptions/opinions based on job title potentially
10. I think there are too few women in the cybersecurity industry at this time.	Are people AWARE of the deficit? Identifies awareness issues
11. I think women are just as technically savvy as men.	Determines if there is a gender stereotype
12. I have noticed a lack of women in this field.	Are people AWARE of the deficit? Identifies awareness issues
13. I like having women supervisors.	Determines if there is a gender stereotype
14. I think a person has to have "thick skin" to be successful in this industry.	Identifies perception of industry
15. I think that many women still believe they should stay home and take care of their children as opposed to working in the industry.	Determines if there is a gender stereotype
16. I think women are intimidated by the predominately male workforce in cybersecurity.	Determines if there is a gender stereotype
17. I think that many men still believe women should stay home and take care of their children as opposed to working in the industry.	Determines if there is a gender stereotype
18. Women make better supervisors than men.	Determines if there is a gender stereotype or gender-based opinion
19. I think that both men and women are afforded the same opportunities and education for knowledge in cybersecurity.	Determines if there is a gender stereotype or gender-based opinion

20. I think women tend to shy away from more technical fields.	Determines if there is a skill/knowledge gap
21. I have noticed that men are afforded more opportunities and education for knowledge in cybersecurity.	Determines if there is a skill/knowledge gap
22. I do not think that STEM careers are marketed to women as much as they are to men.	Determines if there is a skill/knowledge gap
23. I think that women are simply not as interested in cybersecurity as men are for a variety of reasons.	Determines if there is a gender/personality issue
24. I think that women are more qualified to work in nurturing careers such as education and healthcare than in cybersecurity or IT.	Determines if there is a gender/personality issue
25. In general, women's personalities differ from men's personalities greatly.	Determines if there is a gender/personality issue
26. I enjoy working in an environment with few women.	Determines if there is a preference for fewer women in the field
27. I think that diversity in the workplace is important	Determines respondent's opinion of diversity in general
28. I think that cybersecurity is very competitive in regards to gaining employment in the industry.	Provides insight to industry perceptions
29. I think that women add diversity to work groups and the organization/agency in general.	Determines if there is a gender/personality issue
30. Do you think the responsibilities of motherhood and raising a family hinder the success of women in the field?	Identifies perceptions of women in the workplace
31. If you ever needed to leave the industry for a certain amount of time, when you re-enter, do you think it would be difficult to get back "up to speed" on the latest trends and information in cybersecurity that you missed while absent from the field?	Provides insight into what women need in the industry
32. There needs to be more women in the cybersecurity industry.	Identifies perceptions of women in the workplace
33. I have thought of leaving the cybersecurity industry before.	Identifies perception/opinions of industry
34. I enjoy my job in cybersecurity.	Identifies perception/opinions of industry
35. For women only: If you ever needed to leave the industry for a certain amount of time, would any of these options appeal to you when reentering the workforce? Select all that apply.	Provides insight into what women need in the industry
36. I often think of leaving the cybersecurity industry.	Identifies perception/opinions of industry
37. I have a positive perception of the cybersecurity industry in general.	Identifies perception/opinions of industry
38. I feel valued in the workplace.	Identifies perception/opinions of industry

39. I think that men are subject to more harassment in the industry than women.	Identifies perception/opinions of industry
40. I feel respected in the workplace.	Identifies perception/opinions of industry
41. In regards to motivating young people to consider cybersecurity as a future career, I think that cybersecurity is a difficult industry for young people to understand and comprehend when determining their career goals.	Identifies what current professionals think is necessary to motivate young people to pursue a career in cybersecurity
42. I did not know there was such a thing as a "cybersecurity professional" when I was growing up.	Is education/awareness of cybersecurity profession a problem?
43. I think that cybersecurity is a "cool" profession.	Is education/awareness of cybersecurity profession a problem?
44. Cybersecurity is a hard profession to make "cool" for young students.	Is education/awareness of cybersecurity profession a problem?
45. I think that STEM careers are difficult for young people to understand when determining their career goals.	Is education/awareness of cybersecurity profession a problem?
46. What grade level should STEM funding focus on for encouraging K – 12 students to enter into cybersecurity?	Identifies what current professionals' opinions are in regards to STEM education.
47. I think that STEM education prepares students for a career in cybersecurity.	Is education/awareness of cybersecurity profession a problem?
48. Did you know that presently the entire cybersecurity industry is made up of approximately 89% men and 11% women? (yes/no)	Identifies awareness of the deficit
49. Are you surprised by this statistic in any way? (yes/no)	Identifies awareness of the deficit
50. I would mentor a young person that was interested in a STEM career (and more specifically IT or IT security). (Yes/no)	It was questioned whether or not having mentors for young people would be useful. This question answers whether or not adult mentors would be interested.
51. I would mentor a girl (ages 10-18) that was interested in a STEM career (and more specifically IT or IT security). (yes/no)	It was questioned whether or not having mentors for young people would be useful. This question answers whether or not adult mentors would be interested.
52. I would volunteer to be a panelist or speaker at a recruitment event for young people. (yes/no)	It was questioned whether or not having mentors for young people would be useful. This question answers whether or not adult mentors would be interested.
53. I think that having a industry-specific mentor growing up would have helped me determine my career goals sooner. (yes/no)	Is education/awareness of cybersecurity profession a problem?

54. I think that having more school-sponsored events promoting STEM careers would have helped me determine my career goals sooner. (yes/no)	Is education/awareness of cybersecurity profession a problem?
55. I think that having an internship within a cybersecurity role would have helped me determine and understand my career goals sooner. (Yes/no)	Is education/awareness of cybersecurity profession a problem?
56. Do you have any suggestions for motivating more women into choosing cybersecurity as a long-term career choice and staying in the industry over time?	Open-ended question to allow final input and suggestions/comments

3.3 SURVEY CONSIDERATIONS FOR FUTURE RESEARCH

There are some recommendations to improve similar surveys in the future. First, it is important to provide survey respondents a larger window of time to complete the survey. This survey was available to respondents for approximately three weeks. A survey that is available for a month or longer could yield a higher response rate.

Additionally, this survey was marketed and distributed through only the $(ISC)^2$ social media outlets as opposed to the organization's main website. Although the social media outlets gave the survey a potential 7,000-10,000 approximate views, it is recommended that a survey be accessed through other mediums due to the fact that social media is often used for more personal matters. This perhaps affected the survey response rate because many people may have disinterested in filling out a work-related survey after work hours when checking their social media accounts from home.

CHAPTER 4

FINDINGS AND ANALYSIS

The survey was still open to respondents at the close of this research's deadline. Therefore, the following analysis has been conducted on the small number of surveys that have been completed and returned. At the time this data was analyzed, there were 25 surveys returned. Therefore, this analysis will reflect the responses provided from the 25 respondents and suggestions are made on how to enhance future surveys.

The survey results provided preliminary insights to the industry and reflected an snapshot of the current perceptions and opinions of the cybersecurity industry. The survey respondents range in ages, sectors, job titles, education, and more. Additional details will now be discussed.

4.1 DEMOGRAPHICS

This survey was anonymous and no personally identifiable information was asked. Simple demographic information was requested. A majority of respondents to the survey are 35 to 45 years of age, male, and Caucasian. There is an even distribution of respondents in the private and public sectors. For the purposes of this study, although such information was obtained, no additional analysis is conducted on variation of opinions between Americans and non-Americans at this time. Further research should be

conducted on the perceptions of women in the industry from an international viewpoint. Figure 10 illustrates that the respondents were almost evenly distributed through public and private sectors.

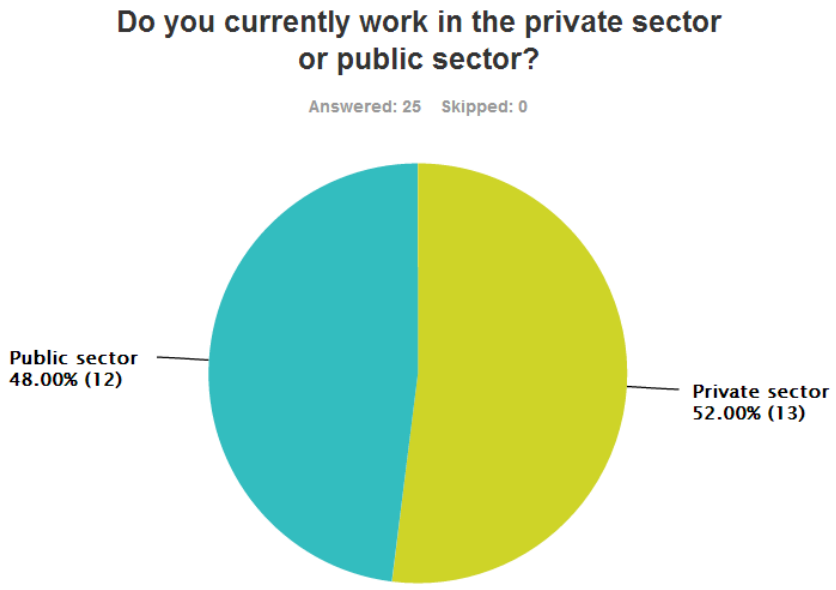

Figure 10: Comparison between private and public sector

Fourteen of the twenty-five respondents have 10 or more years of cybersecurity experience as well as master's degrees. Over 50 percent hold management positions within their respective organizations/agencies. Additionally, 84 percent of respondents were male (see Figure 11). Approximately 80 percent of the respondents were located in the United States.

Four of the twenty-five respondents were women. Seventy-five percent of these women had a master's degree, multiple professional certifications, and are managers in their workplace. This may indicate the level of dedication that women have to the cybersecurity profession.

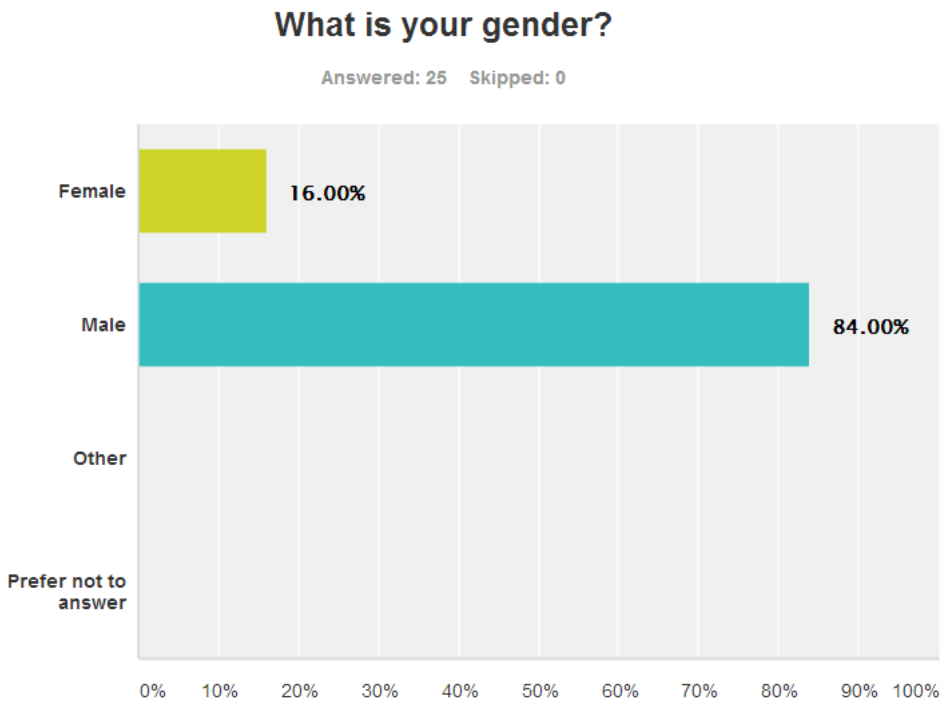

Figure 11: Gender results show that 16 percent respondents were female, which is higher than the statistical number of women in the industry overall

In summary, the respondents were a small representation of cybersecurity professionals in the industry (similar to previous surveys completed by other organizations and researchers) due to their varied backgrounds in regards to education, time spent in the industry, certifications held, etc.

4.2 SURVEY ANALYSIS & DISCUSSION

The goal of the survey was to analyze cybersecurity trends and quantify current viewpoints and opinions from professionals in the industry. The following analysis provides the key findings of the survey. A discussion of the findings is also provided.

4.3 AWARENESS

Respondents were asked if they noticed a lack of women in the field. Eighty-seven percent of those who took the survey reported that they noticed the deficiency. Over 86 percent of respondents also agreed that diversity is important in the workforce and that women add diversity to organizations and work groups overall through their involvement.

These responses are important because they demonstrate that both genders are aware of the deficiency and also value diversity in the workplace. Figure 12 shows that although professionals report that there was a lack of women in cybersecurity, they perhaps did not know *how* few women were in the industry. With cybersecurity being an industry that requires diversity and with very dynamic and ever-changing threats entering the technological world, it appears that the industry is ready for necessary changes and advancements in the workplace diversity.

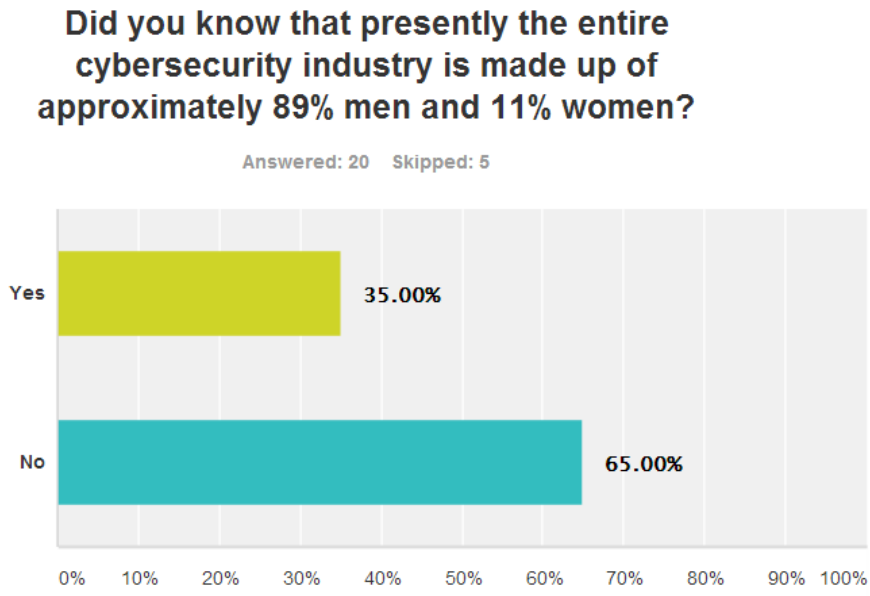

Figure 12: Awareness of women in industry

4.4 STEREOTYPES & STIGMAS

A variety of questions were asked to address whether negative stereotypes were existent in the industry. For example, respondents were asked if they thought that men believe women should stay home rather than be in the workforce. This survey question was partially based on a recent newspaper article about a female pilot who received a note from a passenger post-flight stating that he believed that women should not be pilots but instead be at home raising children (Couts 2014). Over 75 percent of the respondents did not think men held this opinion. Instead the respondents appear to be supportive of women in the industry, with 71 percent of respondents (which were a majority of men) stating that they do not "enjoy working in a field with few women." However, the survey did not ask if men enjoyed working in a field with many men so this could be a useful question to ask in a future survey.

