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An Analysis of Factors that Influence the Success of Women Engineering Leaders in Corporate America

Letha Joye Jepson

Antioch University - PhD Program in Leadership and Change

AN ANALYSIS OF FACTORS THAT INFLUENCE THE SUCCESS OF WOMEN ENGINEERING LEADERS IN CORPORATE AMERICA

LETHA JOYE JEPSON

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Letha Joye Jepson

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Approved by:

Jon Wergin, Ph.D., Chair	March 22, 2010
Elizabeth Holloway, Ph.D., Committee Member	March 22, 2010
Carol Baron, Ph.D., Committee Member	March 22, 2010
Susan Cannon, Ph.D., External Reader	March 22, 2010

Dedication

This work is dedicated to the memory of my father and mother

Colonel Robert E. Ainslie (USAF)

and

LuGarda Mae (Mernaugh) Ainslie

Acknowledgements

I want to thank my family for their patience and support in my pursuit of my doctorial degree. My husband, Rob Jepson, and my children, Erica and Robert, were instrumental in helping me keep my focus and motivating me to never quit.

A special thank you to my parents for their example of what it takes to be successful and authentic, no matter your pursuit, to always dream and reach for the stars—Colonel Robert E. Ainslie and LuGarda Mae (Mernaugh) Ainslie.

This is also to acknowledge the continual support and guidance of the Antioch faculty that helped me through some difficult times during the pursuit of my degree.

And last, but not least, my friends that encouraged me to pursue my degree and were my inspiration for making it through this program—Sandra Jeffcoat and Miriam Grace. Also, to my dialog group that continually gave me the motivation to complete my studies.

To all—THANK YOU!!

Abstract

"One in 4 women entering the engineering profession leaves after age 30, while only 1 in 10 of their male counterparts does" (Perusek, 2008, p. 20). I was interested in analyzing the factors supporting women engineers' leadership development and success. My particular focus was on women engineers in corporate environments—the personal characteristics needed for a successful career and the impacts of social support, career development, and the corporate culture on their career progression. The aspects of social support included the factors of family, friends, and significant others and the levels of supports during the woman's career. The features of corporation culture considered in this study were whether the culture was male- or female-dominated, as well as a combination of gender consciousness, networking, mentoring, and career development opportunities available for women. Personal characteristics included the level of perseverance, persistence despite adversity or discouragement, and self-reliance (a belief in oneself and capabilities). The findings of this study showed that the personal characteristics of having a positive attitude and resilience were the biggest factors in overall career success and satisfaction. Other findings based on the survey and participant comments also pointed to the critical component of corporations having an open environment that provided opportunities for leadership training, mentorship, networking, and special assignments. Also based on the comments, social support of family was important to overall career success and satisfaction. The electronic version of this dissertation is at OhioLink ETD Center, http://www.ohiolink.edu/etd.

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Preface

Evolution of My Studies

This dissertation is the end of my journey at Antioch University in the Leadership and Change Ph.D. program. It has been over 6 years of learning, inspiration, frustration, insights, and growth. The focus of my studies and research during my pursuit of my Ph.D. has been on women in leadership, which is a very broad spectrum to study. Over the 6 years, I narrowed the focus to women in leadership positions within corporate America because I work in the for-profit corporate world. As I progressed through my Ph.D. program, I cultivated an interest in the developmental environment and social support structures for women that have affected their success, especially in corporate America. With this dissertation, I have been able to pursue more research and study in this area and bring forward findings for other corporations to use.