Additionally, respondents were asked whether they thought that women were more qualified to work in more nurturing careers such as healthcare. This question was also asked to determine if stereotypes existed in the field. Eighty-six percent of those who responded disagreed with the statement in varying degrees from "disagree" to "strongly disagree."

A future survey should ask personality-based questions reflective of the Big 5 personality traits which include Extraversion, Agreeableness, Conscientiousness, Neuroticism, and Openness (Cherry 2014). The stereotype is that this industry is full of introverted personality types due to the technical nature of the work (e.g., employees working with computers more often than people), so future survey questions could be directed toward asking questions that deal with personality types.

Seventy-six percent of respondents feel that those entering the field need "thick skin" to be successful in the cybersecurity environment. This could be due to the high levels of stress cybersecurity professionals face with security breaches, etc. Additionally, most IT professionals, including cybersecurity professionals, work lengthy hours, often in front of a computer, which can cause ergonomic problems for many people. The cybersecurity industry is a highly critiqued field in this technology age as well; therefore, a person must be at their peak and their best at all times, even when dealing with stress, long hours, and sometimes less-than-ideal work conditions.

The research findings showed that both male and female respondents (48 percent) have considered leaving the industry at one point during their career. There were also respondents that answered that they do *not* feel respected (15 percent) or valued (21 percent) at work. The responses to this question ranged widely from "strongly agree" to "strongly disagree." This question showed the highest variation in the answers compared to other survey results. This raises the potential question: "Why *aren't* men leaving the industry?"

More research should be conducted to seek out men's opinions of the industry which would partner effectively with the women-focused data. A feeling of "being valued" could be more of a perception than reality; however, this is a research result that should be further investigated by companies because it is apparent that some employees are not happy in their workplace. This could lead to employee turnover or unsatifactory work and results.

An interesting question that came to mind was: if men and women both seem to lack value and respect in the cybersecurity workplace, why does it appear that only

women are hesistant to enter the field? Why are more men not leaving the field? Again, further research should be conducted on the statistics of men entering and leaving the field to gain further insight, but if it was assumed that more men leave the industry than women, why is this? Do women have more job opportunities when choosing to leave a profession? In other words, if a woman does not enjoy her job and her husband also works, is it easier for her to leave the job as opposed to a man who may feel as though he needs to stay in an unsatifactory job in order to support a family whether his wife is or is not working? This could be a useful study to tailor toward the cybersecurity industry as well.

A difficulty encountered when developing this survey was the lack of research published in the field. A number of surveys need to be conducted that identify multiple trends, opinions, perceptions, and more. This survey was over 50 questions and could not capture all items desired; therefore a recommendation would be for more organizations to consider conducting surveys and formal interviews to advance the field in the future.

4.4 WOMEN'S OPINIONS & PERCEPTIONS

A primary goal of this study was to identify how female respondents felt about certain items in the survey. Female respondents reported that they agree that there are a lack of women in cybersecurity and that women are as technically savvy as men. Women also stated that they do not feel as though the old ideals of having to stay home as a wife and take care of a family apply anymore to society from a man's or woman's perspective. They also stated that they do not agree that women necessarily make better supervisors than men. A majority of the women stated that they do not enjoy working in an environment with few women.

Another result is that 100 percent of the women who responded to this survey stated that they have never considered leaving the industry before. This means that those respondents who have considered leaving were men. This is insightful for the research because an initial question was whether the 11 percent statistic of women in the field was due to women not entering the field or women leaving the field. More research is needed with more respondents, but this preliminary result suggests that women enjoy the job enough that they hadn't considered leaving, while some men in the industry have considered leaving cybersecurity.

Additionally, all the women surveyed stated that they enjoyed their job in cybersecurity. The women were asked what type of options they would like to see if they ever needed to leave the industry for a short amount of time and then wanted to return. All the respondents stated that they would like a "refresher program" that would update them on the trends and anything else they may have missed while being absent. Secondary desires included an opportunity to transition back into the company on a part-time basis as well as having a mentor to assist them.

All the women respondents also stated that they feel "valued" in their workplace; however, one respondent reported in a later question that she does not feel "respected" in her job. This is an interesting observation because it requires further analysis to determine the difference between value and respect from a person's perception. A recommendation that will be discussed later in the thesis will address this issue.

4.5 STEM & MOTIVATION FOR YOUNG PEOPLE

A subset of questions asked respondents opinions related to STEM careers and education. A majority of respondents (at least 75 percent in all related questions) agreed

that having industry-specific mentors, internships, and school-sponsored events growing up would have helped them determine their career goals sooner in life. These questions were developed based on research indicating that many young people do now know what cybersecurity is as a profession or are disinterested in choosing such a profession (Verton 2013).

One-hundred percent of the current professionals also reported that they would be interested in being a speaker or panelist at a STEM/cybersecurity event for young people and that they would also in general be willing to act as a mentor for a young person interested in the field. There was some varability as to what age current professionals thought that STEM education should be introduced to young people.

Currently STEM appears to be taught at various ages and grade levels throughout the country. Figure 13 provides insight into respondent's opinons of what grade level STEM funding should be focused and when that funding should focus on cybersecurity education.

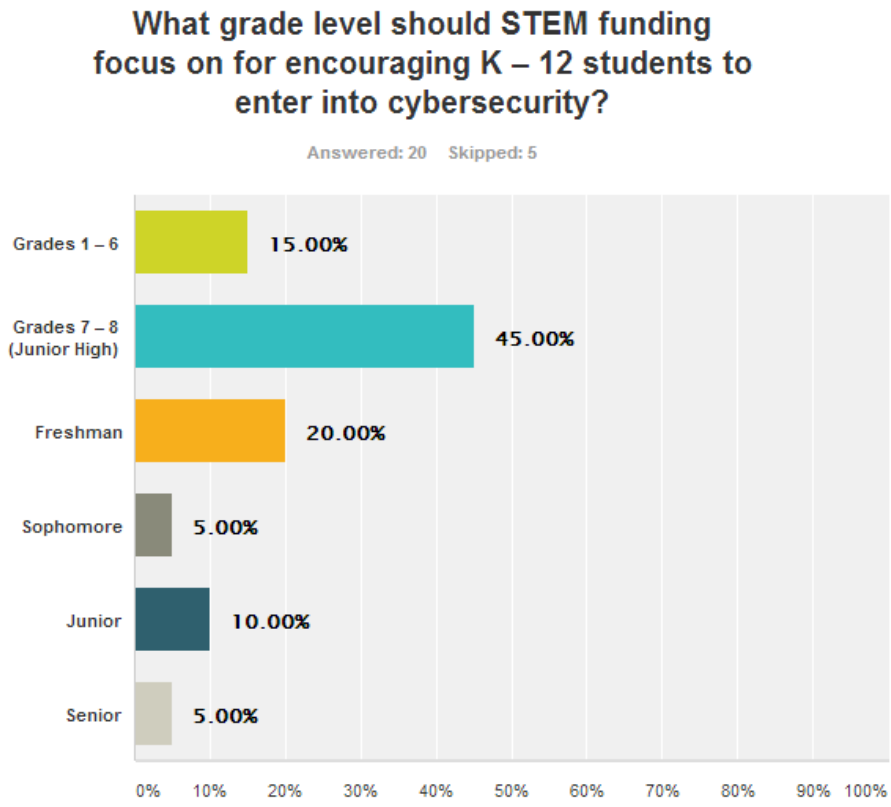

Figure 13: Opinions of where K-12 STEM funding should be focused

4.6 RESPONDENTS' FINAL OPINIONS

A final question allowed for open-ended answers. This question asked for additional comments or suggestions on how to motivate more women to enter the field. Some of the feedback is below as well as in the appendix of this thesis:

> ***Respondent #1 (Male):*** "Treat women as equals to men by providing same training and employment opportunities. Cybersecurity is a relatively young profession. Women now outnumber men in college and that will start to be reflected in this industry as they enter the field and STEM efforts mature and propagate through the system. Additionally, generational attitudes and mores should be taken into consideration and may be reflected as more Millennials enter the field and are followed by the subsequent generations."

Respondent #2 (Male): "I believe that women are groomed at an early age to focus on the "softer" career paths. I believe television and movies have an influence on our perception of career paths more so than a Mentor. The most popular female characters in Computer/Cyber themed films, in my opinion, have been Angelina Jolie (Hackers) and Mary McDonnell (Sneakers). So my best suggestion would be to tell parents to give their girls computers instead of Barbie dolls; find their girls a math class instead of a cooking class; give their girls technical articles & books instead of Cosmo/TMZ/People, etc. The same zest and zeal can be applied to kids (male & female) of Non-European decent."

Respondent #3 (Female): "Add a social aspect to the career field. The young women that I mentor don't want to sit alone looking at a console all day (something that the boys are usually willing to do). Adding some social interaction to the learning experience makes a big difference."

Respondent #4 (Male): "Do your homework and spend time outside of cybersecurity such as in systems administration, network management or application development before jumping into cyber security. The [experiences] you gain in other areas of IT become invaluable when you get into security."

Respondent #5 (Female): "I think it is a sociological issue. Women are impressed with the idea that how they look is what is most important. Until this changes, I think it will continue to be difficult to encourage their involvement in security."

Respondent #6 (Male): "Cybersecurity needs to start in the junior high school curriculum to better get an appreciation of cyber threats for younger people. The threats are going to be different in 5, 10, 15 years..preparation needs to be done now."

4.7 CONCLUDING REMARKS ON ANALYSIS

In conclusion, this survey provided a number of insights regarding current cybersecurity professionals in the industry at this time. Additional results and feedback from the survey can be found in the appendices of this thesis. Moving forward, additional research should be performed by government agencies such as the Bureau of Labor Statistics or by other organizations such as Gallup to determine strengths and weaknesses of the field at this time. Men in the profession appear to be very supportive of having more women in the field so it is a matter of motivating more women to enter the field that will be the hurdle. Negative opinions from men do not appear to be the barrier of entry

for women; it appears that perhaps instead it is due to perceptions and current culture of the industry.

CHAPTER 5

RECOMMENDATIONS & CONCLUSIONS

The survey results provided a number of insightful opinions within the industry at this current time. Additional primary research should be completed so that more knowledge about women's motivation to enter the industry can be gathered. Based upon final discussions with cyber professionals, the initial research completed, and the survey results, final recommendations will be discussed in this chapter. Due to the variation in the answers throughout the survey, a number of recommendations will be offered because one single solution will not solve the problem. However, some people and organizations may only be able to use one recommendation at a time if they have limited resources; therefore a number of viable options will be discussed to provide a variety of opportunities to help the industry move forward.

5.1 MORE STEM, SOONER

Studies currently show that the United States is seeing a decline in STEM curriculum across the country. This is problematic because STEM careers are some of the highest paid careers in the country; therefore, awareness and education in such fields needs to start early. Many of these careers require four years or more in post-secondary education as well. Students need to know about these career options at early ages so that they can begin their education in such fields while in the K-12 system. This will in turn

provide them with: (1) foundational knowledge that can be used in post-secondary education; (2) scholarship opportunities that they can apply for alongside applying to colleges/universities that focus on their STEM career of choice; and (3) allows them to find volunteer opportunities, part-time jobs, and organizations that will let them learn about their career interests earlier than at the college level.

It is unfortunate when the first time a student is made aware of STEM is in college. This often puts them at a disadvantage because they were not spending time in K-12 building a foundation in what they discover they are interested in once they enter college. The results of the research concluded that a majority of respondents deemed it necessary to begin STEM education (and subsequently, cyber security) by junior high level (seventh and eighth grades).

Although some schools may start such education and awareness programs at even younger grade levels, if all schools across the country could ensure there is some STEM teaching taking place by the junior high level, this would allow a number of resources to be created for such grade levels. It is important to recognize that cybersecurity is a diverse field and STEM is not a required focus.

Due to the fact that there are now numerous scholarships available for all ages interested in STEM, it would benefit schools and students to consider supplying information on STEM to students at earlier ages. Additionally, there are many competitions also open to all ages in a number of STEM-tailored activities such as engineering, robotics, math and science competitions. Additional research should be conducted to identify what would interest young people in STEM careers if they are not already interested.

College level students could be asked at what age did they decide their career path. Grade level students could also be asked what their current career path goals are because if many of them do not have a STEM career as a choice, this could be useful knowledge in determing a marketing campaign for STEM.

Awareness programs can be as simple as providing handouts (such as pamphlets or worksheets) to students to get them thinking about the topic of Science or Engineering; they can also be more robust such as school-wide hands-on competitions. Additionally, more STEM-type clubs and organizations could be started in schools so that students who want to learn more outside of the classroom have such opportunities. These clubs could invite business professionals from the community to speak about their experiences, and more hands-on projects could be undertaken.

To reiterate, some schools in the United States are quite successful at teaching STEM to young people early on. There are even some charter schools that focus mainly on STEM careers. However, a number of schools in the country are lacking in such education/awareness. Every child needs to know what STEM is, even if it is simply to help a student determine that they do *not* want to pursue a career that is found within STEM. Providing children with the options and opportunities to learn about everything possible at a young age helps them make better, more informed decisions later in life. Cybersecurity is increasingly becoming a diverse industry in regards to skill sets needed. Therefore, cybersecurity should be marketed through other STEM careers in order to recruit students from other industries who had otherwise never thought of such a career.