When I began the program, I was very focused on the differences between male and female leadership styles. I found that the leadership literature was male-dominated before the 1980s. Not until the late 1980s and into the 1990s did alternative leadership theories become a part of leadership literature. What is interesting to me is that, as I progressed through the program, I realized studying the differences should not be the focus. The literature in the 1980s and 1990s focused on whether women use their own style or adopt a more masculine style. More recently, there is a caution against focusing on masculine or feminine styles in the literature due to risk of marginalizing women, enforcing stereotypes, and job casting. In making a difference, it is better to focus on different styles not based on masculine or feminine, but on personality, work environment, and the situation. I believe that the demands of the 21st century being

placed on organizations, businesses, and society as a whole are opening doors for the alternative voice. Women and people of color are bringing their abilities and skills to the work force and they are being accepted because the old industrial paradigm and hierarchical structures cannot keep up with the demands of globalization. Diversity, understanding, and acceptance are the drivers beginning in the 21st century. As I progressed through the program, I cultivated an interest in the corporate developmental environment for women early in their careers. I implemented a leadership development program at the corporation where I work for my organizational change project assignment. After much reflection and help from the Antioch faculty, I realized I was rectifying what was missing in my career and leadership development. With the leadership development program I put in place at my corporation, I was filling a gap that was missing in the development of leaders—how to get noticed in the first place and start to develop the bench, or pipeline of leaders. I wanted to pursue more research and study in this area to expand on that program and bring forward findings for other corporations to use. And I believe I was able to do so with this study.

Evolution of My Self

Participation in the Antioch University Leadership and Change Ph.D. program has changed my life. Where to begin to explain this was quite the struggle. My mind swirled with so many ideas. My heart was and is filled with passion. My soul found new depths to explore. If you knew me when I started this program, you would be thinking the person at the beginning of the program and the one writing this paper are different people. You would be right.

Of the three areas of scholar, practitioner, and learner, I would have said I had two out of the three before I started the Ph.D. program. Now I know that I only really understood one—being a practitioner. As I was attempting to write my first paper, all of my examples were action oriented. I now realize that, at that point I did not take time to reflect—it was always on to the next project, the next organization, and the next challenge.

I was not a true *learner* in every sense of the word. I would read and I would apply, but I never took the time to reflect on what I read, why I applied it the way I did, or the impact my actions and decisions had on me and others. Being in the Ph.D. program at Antioch showed me there is more to learning then just reading, writing, and testing. There is the deep appreciation of sharing with others and with myself.

I knew I was not a scholar. In fact, I am still (and always will be) learning to be a scholar. The business side of me is always looking to the bottom line. There is not time for the research and finding the applicability of concepts to real life. Or so I thought. I now realize by taking the time to understand, to look to research and lessons learned, I can be more successful and satisfied. Also, ideas, concepts, and theories were all givens before. I did not know why understanding them would contribute to success in my career. I finally learned what I was missing as I understood the importance of the holistic picture, the systematic approach involving mind, heart, soul, and body.

I am wrapping up my journey at Antioch with this dissertation. I am confident in my practitioner, learner, and scholar abilities, and am ready to apply those abilities to my new journey after this dissertation. I have learned what reflection means, to be a lifelong practitioner, learner, and scholar. I can truly say I have learned reflection is a way of life.

Chapter I: Problem Formulation

Introduction

"One in four women entering the engineering profession leaves after age 30, while only one in 10 of their male counterparts [leave at that same age]" (Perusek, 2008, p. 20). The employment status of men and women also indicate some differences. "Men [are] more likely to be employed as engineers—58% vs. 48% of women [and] men are less likely to indicate they are no longer in the labor force (3%) vs. women (12%)" (Frehill, 2007, pp. 24-25). The most logical questions that may follow these statistics are: Why do more men than women enter engineering? Why do women leave engineering after age 30?