Finally, it was discussed that there is a deficit in the number of professionals filling positions with IT Security. Therefore it is critical to start educating young students

now in order to fill this void in upcoming years. Cybersecurity takes time to learn as well, so learning earlier is better. Girls exposed to these STEM topics early in life will be more likely to get hands-on help from teachers and parents which will in turn motivate them to pursue the career and passion past simply their secondary education. Since cybersecurity can be found under the STEM umbrella, it is imperative that students be exposed to STEM. Additionally, due to the fact that cybersecurity is now requiring various skill sets, by teaching a student about STEM, even if they do not specifically learn about cybersecurity in the beginning, a STEM education will prepare them for a number of career possibilities within cybersecurity at a future date.

5.2 ADDITIONAL RESOURCES & NETWORKING OPPORTUNITIES

To accompany the aforementioned STEM awareness and education that should be implemented into schools at all grade levels (and beginning sooner than some schools may currently do), it is imperative for girls to know that they are fostered and supported to pursue such a career path. Much of the preliminary research reflected the importance of having a mentor. The Merriam-Webster dictionary defines 'mentor' as "someone who teaches or give help and advice to a less experienced and often younger person" (Merriam-Webster Dictionary 2014). The literature suggests that for a mentor to be effective, ideally the mentor should have similar traits to the person being mentored (e.g., same gender, same career goals, same ethnicity, and same background).

A complication with this suggestion is that sometimes it could be extremely difficult find a match by having so many requirements. At younger ages, girls may need such a mentor however because it allows them to essentially see a reflection of themselves and realize their potential because a person of similar background with

similar interests was successful. Such a mentor creates an "I can do it too" mentality for a young person. As women get older, the need for a "same as me" mentor dissipates because they are starting to reach goals and become successful on their own.

Often, mentors can be found through organizations such as Girl Scouts and other similar female empowerment organizations so this could also be part of the STEM awareness program implemented in schools. By matching young, interested girls with caring, wise mentors, young girls can gain immense amounts of motivation to pursue cybersecurity. Mentoring can be extremely successful in terms of industry recruitment as well. Organizations should consider adding official mentoring programs to their business so that the employees can gain additional skills and young people can gain a friend in the professional world (Ensign 2014).

Also, seminars are extremely important for young people. Seminars (whether local, national, or international) provide young people with increased knowledge about the world in which they live, a better appreciation and understanding of topics taught at the seminar, and finally resources and networking opportunities. As an example, Ted.com is an excellent seminar opportunity available to any Internet subscriber.

Additionally, more scholarships are needed across all school districts. There are several organizations dedicated to raising funds in order to issue scholarships to young women interested in pursuing computer science as a collegiate major and future career. More organizations need to set up such funds for cybersecurity scholarships. This will promote education in the field and will also potentially create recruitment opportunities for companies looking to groom future employees.

Figure 14: Cell phone application mock-up design

Lastly, a useful resource that a number of organizations and agencies utilize is social media and phone applications. Social media websites such as Twitter, Facebook, LinkedIn, Instagram, and more can provide a easy-to-use interface that many young people can enjoy and utilize to get a variety of information. Just as Jefferson Middle School created a cell phone application (app) to interest girls in STEM, an app can be made specifically for girls interested in cybersecurity. Figure 14 above is a simple mock-up interface of a phone application that the thesis researcher designed. This app could be downloaded on a smart phone (or a tablet) and used to learn more about cybersecurity as

a career and used for testing resources (e.g., they could have quiz questions that help prepare them for the CompTIA Security+ exam).

Additionally, icons such as 'Trivia & Games' could be simple cybersecurity knowledge that can inform girls about cybersecurity safety as well as advanced questions that will help them gauge their interest in the field. The 'More' feature can include items such as: STEM information and resources for other STEM careers, scholarships currently open for students, 'Find a Mentor' to seek out successful professional women in their area who are interested in being mentors, events and conferences tailored toward cybersecurity, and lastly colleges and Scholarship for Service programs around the country that emphasize cybersecurity in their curriculum.

5.3 MORE RESEARCH

A review of the literature clearly indicates that research is lacking in the area of cybersecurity at this time. This is largely because cybersecurity is considered a newer and younger industry as it begins to move away from general Information Technology. Therefore, much of the information found at this time dealt mainly with IT combined with cybersecurity. Over time, additional effort in primary research dealing solely with the cybersecurity industry is needed. Research needs to begin now however. There is great value in research that extends over time because it helps illustrate trends. Therefore, some research needs to start now so that those wanting valuable cyber-related research in ten years will have that information available.

This in turn will immensely aid the industry as a whole because tailored research will assist in finding specific deficits the industry currently faces and obstacles the industry needs to overcome. However, it is not to say that current IT statistics and

research is not useful in conjunction with new and ongoing cybersecurity research. Because many graduates working in cybersecurity first received their degrees in computer science or IT, such research is critically important as well. Separate research in IT Security however will bring more cybersecurity-related issues solely dealing with the cybersecurity industry to light.

5.4 MAKING CYBERSECURITY "FUN" FOR ALL

A majority of millennials and younger generations seem disinterested in the thought of pursuing many STEM careers, especially cybersecurity. Therefore, it is critical that a new "marketing" campaign be considered. Therefore, it seems as though marketing cybersecurity as an all-inclusive career path could inspire young people to understand that even though they want to study medicine, there is a need for cybersecurity professionals within the medical profession so they could essentially do both.

Awareness is a component of the solution. Educating college recruiters and high school counselors is an extremely useful way to introduce the career to students because by educating the recruiters and counselors, they can then pass the information along to the students they assist and recruit. Simple pamphlets could be crafted and sent to schools so that computer science programs (and all other programs within an university) could understand what the profession is and perhaps suggest to certain students that this could be a great career for them.

Additionally, hands-on events are important. Young students can sometimes be overwhelmed with technology. Some technology use is by force, such as online classes and laptop requirements in some high schools now, and other technology use is by choice, such as texting or using social media all throughout the day. Therefore, it is

imperative that hands-on activities or events be created to show students another side of technology. Cybersecurity can be more than simply sitting in front of a computer screen all day; it can include presentations, research, building things, and more. By having hands-on activities for young people, this gets them away from a screen and their hands on more tangible items which in turn could spark creativity and interest in pursuing such a career.

5.5 CHANGE WILL COME

Some respondents of the survey noted that cybersecurity is still quite a young career path in comparison to many other fields such as medicine, engineering, etc. Therefore, the low numbers in the profession means that it is still new and that people are still trying to understand what the career involves. However, to speed up this process of gathering interest and motivating people to join the industry, awareness and education needs to be introduced soon. Colleges, companies, schools, and other organizations are capable of creating awareness documents to help seek out students and professionals.

Additionally, it was discussed through the survey and informal discussions that more women will enter the field soon enough. This could be true; however with the number of jobs needing fulfillment, it is important to motivate girls sooner and perhaps even more so than boys. Men do not seem to need as much motivation to enter the career as women do so it is imperative to pinpoint more areas of concern that women have to enter the career. An additional survey could be sent to non-cybersecurity professionals (especially women) to identify why they did not consider cybersecurity as a career. This could help explain what aspects of cybersecurity are missing for women to be more interested in it.

5.6 CULTURE MAKEOVER

The survey showed that the current culture of cybersecurity has some negative perceptions felt by men *and* women in the profession. If one examines the cybersecurity profession, it can be seen that it is a highly confidential industry in many ways that includes stressful situations, long hours, quick decisions, and sometimes backlash and excessive criticism from decisions and situations, whether they were good or bad.

It can be seen how a person could quickly become "burned out" from such a job. Additionally they could go from an actively engaged employee to a non-engaged employee or even an actively disengaged employee. This means that the criticism of the job can quickly transition its negative energy to the stressed employee, thus the employee will then become incredibly cynical and negative themselves.

Although a component of the research was to identify how to motivate young people (especially women) to join the career field, additional care must be taken to find ways to motivate current cybersecurity professionals to stay in the profession. If current professionals are not happy in their workplace, they will potentially drive away new hires as well as create more negative energy for themselves. The Mayo Clinic reports that a more positive outlook on life can decrease stress and depression greatly (Staff 2014). In the long-term outlook, this could save organizations money with decreased health insurance costs for employees and lower employee turnover rates.

Perhaps improving the culture starts with the Human Resources department. It is imperative for HR professionals to ensure that there is a good job fit and organization fit with each employee they hire. Although there are numerous positions going unfilled in cybersecurity at this time, many of the jobs openings are still quite competitive.

Therefore, the HR professionals and hiring managers need to take time to make the best decision they can to hire the best person they can. Sometimes simply having the necessary skills to do the job is not enough.

A positive, teamwork-oriented attitude can also go a long way and should not be overlooked in the hiring process. With cybersecurity being such a stressful industry at times, applicants with positive attitudes, creative personalities, critical thinking skills, and abilities to overcome negative situations can become key players in the success of organizations. It is easier to hire people with those kinds of attitudes as opposed to figuring out how to train a negative employee with a self-defeating personality later.

In terms of culture, organizations should consider flexible schedules and better work-life balance. Research and the survey results identified that women need options in the industry. This could include allowing part-time work for a short term or making tele-working available on occasion (Smith 2013). Some organizations have in-house child daycare services available. If women have such resources, it may help them feel as though they can still compete in the industry without having to sacrifice their family relationships in any way.

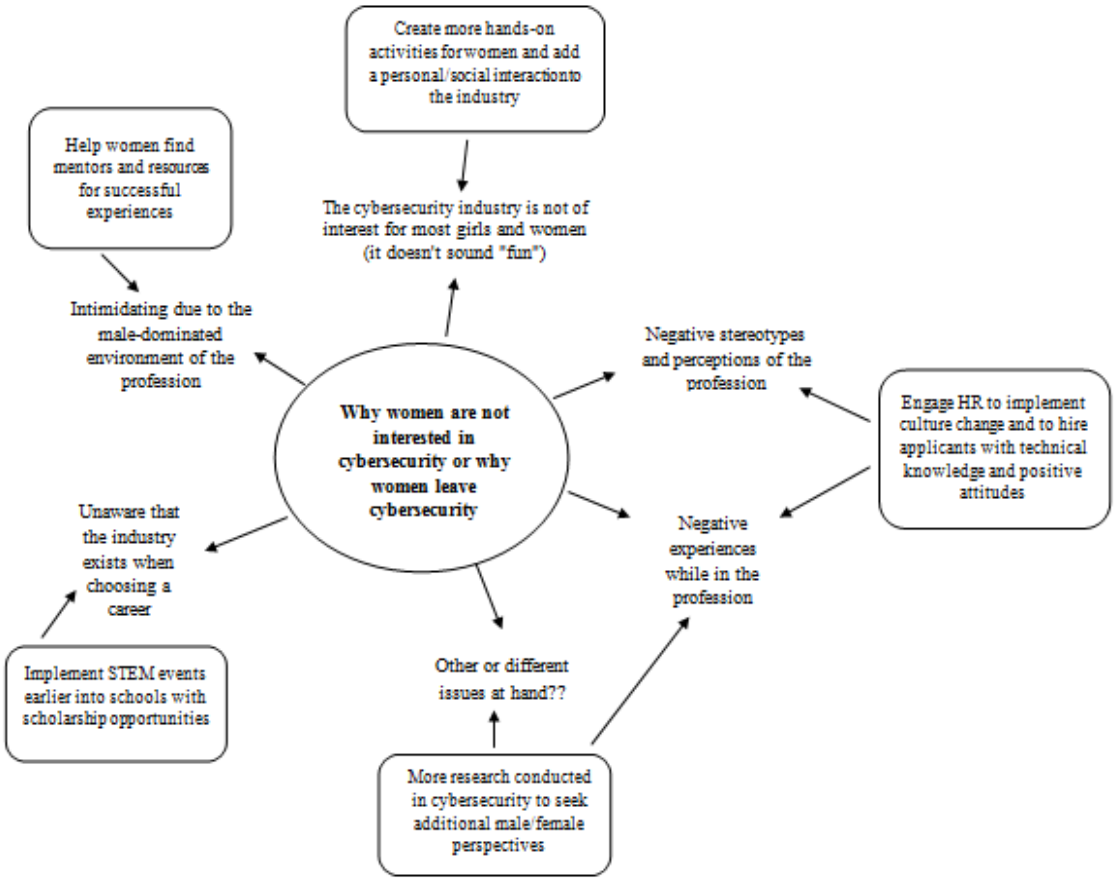

Figure 15: Why women are not interested in cybersecurity-Stage 3

5.7 FINAL THOUGHTS

Figure 15 categorizes and displays the relationships of the research completed and the key areas of focus. The industry of cybersecurity is an ever-growing career that is financially rewarding and challenging for those who choose to enter it. The career requires extensive education and training but can be very rewarding over time. It is still a young industry and began as a predominately male-dominated career. Over time, the number of women entering into the field will increase. However, to start this increase, it is vital for a few things within the industry to change.

For example, because of the stressful environment of the industry, it is essential for there to be a culture shift for increased work satisfaction. The Human Resource department within an organization should initiate such a project and idea to be successful.

For young women, more awareness and education programs need to be established in schools and communities. Many young girls are still mainly exposed to more traditional female careers so increased diversity within education needs to take place so that girls know about all their options before making a final post-graduation career choice. This will in turn stimulate the economy and will add gender diversity to organizations and work groups within the organizations for more successful project completions.

In order to fill the opened jobs in cybersecurity, it is incredibly important for more men and women to enter the workforce. The job outlook for cybersecurity is incredibly bright for all those interested.

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APPENDIX

WOMEN IN CYBERSECURITY SURVEY TEMPLATE

Welcome!

Hello and thank you for taking this survey. We greatly appreciate your dedication to the field of cybersecurity. This survey is being conducted to quantitatively research the opinions of professionals in the cybersecurity/IT industry to understand current trends in the field (including gender diversity) and information systems risk management (ISRM). Any information that you provide will be used only for research purposes. This survey will take approximately 20-30 minutes of your time to complete and you may skip any questions you do not wish to answer.

The following survey is a completely anonymous and online survey, hosted by Survey Monkey. You will NOT be asked for your name, phone number, email address, or any other identifiable information. Participation in this survey is entirely voluntary. By participating, your feedback will assist researchers in their studies which will carry forward to the industry and continue improving the industry for everyone. Thank you for your feedback and assistance.