The answers to these questions may be found in the intervention women receive from early in their lives (Bozeman & Hughes, 2004; Brommer & Eisen, 2006; Chubin, May, & Babco, 2005; Crowe, 2003; House, Johnson, & Borthwick, 2003; Kekelis, Wepsic Ancheta, Heber, & Countryman, 2005; Nicholls, Wolfe, Besterfield-Sacre, Shuman, & Larpkiattaworn, 2007; Rappe Zales & Cronin, 2005; Spears, Dyer, Franks, & Montelone, 2004; Watson & Froyd, 2007; Wiest, 2004; Windschitl & Thompson, 2005). This intervention is needed from teachers and family members who can influence women and minorities to develop an interest in engineering at an early age (Buckley, 2008; Catalyst, 1992; Chavanne, 2008; Chubin et al., 2005). This intervention needs to carry through higher education and into the work environment. Numerous research studies have been done to show that intervention can be applied in many ways including networking, mentoring, hand-on experience, collaboration/team work, and relating

engineering to real life and social relevance (Boyle Single, Muller, Cunningham, Single, & Carlsen, 2005; Grozic & McCarron, 2006; House et al., 2003; Whitten et al., 2003; Wiest, 2004).

> Looking further into the future, by 2050, about half of the U.S. population will be non-white (US Census Bureau 2002). [This indicates that] the engineering profession will need to develop solutions that are acceptable to an increasingly diverse population and [engineering organizations] will need to draw more students from sectors that traditionally have not been well represented in the engineering workforce. (National Academy of Engineering, 2004, p. 28)

In response to the need for a more diverse representation in the engineering field, the current study explored the factors that may contribute to the development of leadership and career success of women engineers. It explored whether or not there is a relationship between personal characteristics, environment, and the strength of the social support network in the career success of women engineers. Personal characteristics may include resilience and goal orientation; environment may include corporate culture and development opportunities; and the strength of the social support network may include elements of family, friends, and significant others for career success for women in engineering. These characteristics were chosen because of findings in previous research that applied to women's success in general (Auster & Ekstein, 2005; Catalyst, 1992; Jagacinski, 1987). I am furthering the research with a focus on women engineers.

The current study used factor analysis and standard multiple regression analysis to determine the factors that may influence the success of women engineers. Additionally, the current study explored the barriers perceived by women engineers in pursuing a career in engineering based on analysis of the narrative response questions in the survey. The quantitative and qualitative analyses were used to suggest further studies.

Women In The Workforce

Women comprise 46% of the total U.S. workforce (U.S. Department of Labor Women's Bureau, 2008) and 50.6% of managerial, professional, and related positions (Catalyst, 2009), and yet relatively few hold corporate officer positions, which are defined as positions of vice president or above. In 2007, only 15.4% of Fortune 500 corporate officer positions were held by women (Catalyst, 2009). These data indicate that even though women are in leadership positions, their overall proportion is disproportionate to their numbers in the workforce population. Catalyst (2009), a women's advocacy group, found more women on a company's board directly related to a company's success (Salvaterra, 2008). "Among the top 500 companies those with the highest percentage of women corporate officers yielded, on average, a 35 percent higher return on equity and a 34 percent higher total return to shareholders compared to those companies with the lowest percentage of women corporate officers" (Women in Cable Telecommunications, 2007, p. 1). These studies show why retaining and promoting women is critical to a company's success. Other studies have also shown advantages: "Enhanced productivity, competitive advantage, and financial performance are three reasons why developing and promoting women leaders are in the best interest of employers" (Northouse, 2004, p. 269).

These statistics confirm that corporations experience success with women in leadership positions, yet they also indicate that there continue to be few women at the top. The next most logical question is: Why do very few women reach the top? Northouse (2004) suggested several different explanations. However, he admitted that there was no empirical evidence to support his postulations. His explanations for

women's lack of success in gaining leadership positions included: (a) women are not part of the managerial pipeline, (b) women do not have line experience, and (c) women lack the necessary qualifications and/or confidence. Northouse indicated that the slow progression of women into leadership could also be attributed to organizational, interpersonal, and personal barriers. Organizational barriers were identified as (a) women being held to higher standards of performance, (b) women lacking developmental opportunities, and (c) women in a hostile culture/environment. Interpersonal barriers included (a) women being stereotyped, (b) women lacking or being excluded from mentoring and networking, and (c) women lacking emotional support. Personal barriers included (a) women striving for work/life balance, (b) women's non-work obligations, and (c) women lacking political savvy (Northouse, 2004).