1. What is your age?

- ◯ 18 to 24
- ◯ 25 to 34
- ◯ 35 to 44
- ◯ 45 to 54
- ◯ 55 to 64
- ◯ 65 to 74
- ◯ 75 or older

2. What is your gender?

- ◯ Female
- ◯ Male
- ◯ Other
- ◯ Prefer not to answer

3. What is your ethnicity? (Please select all that apply.)

- ☐ American Indian or Alaskan Native
- ☐ Asian or Pacific Islander
- ☐ Black or African American
- ☐ Hispanic or Latino
- ☐ White / Caucasian
- ☐ Prefer not to answer

4. Do you currently work in the private sector or public sector?

- ◯ Private sector
- ◯ Public sector

5. In what region of the world do you currently reside?

- ◯ North America (United States)
- ◯ North America (but not the United States)
- ◯ Asia
- ◯ Africa
- ◯ Antarctica
- ◯ Europe
- ◯ South America
- ◯ Australia

6. How many years have you worked in the IT Security/Cybersecurity field?

- ◯ 1-5 years
- ◯ 6-10 years
- ◯ 11-15 years
- ◯ 16-20 years
- ◯ 21-25 years
- ◯ 26-30 years
- ◯ 31-35 years
- ◯ 36+ years

7. What is the highest level of education you have completed?

8. How many professional certifications do you currently have and maintain within the cybersecurity profession (such as a CISSP or CISM certification)?

- ◯ None
- ◯ 1
- ◯ 2-4
- ◯ 5+

9. What job title best fits what you do?

- ◯ Chief security officer
- ◯ Chief technology officer
- ◯ Chief information officer
- ◯ Security manager
- ◯ Systems engineer
- ◯ Systems integrator
- ◯ Chief risk officer
- ◯ Systems and network administrator
- ◯ Student
- ◯ Professor/Instructor

Other (please specify):

The following questions are being asked to gauge your opinion to diversity in the workplace and risk management. Please answer the following questions based on your own opinion of each statement.

10. I think that there are too few women in the cybersecurity industry at this time.

Strongly disagree	Disagree	Somewhat disagree	Undecided/Neutral	Somewhat agree	Agree	Strongly agree
◯	◯	◯	◯	◯	◯	◯

11. I think that women are as technically savvy as men.

Strongly disagree	Disagree	Somewhat disagree	Undecided/Neutral	Somewhat agree	Agree	Strongly agree
◯	◯	◯	◯	◯	◯	◯

12. I have noticed a lack of women in this field.

◯ Yes

◯ No

13. I like having women supervisors.

Strongly disagree	Disagree	Somewhat disagree	Undecided/Neutral	Somewhat agree	Agree	Strongly agree
◯	◯	◯	◯	◯	◯	◯

14. I think a person has to have "thick skin" to be successful in this industry.

Strongly disagree	Disagree	Somewhat disagree	Undecided/Neutral	Somewhat agree	Agree	Strongly agree
◯	◯	◯	◯	◯	◯	◯

15. I think that many women still believe they should stay home and take care of their children as opposed to working in the industry.

Strongly disagree	Disagree	Somewhat disagree	Undecided/Neutral	Somewhat agree	Agree	Strongly agree
◯	◯	◯	◯	◯	◯	◯

16. I think women are intimidated by the predominately male workforce in cybersecurity.

Strongly disagree	Disagree	Somewhat disagree	Undecided/Neutral	Somewhat agree	Agree	Strongly agree
◯	◯	◯	◯	◯	◯	◯

17. I think many men still believe that women should stay home and take care of their children as opposed to working outside of the home.

Strongly disagree	Disagree	Somewhat disagree	Undecided/Neutral	Somewhat agree	Agree	Strongly agree
◯	◯	◯	◯	◯	◯	◯

18. Women make better supervisors than men.

Strongly disagree	Disagree	Somewhat disagree	Undecided/Neutral	Somewhat agree	Agree	Strongly agree
◯	◯	◯	◯	◯	◯	◯

19. I think that both men and women are afforded the same opportunities and education for knowledge in cybersecurity.

Strongly disagree	Disagree	Somewhat disagree	Undecided/Neutral	Somewhat agree	Agree	Strongly agree
◯	◯	◯	◯	◯	◯	◯

20. I think women tend to shy away from more technical fields.

Strongly disagree	Disagree	Somewhat disagree	Undecided/Neutral	Somewhat agree	Agree	Strongly agree
◯	◯	◯	◯	◯	◯	◯

21. I have noticed that men are afforded more opportunities in the cyber industry than women.

Strongly disagree	Disagree	Somewhat disagree	Undecided/Neutral	Somewhat agree	Agree	Strongly agree
◯	◯	◯	◯	◯	◯	◯

22. I do not think that STEM careers are marketed to women as much as they are to men.

Strongly disagree	Disagree	Somewhat disagree	Undecided/Neutral	Somewhat agree	Agree	Strongly agree
◯	◯	◯	◯	◯	◯	◯

23. I think that women are simply not as interested in cybersecurity as men are for any variety of reasons.

Strongly disagree	Disagree	Somewhat disagree	Undecided/Neutral	Somewhat agree	Agree	Strongly agree
◯	◯	◯	◯	◯	◯	◯

24. I think that women are more qualified to work in nurturing careers such as education and healthcare than in cybersecurity or IT.

Strongly disagree	Disagree	Somewhat disagree	Undecided/Neutral	Somewhat agree	Agree	Strongly agree
◯	◯	◯	◯	◯	◯	◯

25. In general, women's personalities differ from men's personalities greatly.

Strongly disagree	Disagree	Somewhat disagree	Undecided/Neutral	Somewhat agree	Agree	Strongly agree
◯	◯	◯	◯	◯	◯	◯

26. I enjoy working in an environment with few women.

Strongly disagree	Disagree	Somewhat disagree	Undecided/Neutral	Somewhat agree	Agree	Strongly agree
◯	◯	◯	◯	◯	◯	◯

22. I do not think that STEM careers are marketed to women as much as they are to men.

Strongly disagree	Disagree	Somewhat disagree	Undecided/Neutral	Somewhat agree	Agree	Strongly agree
◯	◯	◯	◯	◯	◯	◯

23. I think that women are simply not as interested in cybersecurity as men are for any variety of reasons.

Strongly disagree	Disagree	Somewhat disagree	Undecided/Neutral	Somewhat agree	Agree	Strongly agree
◯	◯	◯	◯	◯	◯	◯

24. I think that women are more qualified to work in nurturing careers such as education and healthcare than in cybersecurity or IT.

Strongly disagree	Disagree	Somewhat disagree	Undecided/Neutral	Somewhat agree	Agree	Strongly agree
◯	◯	◯	◯	◯	◯	◯

25. In general, women's personalities differ from men's personalities greatly.

Strongly disagree	Disagree	Somewhat disagree	Undecided/Neutral	Somewhat agree	Agree	Strongly agree
◯	◯	◯	◯	◯	◯	◯

26. I enjoy working in an environment with few women.

Strongly disagree	Disagree	Somewhat disagree	Undecided/Neutral	Somewhat agree	Agree	Strongly agree
◯	◯	◯	◯	◯	◯	◯

27. I think that diversity in the workplace is important.

Strongly disagree	Disagree	Somewhat disagree	Undecided/Neutral	Somewhat agree	Agree	Strongly agree
◯	◯	◯	◯	◯	◯	◯

28. I think that cybersecurity is very competitive in regards to gaining employment in the industry.

Strongly disagree	Disagree	Somewhat disagree	Undecided/Neutral	Somewhat agree	Agree	Strongly agree
◯	◯	◯	◯	◯	◯	◯

29. I think that women add diversity to work groups and the organization/agency in general.

Strongly disagree	Disagree	Somewhat disagree	Undecided/Neutral	Somewhat agree	Agree	Strongly agree
◯	◯	◯	◯	◯	◯	◯

30. Do you think the responsibilities of motherhood and raising a family hinder the success of women in the field?

- ◯ Yes
- ◯ No
- ◯ Not sure/I don't know
- ◯ Prefer not to answer

31. If you ever needed to leave the industry for a certain amount of time, when you re-enter, do you think it would be difficult to get back "up to speed" on the latest trends and information in cybersecurity that you missed while absent from the field?

- ◯ I have been in this situation, and it was difficult.
- ◯ I have been in this situation, and it was not difficult.
- ◯ I have never been in this situation, but I think it would be difficult.
- ◯ I have never been in this situation, but I think it would not be difficult.
- ◯ Prefer not to answer.

32. There needs to be more women in the cybersecurity industry.

Strongly disagree	Disagree	Somewhat disagree	Undecided/Neutral	Somewhat agree	Agree	Strongly agree
◯	◯	◯	◯	◯	◯	◯

33. I have thought of leaving the cybersecurity industry before.

Strongly disagree	Disagree	Somewhat disagree	Undecided/Neutral	Somewhat agree	Agree	Strongly agree
◯	◯	◯	◯	◯	◯	◯

34. I enjoy my job in cybersecurity.

Strongly disagree	Disagree	Somewhat disagree	Undecided/Neutral	Somewhat agree	Agree	Strongly agree	N/A
◯	◯	◯	◯	◯	◯	◯	◯

35. For women only: If you ever needed to leave the industry for a certain amount of time, would any of these options appeal to you when reentering the workforce? Select all that apply.

- ☐ The opportunity to continue working on a part-time basis
- ☐ A refresher program to update you on the latest trends and information you may have missed during your absence
- ☐ If there were an organizational/agency mentor or role model
- ☐ This question does not apply to me

Other (please specify):

36. I often think of leaving the cybersecurity industry.

Strongly disagree	Disagree	Somewhat disagree	Undecided/Neutral	Somewhat agree	Agree	Strongly agree
◯	◯	◯	◯	◯	◯	◯

37. I have a positive perception of the cybsersecurity industry in general.

Strongly disagree	Disagree	Somewhat disagree	Undecided/Neutral	Somewhat agree	Agree	Strongly agree
◯	◯	◯	◯	◯	◯	◯

38. I feel valued in my workplace.

Strongly disagree	Disagree	Somewhat disagree	Undecided/Neutral	Somewhat agree	Agree	Strongly agree
◯	◯	◯	◯	◯	◯	◯

39. I think that men are subject to more harassment in the industry than women.

Strongly disagree	Disagree	Somewhat disagree	Undecided/Neutral	Somewhat agree	Agree	Strongly agree
◯	◯	◯	◯	◯	◯	◯

40. I feel respected in my workplace.

Strongly disagree	Disagree	Somewhat disagree	Undecided/Neutral	Somewhat agree	Agree	Strongly agree
◯	◯	◯	◯	◯	◯	◯

41. In regards to motivating young people to consider cybersecurity as a future career, I think that cybersecurity is a difficult industry for young people to understand and comprehend when determining their career goals.

Strongly disagree	Disagree	Somewhat disagree	Undecided/Neutral	Somewhat agree	Agree	Strongly agree
◯	◯	◯	◯	◯	◯	◯

38. I feel valued in my workplace.

Strongly disagree	Disagree	Somewhat disagree	Undecided/Neutral	Somewhat agree	Agree	Strongly agree
◯	◯	◯	◯	◯	◯	◯

39. I think that men are subject to more harassment in the industry than women.

Strongly disagree	Disagree	Somewhat disagree	Undecided/Neutral	Somewhat agree	Agree	Strongly agree
◯	◯	◯	◯	◯	◯	◯

40. I feel respected in my workplace.

Strongly disagree	Disagree	Somewhat disagree	Undecided/Neutral	Somewhat agree	Agree	Strongly agree
◯	◯	◯	◯	◯	◯	◯

41. In regards to motivating young people to consider cybersecurity as a future career, I think that cybersecurity is a difficult industry for young people to understand and comprehend when determining their career goals.

Strongly disagree	Disagree	Somewhat disagree	Undecided/Neutral	Somewhat agree	Agree	Strongly agree
◯	◯	◯	◯	◯	◯	◯

42. I did not know there was such a thing as a "cybersecurity professional" when I was growing up.

Strongly disagree	Disagree	Somewhat disagree	Undecided/Neutral	Somewhat agree	Agree	Strongly agree
◯	◯	◯	◯	◯	◯	◯

43. I think that cybersecurity is considered a "cool" profession.

Strongly disagree	Disagree	Somewhat disagree	Undecided/Neutral	Somewhat agree	Agree	Strongly agree
◯	◯	◯	◯	◯	◯	◯

44. Cybersecurity is a hard profession to make "cool" for young students.

Strongly disagree	Disagree	Somewhat disagree	Undecided/Neutral	Somewhat agree	Agree	Strongly agree
◯	◯	◯	◯	◯	◯	◯

45. I think that STEM careers are difficult for young people to understand when determining their career goals at a young age.

Strongly disagree	Disagree	Somewhat disagree	Undecided/Neutral	Somewhat agree	Agree	Strongly agree
◯	◯	◯	◯	◯	◯	◯

46. What grade level should STEM funding focus on for encouraging K – 12 students to enter into cybersecurity?

- ◯ Grades 1 – 6
- ◯ Grades 7 – 8 (Junior High)
- ◯ Freshman
- ◯ Sophomore
- ◯ Junior
- ◯ Senior

47. I think that STEM education prepares students for a career in cybersecurity.

Strongly disagree	Disagree	Somewhat disagree	Undecided/Neutral	Somewhat agree	Agree	Strongly agree
◯	◯	◯	◯	◯	◯	◯

48. Did you know that presently the entire cybersecurity industry is made up of approximately 89% men and 11% women?

- ◯ Yes
- ◯ No

49. Are you surprised by this statistic in any way?

- ◯ Yes
- ◯ No

50. I would mentor a young person who is interested in a STEM career (and more specifically IT or IT security).

- ◯ Yes
- ◯ No

51. I would mentor a girl (ages 10-18) who is interested in a STEM career (and more specifically IT or IT security).

- ◯ Yes
- ◯ No

52. I would volunteer to be a panelist or speaker at a cybersecurity recruitment event for young people.

- ◯ Yes
- ◯ No

53. I think that having a industry-specific mentor growing up would have helped me determine my career goals sooner.

- ◯ Yes
- ◯ No

54. I think that having more school-sponsored events promoting STEM careers would have helped me determine my career goals sooner.

- ◯ Yes
- ◯ No

55. I think that having an internship within a cybersecurity role during my education would have helped me determine and understand my career goals sooner.