It is projected that 49% of the increase in total labor force between 2006 and 2016 (U.S. Department of Labor Women's Bureau*,* 2008) will be women, yet barriers to women's success continue. Several authors have suggested that in leadership roles, masculine traits and values have been valued as superior to feminine ones, thus necessarily limiting women and privileging men in the perceived value of their respective contributions to corporate life (Helgesen, 1995a, 1995b; Northouse, 2004; Rhode, 2003; Wilson, 2004). It is not surprising to find that women often feel that they must conform to masculine-type behaviors to gain leadership positions especially in male-dominated, corporate cultures.

Nonetheless, women's assimilation of masculine-type leadership styles has not always spelled success. As women work toward higher positions in the corporation, they encounter the *glass ceiling*— a term used to describe the barriers that prevent women

from moving into the highest echelons of corporate power. "Despite the progress of women in corporate America and small signs of change detected in previous perceptual studies, being male and possessing masculine characteristics continue to be associated with positions of leadership in organizations" (Dennis & Kunkel, 2004, p. 166). What is the corporate culture's role in maintaining the glass ceiling in spite of the volume of evidence that exists to support the impact of women leaders on increasing the bottom line?

> In a Business Week survey of 400 American women in management, 70% cited "the male dominated corporate culture as an obstacle to their success" . . . and Lyness and Thompson (2000) found that female executives reported greater barriers to their advancement including lack of culture fit and exclusion from informal networks than did male executives. (Bajdo & Dickson, 2001, p. 400)

So, even though the corporate environment is slowly adjusting to increasing numbers of women in the workforce, the male-dominant corporate culture continues to be a barrier for women within the corporate setting (Feyerherm & Vick, 2005).

Environment—Corporate Culture

The corporate environment is defined for the purposes of this study as a combination of gender consciousness and the types of networking, mentoring, and career development opportunities available for women. The culture of the organization is also based on whether it is male- or female-dominated (Bierema, 2005; Smith & Smits, 1994). "In male-dominated industries [women] may face pressures different from those faced by men in the same jobs, or by women and men in more female-dominated environments" (Gardiner & Tiggermann, 1999, p. 310). Male-dominated cultures can be unhealthy for men and women because it suppresses their emotions and needs (Due Billing &

Alvesson, 2000). This suggests that a gender conscious environment may affect the success of women in the corporate environment.

Gender consciousness is concerned with the type and degree of support for women in the corporate structure and whether the corporation has a support structure in place for women. That includes training, mentoring, networking, and affinity groups.

> According to statistics from the advocacy group Human Rights Campaign, in 2001, only eight companies in the Fortune 500 included gender identity in their nondiscrimination and diversity policies. At the end of 2006, the number of Fortune 500 companies with gender identity policies had increased to 124. (Women in Cable Telecommunications, 2007, p. 1)

As part of the culture of the organization, are corporate leaders cognizant of the environment? Do they know whether there is discrimination or acceptance of diversity? Do they lead by example? Answers to these questions may indicate whether or not there is gender consciousness in a corporation.

> Organizations must be cognizant of the concerns that women have about getting involved in initiatives to help marginalized groups and work to mitigate such anxieties. . . . Organizations need to critically evaluate their cultures and take conscious steps to address inhospitable environs for women and other marginalized groups. (Bierema, 2005, p. 17)

Even in companies that formally acknowledge sensitivity to issues of gender in policy statements, women may still not attain higher levels of management.

This study sought to examine the corporate culture in relation to women's advancement by exploring the women engineers' perspective on support structures that enhance their success and corporate barriers that discourage their attainment of leadership roles.

Globalization and Technology

In today's environment, globalization and technology are driving forces for companies' success. How has the explosion of distance-time barriers affected women in corporate America? Globalization of companies has an impact on women's opportunities because the mix of different cultures doing business together makes one size of leadership style no longer appropriate. This implies that leaders today are required to be global in their style of leadership. Goldsmith, Greenberg, Robertson, and Hu-Chan (2003) laid out five emerging characteristics of global leaders:

1. Thinking globally
2. Appreciating cultural diversity
3. Developing technological savvy
4. Building partnerships and alliances
5. Sharing leadership. (p. 2)

In today's global economy, partnerships and alliances must be built not only within organizations, but also across multi-national organizations. As the business environment has become more complex and information volume and speed of access increases exponentially, it has become necessary to coordinate and work in cross-functional, rather than hierarchical teams to do business in today's environment and in the future. Participatory management, consensual decision making, and two-way flow of information are critical to simply stay abreast of changes in the environment. Hierarchical organizations are not set up to handle any of these factors (Harari, 2002; Kouzes & Posner, 1997; Raelin, 2003). Goldsmith et al. (2003) supported this and believed that:

> As organizations expand across the globe, global leaders preside over workers located anywhere in the world, and in an alliance or partnership, they may have to generate results from staff in other companies, with different corporate cultures, styles, and reporting relationships. As such, global leaders must build teams and

> create networks to accomplish organizational goals. By exploring and building partnerships and relationships with companies and individuals within and outside their organizations, global leaders add incredible value to and continue the success of the company. (p. 79)

With all of the global expansion, the increasing numbers of mergers and partnerships across the globe, and the flattening of organizations to speed up decision making and collaboration, the need for a broad base of knowledge and expertise is greater than ever. "Shared leadership, by virtue of its use of the combined best of leaders' abilities, is being tested as one possible solution for meeting these challenging business needs" (Goldsmith et al., 2003, p. 95).

Globalization indicates that global leaders needed in the 21st century should have the ability to manage organizations in non-hierarchical and multidimensional ways. Globalization also indicates a need for shared leadership. This may help maximize all of the human resources and assets in an organization by empowering individuals and their leadership opportunities. The shift from a lone leader at the top could reduce the complexity of today's global environments.

Feminine principles of leadership are being recognized as necessary skills in the 21st century business world of globalization, complexity, and rapidly changing technology. Northouse (2004) stated:

> [The] preferred style of cooperative or "web leadership" [found in women] provides a good fit with the evolving requirements for 21st century global leadership. . . . Women leaders tend to be more participative and less autocratic, a pattern that is well-suited to 21st century global organizations. (pp. 272-273)

Northouse's comment is particularly significant in the field of engineering. Statistics show that women in leadership positions in engineering are lower than in other professions as depicted in Figure 1.1. (In Figure 1.1, the "engineering—other" category

includes the following engineering disciplines: aerospace, agricultural, biomedical, chemical, environmental, materials, mining, nuclear, petroleum, and all others.) The intent of this dissertation is to add to that understanding by exploring the influences on leadership success for women in engineering.

Percentage of Men and Women Employed in High Tech Occupations - 2008

Employment Field	Total Number of Population	Percentage of Population (Women / Men)
Engineering Technicians	416,000	18.5% / 81.5%
Electrical & Electronics Engineers	350,000	7.7% / 92.3%
Civil Engineers	364.000	10.4% / 89.6%
Mechanical Engineers	318,000	6.7% / 93.3%
Industrial Engineers	177,000	14.9% / 85.1%
Computer Hardware Engineers	69,000	19.4% / 80.6%
Computer & Mathematical	3,676,000	24.8% / 75.2%
Engineering – Other	690,000	9.3% / 90.7%
Engineering Managers	109,000	6.3% / 93.7%
Computer & Information Systems Managers	475,000	27.2% / 72.8%

http://www.bls.gov/cps/cpsaat11.pdf

Figure 1.1. Employment in high tech.

Diversity in engineering is critical because we need to tap into the talents of all people to meet the demands of engineering now and in the future. For the United States to be competitive in a global marketplace, and because of social needs and the workforce shortage, we must attract a diverse workforce, especially in the science, technology, engineering and math (STEM) fields (Busch-Vishniac & Jarosz, 2004; Chubin et al., 2005; May & Chubin, 2003; Rappe Zales & Cronin, 2005; Watson & Froyd, 2007).