- ◯ Yes
- ◯ No

56. Do you have any suggestions for motivating more women into choosing cybersecurity as a long-term career choice and staying in the industry over time?

Thank you again for your participation of this survey. The following information discusses the purpose and background information of this survey.

One purpose of this study is to examine the methods in which information security professionals determine the likelihood of cyber-threats upon their organizations.

The other purpose aims to identify why current professionals in this industry think women are not seemingly interested in the IT Security field, why they are potentially leaving the industry, and what could be done to motivate young people (especially young women) to consider the IT Security field.

If you have any questions in regards to this survey, please contact the scholarly researchers:

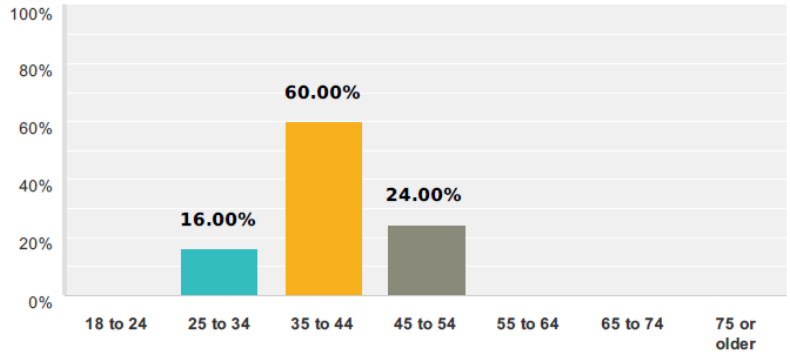
Princess Young: younprin@niatec.isu.edu
Jeremy Brown: browjere@niatec.isu.edu

WOMEN IN CYBERSEUCRITY PILOT SURVEY RESULTS 2014

Diversity in the Cybersecurity Industry and Risk Assessment-Survey 2014

Q1 What is your age?

Answered: 25 Skipped: 0

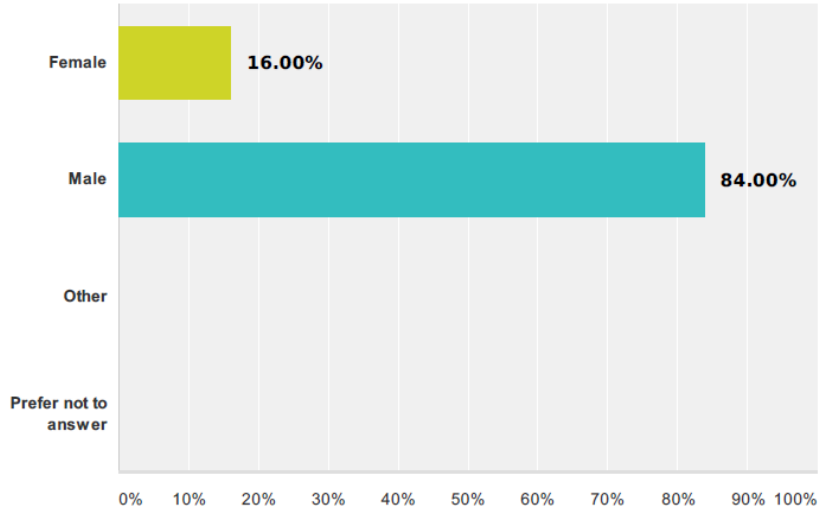


Answer Choices	Responses	
18 to 24	0.00%	0
25 to 34	16.00%	4
35 to 44	60.00%	15
45 to 54	24.00%	6
55 to 64	0.00%	0
65 to 74	0.00%	0
75 or older	0.00%	0
Total		25

Diversity in the Cybersecurity Industry and Risk Assessment-Survey 2014

Q2 What is your gender?

Answered: 25 Skipped: 0

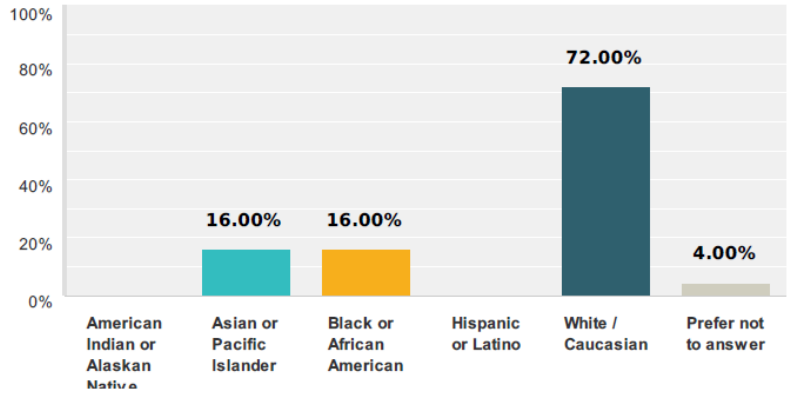


Answer Choices	Responses	
Female	16.00%	4
Male	84.00%	21
Other	0.00%	0
Prefer not to answer	0.00%	0
Total		25

Diversity in the Cybersecurity Industry and Risk Assessment-Survey 2014

Q3 What is your ethnicity? (Please select all that apply.)

Answered: 25 Skipped: 0

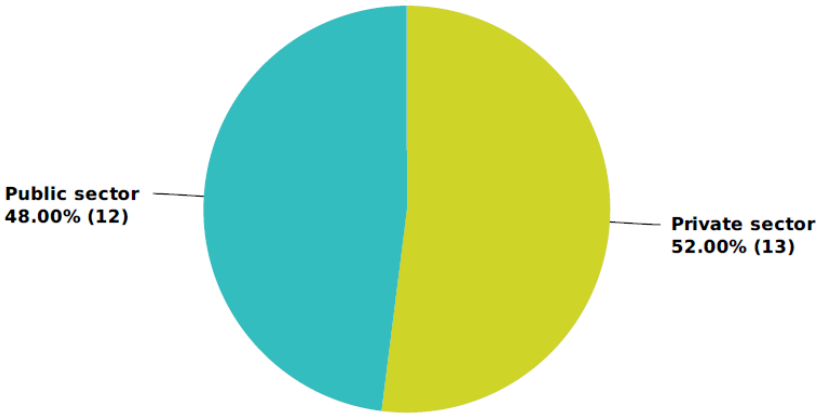


Answer Choices	Responses	
American Indian or Alaskan Native	0.00%	0
Asian or Pacific Islander	16.00%	4
Black or African American	16.00%	4
Hispanic or Latino	0.00%	0
White / Caucasian	72.00%	18
Prefer not to answer	4.00%	1
Total Respondents: 25		

Diversity in the Cybersecurity Industry and Risk Assessment-Survey 2014

Q4 Do you currently work in the private sector or public sector?

Answered: 25 Skipped: 0

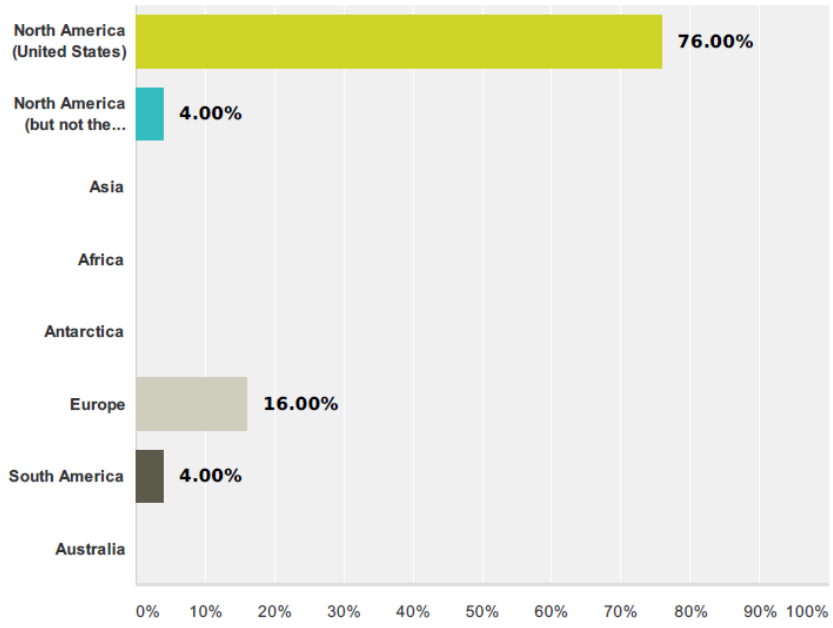


Answer Choices	Responses	
Private sector	52.00%	13
Public sector	48.00%	12
Total		25

Diversity in the Cybersecurity Industry and Risk Assessment-Survey 2014

Q5 In what region of the world do you currently reside?

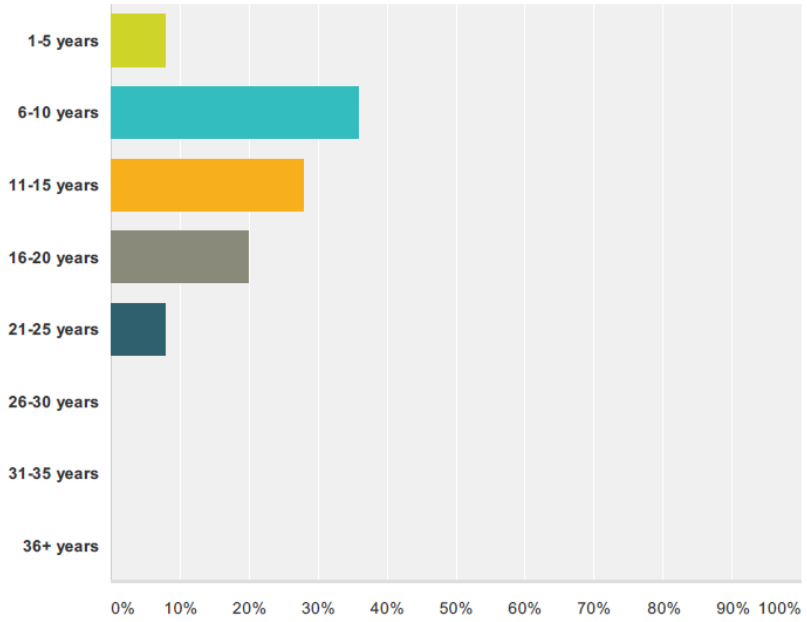
Answered: 25 Skipped: 0



Answer Choices	Responses	
North America (United States)	76.00%	19
North America (but not the United States)	4.00%	1
Asia	0.00%	0
Africa	0.00%	0
Antarctica	0.00%	0
Europe	16.00%	4
South America	4.00%	1
Australia	0.00%	0
Total		25

Q6 How many years have you worked in the IT Security/Cybersecurity field?

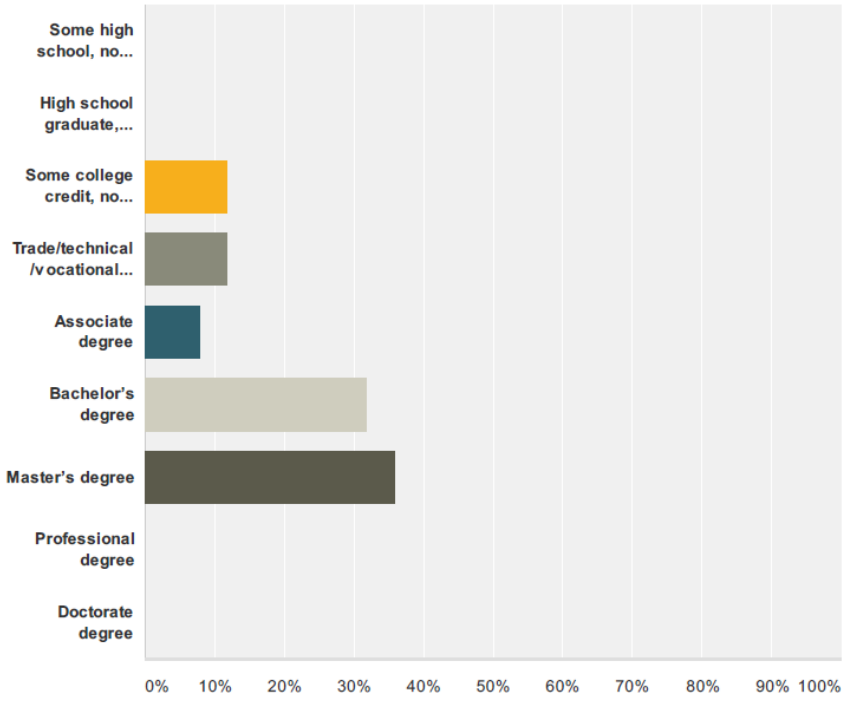
Answered: 25 Skipped: 0



Answer Choices	Responses	
1-5 years	8.00%	2
6-10 years	36.00%	9
11-15 years	28.00%	7
16-20 years	20.00%	5
21-25 years	8.00%	2
26-30 years	0.00%	0
31-35 years	0.00%	0
36+ years	0.00%	0
Total		25

Q7 What is the highest level of education you have completed?

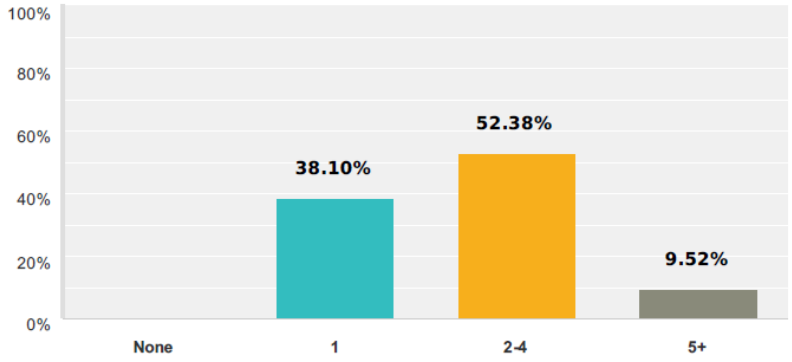
Answered: 25 Skipped: 0



Answer Choices	Responses	
Some high school, no diploma	0.00%	0
High school graduate, diploma or the equivalent (for example: GED)	0.00%	0
Some college credit, no degree	12.00%	3
Trade/technical/vocational training	12.00%	3
Associate degree	8.00%	2
Bachelor's degree	32.00%	8
Master's degree	36.00%	9
Professional degree	0.00%	0
Doctorate degree	0.00%	0
Total		25

Q10 How many professional certifications do you currently have and maintain within the cybersecurity profession (such as a CISSP or CISM certification)?