> Diversity is now seen as a business necessity driven by two primary factors: the globalization of business and the need to have an employee base that is both comfortable and accepted in a wide variety of cultures and the desire to have a broad range of perspectives and experiences to enhance the function of engineering design so critical to product development. (Busch-Vishniac & Jarosz, 2004, p. 255)

Having diversity provides the variety of viewpoints necessary for novel approaches to engineering challenges. "As a consequence of a lack of diversity [in engineering], we pay an opportunity cost, a cost in designs not thought of, in solutions not produced" (Wulf, 2002, p. 2). Further,

> The NAE believes that diversity in the science, engineering, and technical workforce is critical, and we are concerned with the lack of diversity in the engineering workforce. Engineering is one of those professions that materially affects the quality of life of every person in society. To the extent that engineering lacks diversity, it is impoverished. It is not able to engineer as well as it could. Since the products and processes we create are limited by the life experiences of the workforce, the best solution the *elegant* solution may never be considered because of that lack! (Wulf, 1999, p. 1)

Having cross-disciplinary teams will enable engineers to gain a systemic view of the complexity of issues facing engineers. "Indisputably, engineers of today and tomorrow must conceive and direct projects of enormous complexity that require a new, highly integrative view of engineering systems" (American Society for Engineering Education, 2007, p. 165). The next question to ask is, what are the reasons for so few women in engineering? We must first increase the number of women in engineering in order to increase the pool of potential leadership talent. The first area to explore is the educational environment.

Engineering and Education

Because of technological advances and globalization of business, economies, and cultures, the importance of engineering disciplines and education is at a critical state

(National Academy of Engineering, 2004). The National Academy of Engineering sponsored a project called "The Engineer of 2020" to address what will be the roles of engineers now and in the future, and what will be the educational needs to meet the demands. Engineers in 2020 will need to possess strong analytical skills. They will also have to have creativity, practical ingenuity, as well as good communication skills. Having business and management skills, understanding the principles of leadership, having high ethical standards and being flexible, as well as being resilient and lifelong learners are also important to being an engineer (National Academy of Engineering, 2004). Globalization and technology, the complexity of work, the type of work, and the issues in the workplace will require increased collaboration across multi-disciplined teams. Inclusion and respect for diversity and a receptiveness to change are critical. The engineer of 2020 must have well-developed people skills, as well as analytical and problem-solving skills, which are not now a part of many engineering programs.

Lack of diversity in engineering fields. The National Science Foundation (NSF) and many experts have stated conclusively that women and minority students still do not achieve degrees in STEM at the same rate as their white male counterparts (Agosto, 2004; Bell, Spencer, Iserman, & Logel, 2003; Boyle Single et al., 2005; Brommer & Eisen, 2006; Busch-Vishniac & Jarosz, 2004; Chubin et al., 2005; Earl-Novell, 2006; Gilmartin, Li, & Aschbacher, 2006; Hanson, 2006; House et al., 2003; Jessup, Sumner, & Barker, 2005; Khan, 2005; May & Chubin, 2003; McCoy & Heafner, 2004; National Academy of Engineering, 2004, 2005; Nicholls et al., 2007; O'Callaghan & Enright Jerger, 2006; Whitten et al., 2003; Wiest, 2004). There is a need for more diversity within STEM fields, especially in engineering. Engineering is the lowest of all STEM

fields in recruiting and retaining women and minorities (Bell et al., 2003; Boyle Single et al., 2005; Busch-Vishniac & Jarosz, 2004; Capobiance, 2006; House et al., 2003; Nicholls et al., 2007; Tonso, 2006; Vogt, 2003). Figure 1.2 shows a breakout of men and women that attain degrees in engineering.