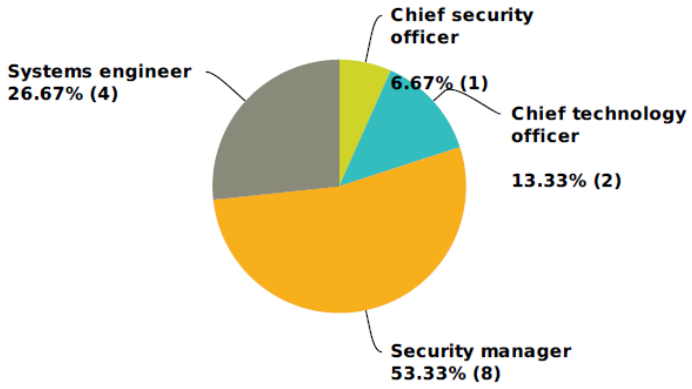
Answered: 21 Skipped: 4



Answer Choices	Responses	
None	0.00%	0
1	38.10%	8
2-4	52.38%	11
5+	9.52%	2
Total		21

Q11 What job title best fits what you do?

Answered: 15 Skipped: 10



Answer Choices	Responses	
Chief security officer	6.67%	1
Chief technology officer	13.33%	2
Chief information officer	0.00%	0
Security manager	53.33%	8
Systems engineer	26.67%	4
Systems integrator	0.00%	0
Chief risk officer	0.00%	0
Systems and network administrator	0.00%	0
Student	0.00%	0
Professor/Instructor	0.00%	0
Total		15

#	Other (please specify):	Date
1	Lead information security analyst	4/17/2014 4:29 PM
2	Security Architect/Solutions Architect	4/17/2014 3:53 PM
3	Director, Security Operations	4/17/2014 1:59 PM
4	Information Security Officer	4/14/2014 12:50 PM
5	Systems Analyst, Information Security	4/14/2014 7:10 AM
6	Security Architect	4/14/2014 7:02 AM

Q12 I think that there are too few women in the cybersecurity industry at this time.

Answered: 21 Skipped: 4

	Strongly disagree	Disagree	Somewhat disagree	Undecided/Neutral	Somewhat agree	Agree	Strongly agree	Total	Average Rating
(no label)	0.00% 0	4.76% 1	4.76% 1	19.05% 4	33.33% 7	28.57% 6	9.52% 2	21	5.05

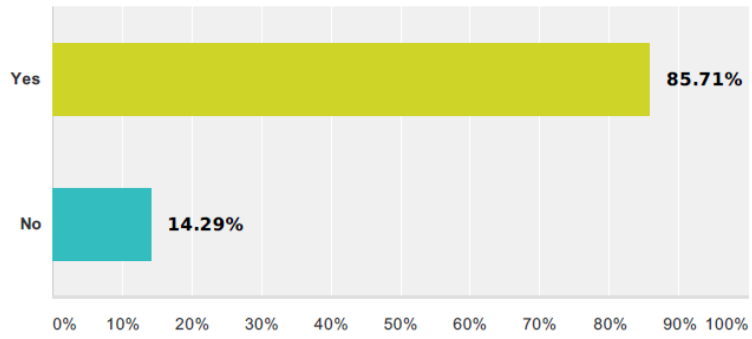
Q13 I think that women are as technically savvy as men.

Answered: 21 Skipped: 4

	Strongly disagree	Disagree	Somewhat disagree	Undecided/Neutral	Somewhat agree	Agree	Strongly agree	Total	Average Rating
(no label)	0.00% 0	0.00% 0	4.76% 1	4.76% 1	0.00% 0	57.14% 12	33.33% 7	21	6.10

Q14 I have noticed a lack of women in this field.

Answered: 21 Skipped: 4



Answer Choices	Responses	
Yes	85.71%	18
No	14.29%	3
Total		21

Q15 I like having women supervisors.

Answered: 21 Skipped: 4

	Strongly disagree	Disagree	Somewhat disagree	Undecided/Neutral	Somewhat agree	Agree	Strongly agree	Total	Average Rating
(no label)	0.00% 0	9.52% 2	0.00% 0	61.90% 13	14.29% 3	9.52% 2	4.76% 1	21	4.29

Q16 I think a person has to have "thick skin" to be successful in this industry.

Answered: 21 Skipped: 4

	Strongly disagree	Disagree	Somewhat disagree	Undecided/Neutral	Somewhat agree	Agree	Strongly agree	Total	Average Rating
(no label)	4.76% 1	9.52% 2	4.76% 1	4.76% 1	23.81% 5	23.81% 5	28.57% 6	21	5.19

Q17 I think that many women still believe they should stay home and take care of their children as opposed to working in the industry.

Answered: 21 Skipped: 4

	Strongly disagree	Disagree	Somewhat disagree	Undecided/Neutral	Somewhat agree	Agree	Strongly agree	Total	Average Rating
(no label)	42.86% 9	23.81% 5	4.76% 1	19.05% 4	4.76% 1	4.76% 1	0.00% 0	21	2.33

Q18 I think women are intimidated by the predominately male workforce in cybersecurity.

Answered: 21 Skipped: 4

	Strongly disagree	Disagree	Somewhat disagree	Undecided/Neutral	Somewhat agree	Agree	Strongly agree	Total	Average Rating
(no label)	9.52% 2	19.05% 4	33.33% 7	19.05% 4	19.05% 4	0.00% 0	0.00% 0	21	3.19

Q19 I think many men still believe that women should stay home and take care of their children as opposed to working outside of the home.

Answered: 21 Skipped: 4

	Strongly disagree	Disagree	Somewhat disagree	Undecided/Neutral	Somewhat agree	Agree	Strongly agree	Total	Average Rating
(no label)	19.05% 4	52.38% 11	4.76% 1	9.52% 2	9.52% 2	0.00% 0	4.76% 1	21	2.57

Q20 Women make better supervisors than men.

Answered: 21 Skipped: 4

	Strongly disagree	Disagree	Somewhat disagree	Undecided/Neutral	Somewhat agree	Agree	Strongly agree	Total	Average Rating
(no label)	14.29% 3	19.05% 4	9.52% 2	52.38% 11	4.76% 1	0.00% 0	0.00% 0	21	3.14

Q21 I think that both men and women are afforded the same opportunities and education for knowledge in cybersecurity.

Answered: 21 Skipped: 4

	Strongly disagree	Disagree	Somewhat disagree	Undecided/Neutral	Somewhat agree	Agree	Strongly agree	Total	Average Rating
(no label)	0.00% 0	0.00% 0	4.76% 1	9.52% 2	19.05% 4	57.14% 12	9.52% 2	21	5.57

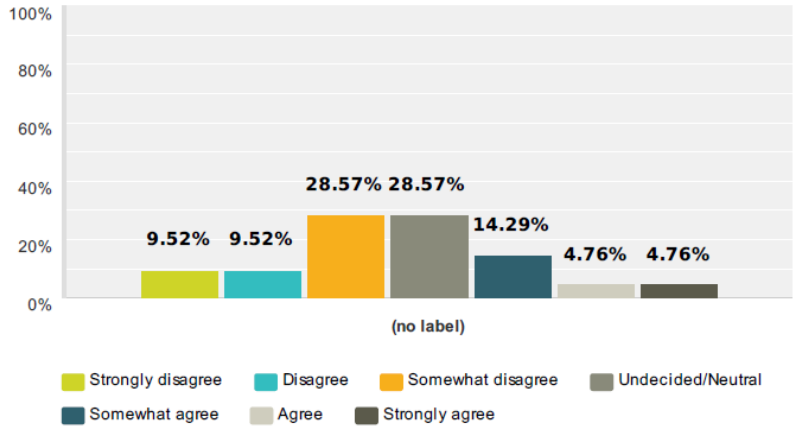
Q23 I think women tend to shy away from more technical fields.

Answered: 21 Skipped: 4

	Strongly disagree	Disagree	Somewhat disagree	Undecided/Neutral	Somewhat agree	Agree	Strongly agree	Total	Average Rating
(no label)	0.00% 0	19.05% 4	4.76% 1	28.57% 6	28.57% 6	14.29% 3	4.76% 1	21	4.29

Q24 I have noticed that men are afforded more opportunities in the cyber industry than women.

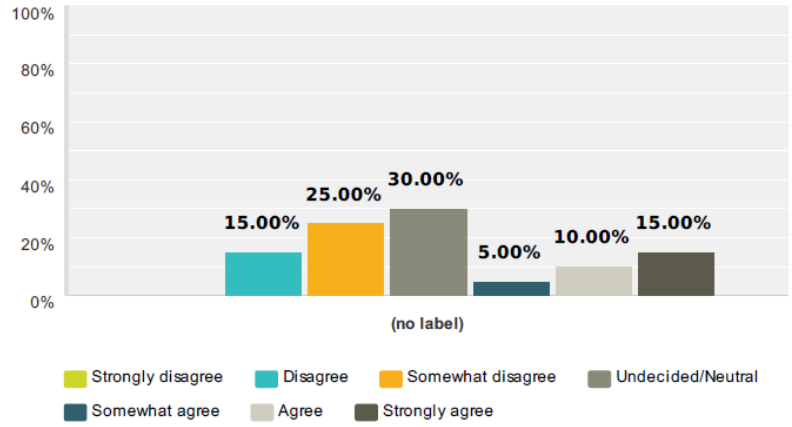
Answered: 21 Skipped: 4



	Strongly disagree	Disagree	Somewhat disagree	Undecided/Neutral	Somewhat agree	Agree	Strongly agree	Total	Average Rating
(no label)	9.52% 2	9.52% 2	28.57% 6	28.57% 6	14.29% 3	4.76% 1	4.76% 1	21	3.62

Q25 I do not think that STEM careers are marketed to women as much as they are to men.

Answered: 20 Skipped: 5



	Strongly disagree	Disagree	Somewhat disagree	Undecided/Neutral	Somewhat agree	Agree	Strongly agree	Total	Average Rating
(no label)	0.00% 0	15.00% 3	25.00% 5	30.00% 6	5.00% 1	10.00% 2	15.00% 3	20	4.15

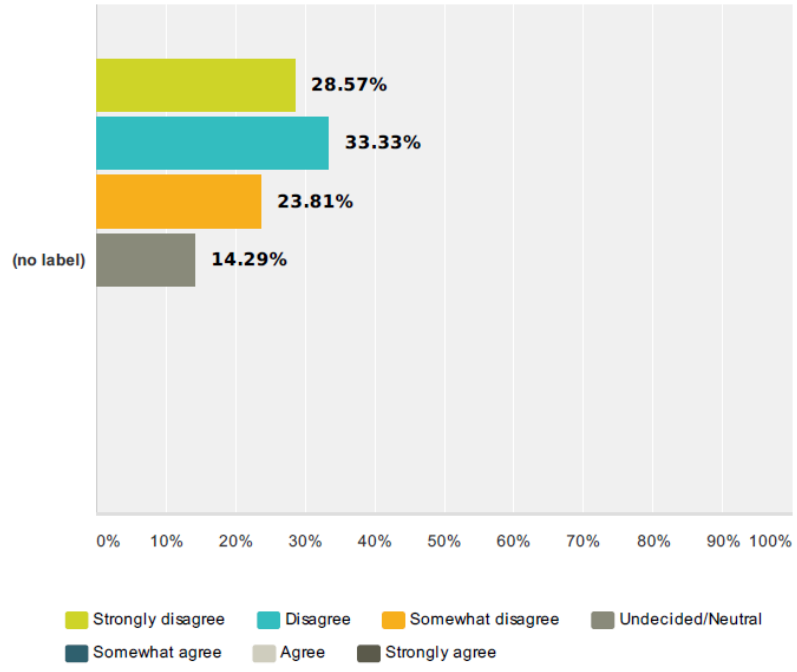
Q26 I think that women are simply not as interested in cybersecurity as men are for any variety of reasons.

Answered: 21 Skipped: 4

	Strongly disagree	Disagree	Somewhat disagree	Undecided/Neutral	Somewhat agree	Agree	Strongly agree	Total	Average Rating
(no label)	0.00% 0	19.05% 4	9.52% 2	28.57% 6	19.05% 4	19.05% 4	4.76% 1	21	4.24

Q27 I think that women are more qualified to work in nurturing careers such as education and healthcare than in cybersecurity or IT.

Answered: 21 Skipped: 4



	Strongly disagree	Disagree	Somewhat disagree	Undecided/Neutral	Somewhat agree	Agree	Strongly agree	Total	Average Rating
(no label)	28.57% 6	33.33% 7	23.81% 5	14.29% 3	0.00% 0	0.00% 0	0.00% 0	21	2.24

Q28 In general, women's personalities differ from men's personalities greatly.

Answered: 20 Skipped: 5

	Strongly disagree	Disagree	Somewhat disagree	Undecided/Neutral	Somewhat agree	Agree	Strongly agree	Total	Average Rating
(no label)	5.00% 1	10.00% 2	15.00% 3	25.00% 5	25.00% 5	15.00% 3	5.00% 1	20	4.20

Q30 I enjoy working in an environment with few women.

Answered: 21 Skipped: 4

	Strongly disagree	Disagree	Somewhat disagree	Undecided/Neutral	Somewhat agree	Agree	Strongly agree	Total	Average Rating
(no label)	14.29% 3	33.33% 7	23.81% 5	19.05% 4	4.76% 1	4.76% 1	0.00% 0	21	2.81

Q31 I think that diversity in the workplace is important.

Answered: 21 Skipped: 4

	Strongly disagree	Disagree	Somewhat disagree	Undecided/Neutral	Somewhat agree	Agree	Strongly agree	Total	Average Rating
(no label)	0.00% 0	0.00% 0	0.00% 0	14.29% 3	4.76% 1	38.10% 8	42.86% 9	21	6.10

Q32 I think that cybersecurity is very competitive in regards to gaining employment in the industry.

Answered: 21 Skipped: 4

	Strongly disagree	Disagree	Somewhat disagree	Undecided/Neutral	Somewhat agree	Agree	Strongly agree	Total	Average Rating
(no label)	0.00% 0	0.00% 0	14.29% 3	4.76% 1	14.29% 3	52.38% 11	14.29% 3	21	5.48

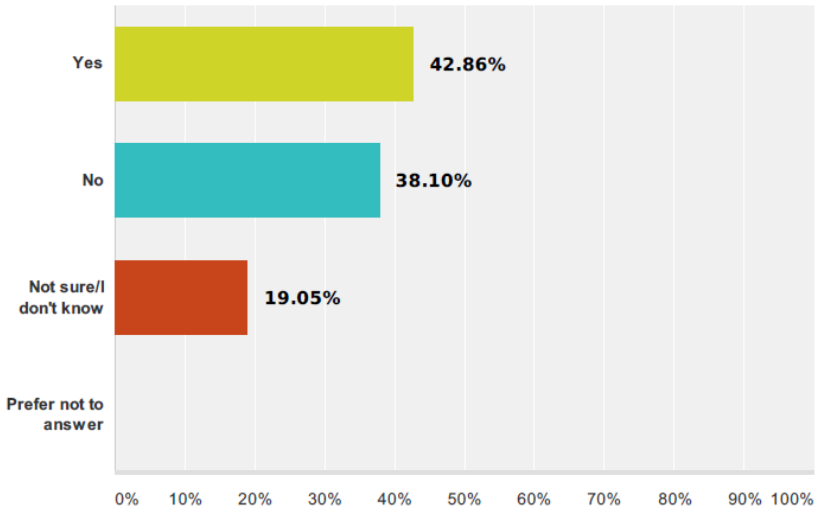
Q34 I think that women add diversity to work groups and the organization/agency in general.

Answered: 21 Skipped: 4

	Strongly disagree	Disagree	Somewhat disagree	Undecided/Neutral	Somewhat agree	Agree	Strongly agree	Total	Average Rating
(no label)	0.00% 0	0.00% 0	0.00% 0	9.52% 2	9.52% 2	52.38% 11	28.57% 6	21	6.00

Q35 Do you think the responsibilities of motherhood and raising a family hinder the success of women in the field?

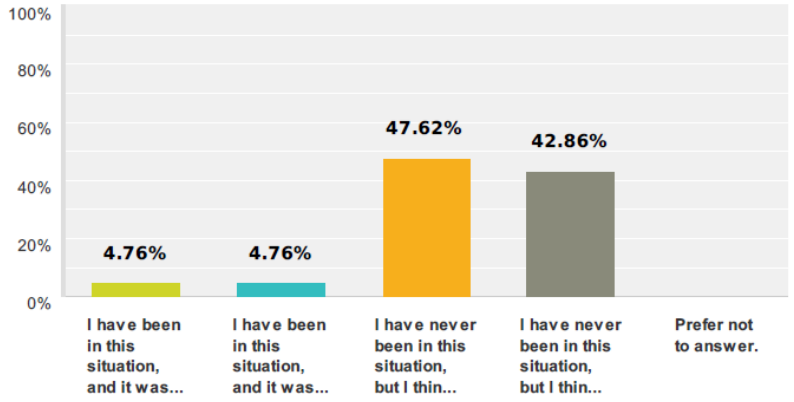
Answered: 21 Skipped: 4



Answer Choices	Responses	
Yes	42.86%	9
No	38.10%	8
Not sure/I don't know	19.05%	4
Prefer not to answer	0.00%	0
Total		21

Q36 If you ever needed to leave the industry for a certain amount of time, when you re-enter, do you think it would be difficult to get back "up to speed" on the latest trends and information in cybersecurity that you missed while absent from the field?

Answered: 21 Skipped: 4



Answer Choices	Responses	
I have been in this situation, and it was difficult.	4.76%	1
I have been in this situation, and it was not difficult.	4.76%	1
I have never been in this situation, but I think it would be difficult.	47.62%	10
I have never been in this situation, but I think it would not be difficult.	42.86%	9
Prefer not to answer.	0.00%	0
Total		21

Q37 There needs to be more women in the cybersecurity industry.

Answered: 21 Skipped: 4

	Strongly disagree	Disagree	Somewhat disagree	Undecided/Neutral	Somewhat agree	Agree	Strongly agree	Total	Average Rating
(no label)	0.00% 0	4.76% 1	0.00% 0	28.57% 6	14.29% 3	42.86% 9	9.52% 2	21	5.19

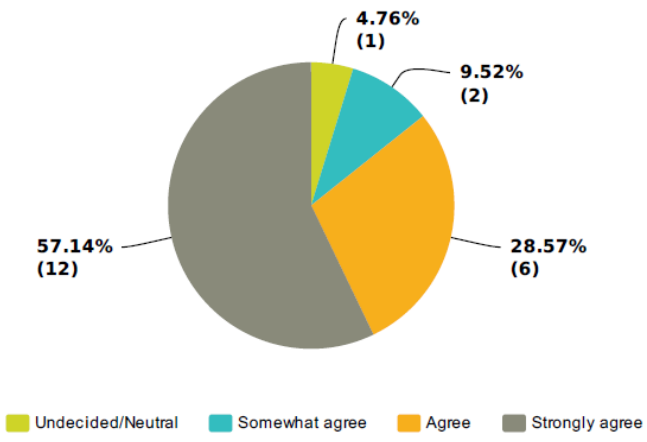
Q38 I have thought of leaving the cybersecurity industry before.

Answered: 21 Skipped: 4

	Strongly disagree	Disagree	Somewhat disagree	Undecided/Neutral	Somewhat agree	Agree	Strongly agree	Total	Average Rating
(no label)	28.57% 6	14.29% 3	4.76% 1	4.76% 1	19.05% 4	23.81% 5	4.76% 1	21	3.62

Q39 I enjoy my job in cybersecurity.

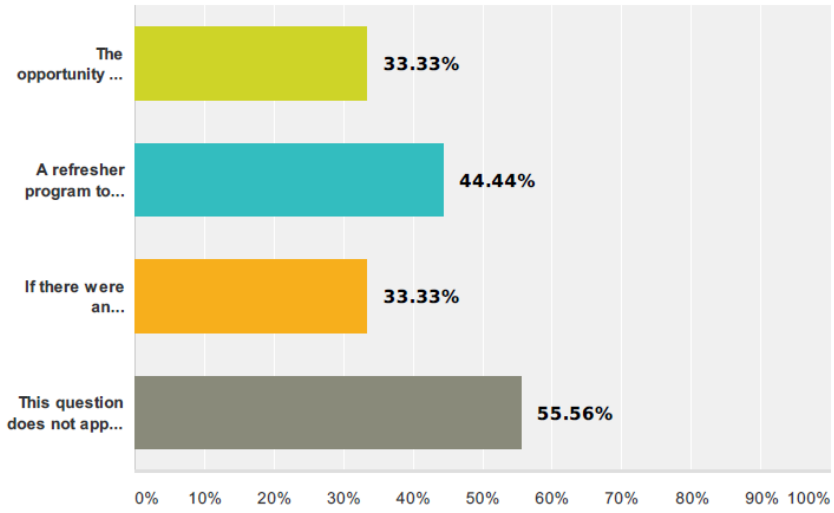
Answered: 21 Skipped: 4



	Strongly disagree	Disagree	Somewhat disagree	Undecided/Neutral	Somewhat agree	Agree	Strongly agree	N/A	Total	Average Rating
(no label)	0.00% 0	0.00% 0	0.00% 0	4.76% 1	9.52% 2	28.57% 6	57.14% 12	0.00% 0	21	6.38

Q40 For women only: If you ever needed to leave the industry for a certain amount of time, would any of these options appeal to you when reentering the workforce? Select all that apply.

Answered: 9 Skipped: 16

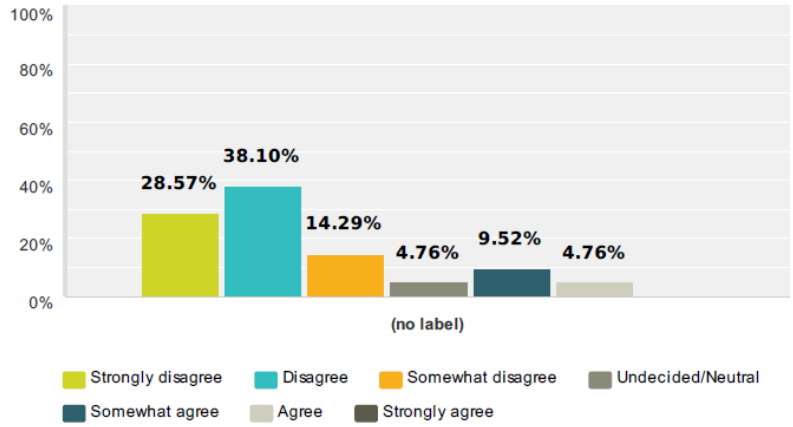


Answer Choices	Responses	
The opportunity to continue working on a part-time basis	33.33%	3
A refresher program to update you on the latest trends and information you may have missed during your absence	44.44%	4
If there were an organizational/agency mentor or role model	33.33%	3
This question does not apply to me	55.56%	5
Total Respondents: 9		

#	Other (please specify):	Date
	There are no responses.	

Q41 I often think of leaving the cybersecurity industry.

Answered: 21 Skipped: 4



	Strongly disagree	Disagree	Somewhat disagree	Undecided/Neutral	Somewhat agree	Agree	Strongly agree	Total	Average Rating
(no label)	28.57% 6	38.10% 8	14.29% 3	4.76% 1	9.52% 2	4.76% 1	0.00% 0	21	2.43

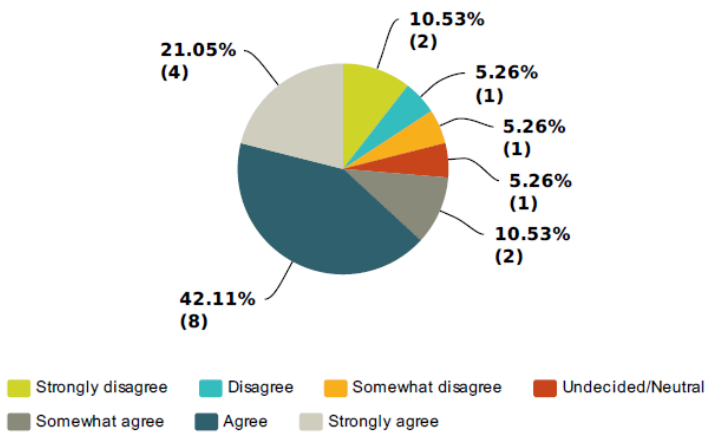
Q42 I have a positive perception of the cybsersecurity industry in general.

Answered: 21 Skipped: 4

	Strongly disagree	Disagree	Somewhat disagree	Undecided/Neutral	Somewhat agree	Agree	Strongly agree	Total	Average Rating
(no label)	0.00% 0	0.00% 0	0.00% 0	9.52% 2	23.81% 5	42.86% 9	23.81% 5	21	5.81

Q43 I feel valued in my workplace.

Answered: 19 Skipped: 6



	Strongly disagree	Disagree	Somewhat disagree	Undecided/Neutral	Somewhat agree	Agree	Strongly agree	Total	Average Rating
(no label)	10.53% 2	5.26% 1	5.26% 1	5.26% 1	10.53% 2	42.11% 8	21.05% 4	19	5.11

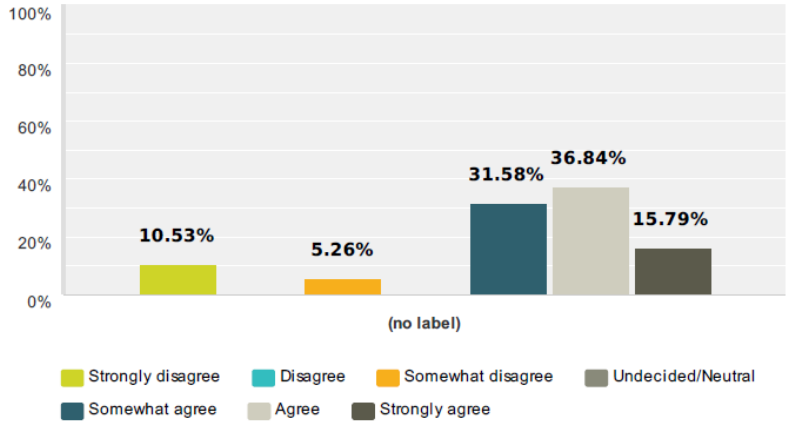
Q45 I think that men are subject to more harassment in the industry than women.

Answered: 20 Skipped: 5

	Strongly disagree	Disagree	Somewhat disagree	Undecided/Neutral	Somewhat agree	Agree	Strongly agree	Total	Average Rating
(no label)	15.00% 3	35.00% 7	20.00% 4	30.00% 6	0.00% 0	0.00% 0	0.00% 0	20	2.65

Q46 I feel respected in my workplace.

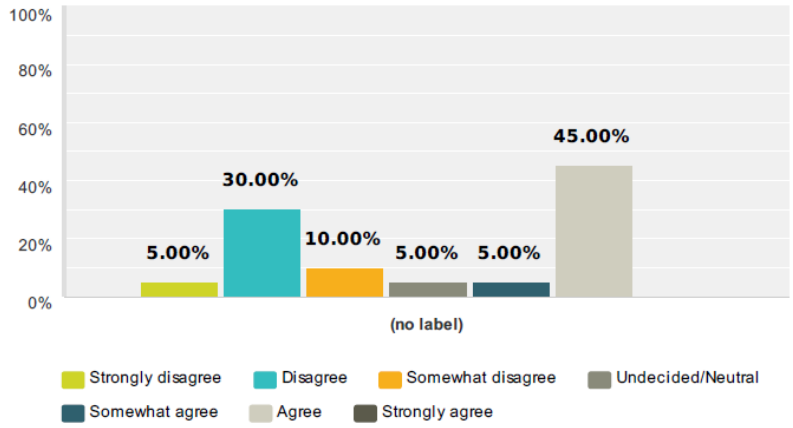
Answered: 19 Skipped: 6



	Strongly disagree	Disagree	Somewhat disagree	Undecided/Neutral	Somewhat agree	Agree	Strongly agree	Total	Average Rating
(no label)	10.53% 2	0.00% 0	5.26% 1	0.00% 0	31.58% 6	36.84% 7	15.79% 3	19	5.16

Q47 In regards to motivating young people to consider cybersecurity as a future career, I think that cybersecurity is a difficult industry for young people to understand and comprehend when determining their career goals.