Percentage of Engineering Educational Degrees – 2005-2006

Degree	Total Population	Percentage of Population	Women	Men
Percent of Total Computer and Information Sciences and Support Services Degrees Earned				
Bachelor's	47,480		20.6%	79.4%
Master's	17,055		26.9%	73.1%
PhD's	1,416		21.7%	78.3%
Percent of Total Engineering Degrees Earned				
Bachelor's	67,045		19.4%	80.6%
Master's	30,989		23%	77%
PhD's	7,396		20.1%	79.9%
Percent of Total Civil Engineering Degrees Earned				
Bachelor's	8,890		21.8%	78.2%
Master's	3,471		27.5%	72.5%
PhD's	699		20%	80%
Percent of Total Mechanical Engineering Degrees Earned				
Bachelor's	15,850		13%	87%
Master's	4,443		14%	86%
PhD's	1,096		13%	87%
Percent of Computer Engineering Degrees Earned				
Bachelor's	5,301		10.5%	89.5%
Master's	1,529		25.2%	74.8%
PhD's	236		14.8%	85.2%
Percentage of Electrical, Electronics, and Communications Engineering Degrees Earned				
Bachelor's	13,966		13.6%	86.4%
Master's	8,123		19.9%	80.1%
PhD's	1,860		13.9%	86.1%

http://nced.ed.gov/programs/digest/d07/tables/dt07_265.asp

Figure 1.2. Engineering educational degrees (U.S. Department of Education, National Center for Education Statistics, 2007).

Natural and biological sciences have more women participants than math, computer science, or engineering (Agosto, 2004; Earl-Novell, 2006; Jessup et al., 2005;

Khan, 2005; Spears et al., 2004; Wiest, 2004). What are the barriers in engineering education that keep women from pursuing and attaining engineering degrees?

Male-domination in STEM fields. Engineering is seen as an elite field that is dominated by white males (Boyle Single et al., 2005; Gilbert, Bravo, & Kearney, 2004; Hartman & Hartman, 2005; Laeser, Moskal, Knecht, & Lasich, 2003; Vogt, 2003). Science, as traditionally practiced, is based on male cultural norms. With STEM fields based on male cultural norms, the appeal to women and minorities is likely to be less pronounced. Many women and minorities have feelings of marginalization and do not feel welcome (Bell et al., 2003; Busch-Vishniac & Jarosz, 2004; Gilmartin et al., 2006; Gokhale & Stier, 2004; May & Chubin, 2003; McLoughlin, 2005; O'Callaghan & Enright Jerger, 2006; Vogt, 2003; Watson & Froyd, 2007). For this reason, more women are leaving engineering as well as other STEM fields and majors—not because of insufficient preparation or academic performance (Bozeman & Hughes, 2004; Busch-Vishniac & Jarosz, 2004; O'Callaghan & Enright Jerger, 2006; Zhang, Anderson, Ohland, & Thorndyke, 2004). The education environment in all STEM fields, but especially engineering, needs to change from exclusion to inclusion, competition to collaboration, and narrow specialization to appreciation for diverse ideas (Busch-Vishniac & Jarosz, 2004; Ferreira, 2003; Larsen & Stubbs, 2005). It has been suggested that emphasizing the people-side of engineering, as well as the social relevance and value to marginalized communities may make STEM fields more appealing to women and minorities (Gokhale & Stier, 2004; O'Callaghan & Enright Jerger, 2006). In addition, recruitment and retention efforts need to emphasize an atmosphere of inclusiveness and collaboration to broaden the appeal of undergraduate programs in these highly technical fields.

Intervention programs. Many women and minorities may not have similar experiences to those of white males have when entering into college. The reasons for this are (a) lack of resources during their pre-college years, (b) lack of interest (cannot identify with or see social relevance), or (c) lack of role models. There is also the presence of sex-role stereotypes that cause women and minorities to believe that STEM fields are not an option (Bell et al., 2003; Carlone, 2003; Gilmartin et al., 2006; Jessup et al., 2005; May & Chubin, 2003; Spears et al., 2004). Partnering of middle and high school faculty with university faculty to explore strategies for integrating science and engineering into the classrooms is a critical component of baccalaureate intervention (Cantrell, Pekcan, Itani, & Velasquez-Bryant, 2006; Spears et al., 2004). Partnering arrangements between pre-college intervention programs with faculty and corporations can be critical to show young women and minorities future opportunities and provide role models (Wilkinson & Sullivan, 2003).