Answered: 20 Skipped: 5



	Strongly disagree	Disagree	Somewhat disagree	Undecided/Neutral	Somewhat agree	Agree	Strongly agree	Total	Average Rating
(no label)	5.00% 1	30.00% 6	10.00% 2	5.00% 1	5.00% 1	45.00% 9	0.00% 0	20	4.10

Q48 I did not know there was such a thing as a "cybersecurity professional" when I was growing up.

Answered: 20 Skipped: 5

	Strongly disagree	Disagree	Somewhat disagree	Undecided/Neutral	Somewhat agree	Agree	Strongly agree	Total	Average Rating
(no label)	5.00% 1	10.00% 2	0.00% 0	0.00% 0	5.00% 1	35.00% 7	45.00% 9	20	5.75

Q49 I think that cybersecurity is considered a "cool" profession.

Answered: 20 Skipped: 5

	Strongly disagree	Disagree	Somewhat disagree	Undecided/Neutral	Somewhat agree	Agree	Strongly agree	Total	Average Rating
(no label)	5.00% 1	5.00% 1	5.00% 1	0.00% 0	15.00% 3	60.00% 12	10.00% 2	20	5.35

Q51 Cybersecurity is a hard profession to make "cool" for young students.

Answered: 20 Skipped: 5

	Strongly disagree	Disagree	Somewhat disagree	Undecided/Neutral	Somewhat agree	Agree	Strongly agree	Total	Average Rating
(no label)	5.00% 1	40.00% 8	15.00% 3	15.00% 3	10.00% 2	15.00% 3	0.00% 0	20	3.30

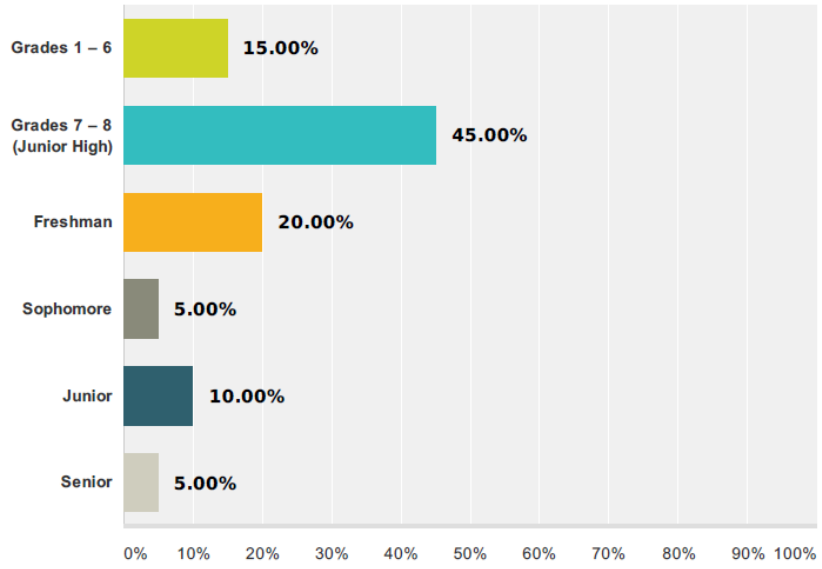
Q52 I think that STEM careers are difficult for young people to understand when determining their career goals at a young age.

Answered: 19 Skipped: 6

	Strongly disagree	Disagree	Somewhat disagree	Undecided/Neutral	Somewhat agree	Agree	Strongly agree	Total	Average Rating
(no label)	5.26% 1	21.05% 4	15.79% 3	15.79% 3	21.05% 4	21.05% 4	0.00% 0	19	3.89

Q53 What grade level should STEM funding focus on for encouraging K – 12 students to enter into cybersecurity?

Answered: 20 Skipped: 5



Answer Choices	Responses	
Grades 1 – 6	15.00%	3
Grades 7 – 8 (Junior High)	45.00%	9
Freshman	20.00%	4
Sophomore	5.00%	1
Junior	10.00%	2
Senior	5.00%	1
Total		20

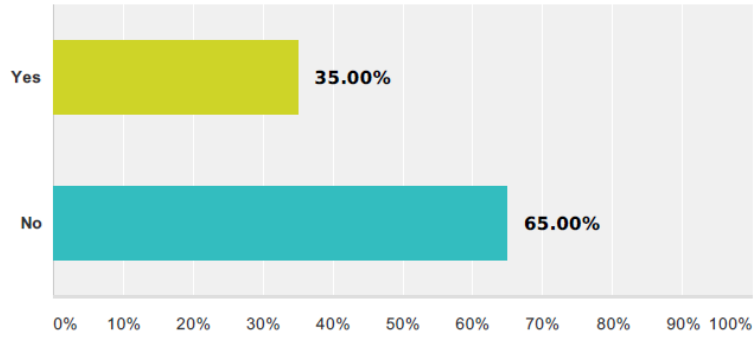
Q54 I think that STEM education prepares students for a career in cybersecurity.

Answered: 19 Skipped: 6

	Strongly disagree	Disagree	Somewhat disagree	Undecided/Neutral	Somewhat agree	Agree	Strongly agree	Total	Average Rating
(no label)	0.00% 0	10.53% 2	5.26% 1	36.84% 7	26.32% 5	15.79% 3	5.26% 1	19	4.47

Q55 Did you know that presently the entire cybersecurity industry is made up of approximately 89% men and 11% women?

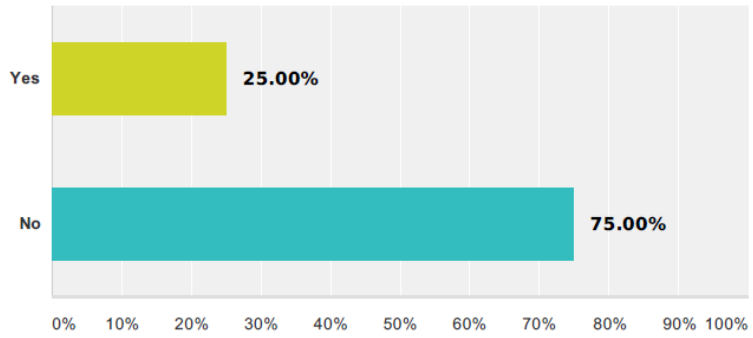
Answered: 20 Skipped: 5



Answer Choices	Responses	
Yes	35.00%	7
No	65.00%	13
Total		20

Q56 Are you surprised by this statistic in any way?

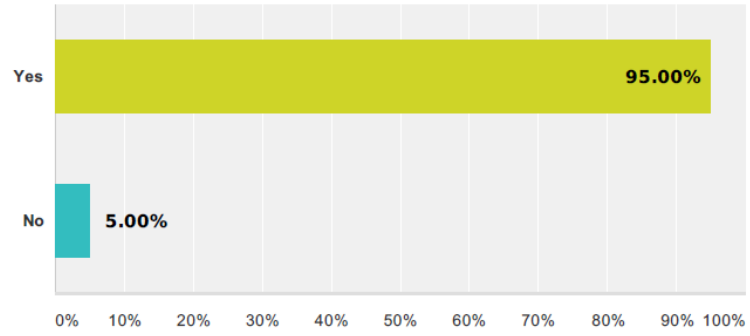
Answered: 20 Skipped: 5



Answer Choices	Responses	
Yes	25.00%	5
No	75.00%	15
Total		20

Q57 I would mentor a young person who is interested in a STEM career (and more specifically IT or IT security).

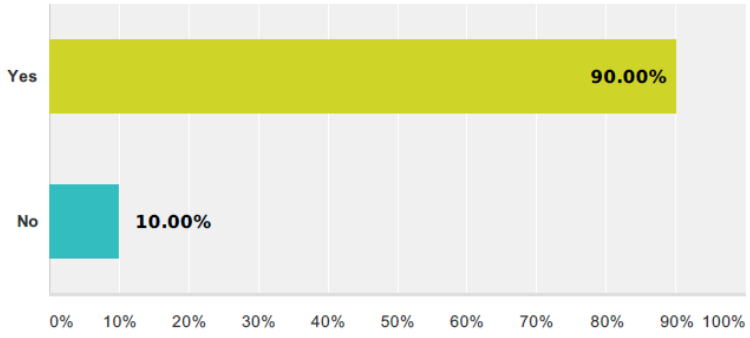
Answered: 20 Skipped: 5



Answer Choices	Responses	
Yes	95.00%	19
No	5.00%	1
Total		20

Q58 I would mentor a girl (ages 10-18) who is interested in a STEM career (and more specifically IT or IT security).

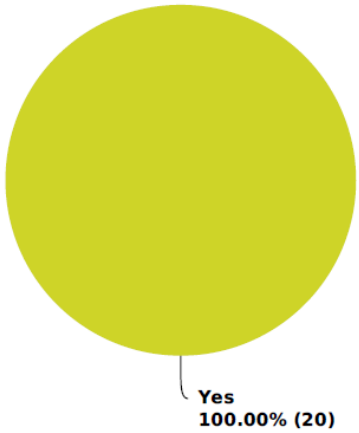
Answered: 20 Skipped: 5



Answer Choices	Responses	
Yes	90.00%	18
No	10.00%	2
Total		20

Q59 I would volunteer to be a panelist or speaker at a cybersecurity recruitment event for young people.

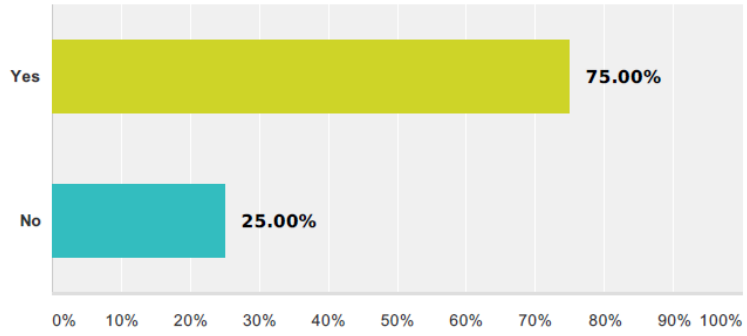
Answered: 20 Skipped: 5



Answer Choices	Responses	
Yes	100.00%	20
No	0.00%	0
Total		20

Q60 I think that having a industry-specific mentor growing up would have helped me determine my career goals sooner.

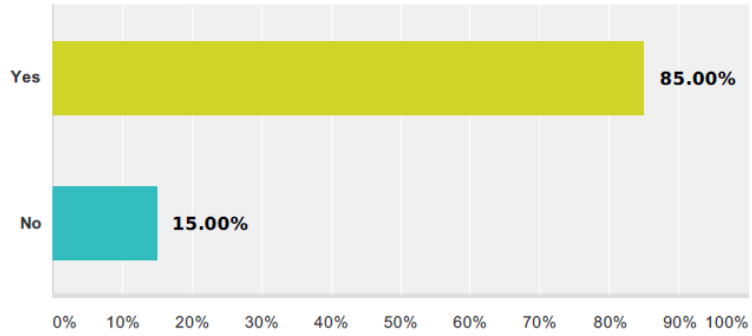
Answered: 20 Skipped: 5



Answer Choices	Responses	
Yes	75.00%	15
No	25.00%	5
Total		20

Q61 I think that having more school-sponsored events promoting STEM careers would have helped me determine my career goals sooner.

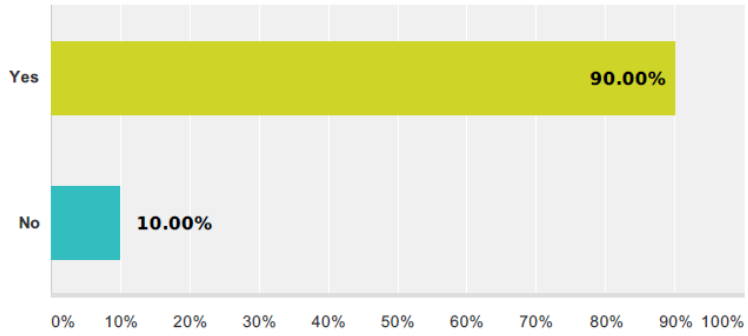
Answered: 20 Skipped: 5



Answer Choices	Responses	
Yes	85.00%	17
No	15.00%	3
Total		20

Q62 I think that having an internship within a cybersecurity role during my education would have helped me determine and understand my career goals sooner.

Answered: 20 Skipped: 5



Answer Choices	Responses	
Yes	90.00%	18
No	10.00%	2
Total		20

Q63 Do you have any suggestions for motivating more women into choosing cybersecurity as a long-term career choice and staying in the industry over time?

Answered: 7 Skipped: 18

#	Responses	Date
1	Cybersecurity needs to start in the junior high school curriculum to better get an appreciation of cyber threats for younger people. The threats are going to be different in 5, 10, 15 years..preparation needs to be done now.	4/17/2014 4:32 PM
2	I suggest focusing on other women in IT and encouraging them to retool themselves into security.	4/17/2014 2:31 PM
3	Treat women as equals to men by providing same training and employment opportunities. Cybersecurity is a relatively young profession. Women now out number men in college and that will start to be reflected in this industry as they enter the field and STEM efforts mature and propagate through the system. Additionally, generational attitudes and mores should be taken into consideration and may be reflected as more Millennials enter the field and are followed by the subsequent generations.	4/15/2014 7:14 PM
4	I have been into computers since the 1980's when computers were new and the best you could hope for was a TRS-80 and a VAX. I believe that women are groomed at an early age to focus on the "softer" career paths. I believe television and movies have an influence on our perception of career paths more so than a Mentor. The most popular female characters in Computer/Cyber themed films, in my opinion, have been Angelina Jolie (Hackers) and Mary McDonnell (Sneakers). So my best suggestion would be to tell parents to give their girls computers instead of Barbie dolls; find their girls a math class instead of a cooking class; give their girls technical articles & books instead of Cosmo/TMZ/People, etc. The same zest and zeal can be applied to kids (male & female) of Non-European decent.	4/14/2014 5:13 PM
5	Add a social aspect to the career field. The young women that I mentor don't want to sit alone looking at a console all day (something that the boys are usually willing to do). Adding some social interaction to the learning experience makes a big difference.	4/14/2014 12:14 PM
6	Do your homework and spend time outside of cybersecurity such as in systems administration, network management or application development before jumping into cyber security. The experience you gain in other areas of IT become invaluable when you get into security.	4/14/2014 7:14 AM
7	I think it is a sociological issue. Women are impressed with the idea that how they look is what is most important. Until this changes, I think it will continue to be difficult to encourage their involvement in security.	4/14/2014 7:08 AM