There have been studies showing that some interventions focused on women can have adverse affects (McLoughlin, 2005). Certain type of interventions can spotlight women. "'Spotlighting' is the singling out of women by gender in ways that make them uncomfortable" (McLoughlin, 2005, p. 373). Spotlighted women can be perceived as being different by some faculty and male students and seen as less capable because they need the extra help. For this reason, some assert that programs that reach out to everyone interested in STEM fields to help in their studies and socialization would be more beneficial for incorporating women and minorities into STEM (McLoughlin, 2005). A few researchers have also expressed concern that "women-only associations are seen as promoting the marginalization of women, rather than bringing them into the mainstream

of engineering" (Hartman & Hartman, 2005, p. 120). Conversely, some findings show that involvement in any type of mixed-group or women-only associations are a benefit to the individual. Participants are more involved, more confident, and strongly committed to a future in engineering (Hartman & Hartman, 2005).

Faculty and student interaction is critical, especially for women, because many women value personal interactions. Students need affirmation from faculty for confidence building. Many women and minorities tend to drop out of school or change out of STEM majors because of lack of or loss of confidence. Some do not even consider entering into a STEM major because of the lack of confidence and the feeling that they are not prepared or do not have enough experience (Earl-Novell, 2006; Gokhale & Stier, 2004; Khan, 2005; Larsen & Stubbs, 2005; Zhang et al., 2004). A compounding problem is the lack of female faculty in STEM departments (Brommer & Eisen, 2006; Chubin et al., 2005). Numerous studies have demonstrated that the presence of female faculty members in STEM fields is strongly correlated with the number of female students who become scientists and engineers (Earl-Novell, 2006; Jessup et al., 2005; O'Callaghan & Enright Jerger, 2006; Whitten et al., 2003). Female faculty are more likely to experiment with innovative teaching methods and interactive classes which has been proven to appeal to women and minorities (Ferreira, 2003; Grozic & McCarron, 2006; Whitten et al., 2003).

Identify with engineering. It is important that women and minorities can see themselves as scientists and engineers. "An explicit goal of instruction should be to support students in developing identities that have an interest in, see value in, and have confidence in engaging in mathematics and scientific inquiry" (Hodge, 2006, p. 246).

The Society of Women Engineers (SWE) has strongly supported the need for young people to enter the engineering field. "It is critical that the message we deliver to young people and the adults around them—parents, teachers, and counselors—is both appealing and accurate. . . . It is important we talk about rewarding aspects of being an engineer" (Finken, 2007, p. 24). Currently, based on themes in the literature, there are stereotypes for STEM careers—geeks, nerds, anti-social, and so on—that turn off many women and minorities. In fact, some white males are also turned-off by the stereotypes. It is important to make STEM professions more attractive (Busch-Vishniac & Jarosz, 2004; Creamer, Burger, & Meszaros, 2004; Larsen & Stubbs, 2005; May & Chubin, 2003; McCoy & Heafner, 2004; Wyer, 2003).

The influence of family support and perceptions also plays a key role in women and minorities interest in STEM fields (Crowe, 2003; Hodge, 2006; Spears et al., 2004). "Parents and teachers . . . play a strong role in the development of students' self-concept, perceptions, expectancies, and values" (Gilmartin et al., 2006, p. 184). Recruiting and out-reach programs can help in making STEM careers more attractive to women and minorities by addressing work/life balance (Chubin et al., 2005; Creamer et al., 2004; O'Callaghan & Enright Jerger, 2006; Whitten et al., 2003). The current study explored factors related to the social support structure for successful women engineers in corporate settings.

Engineering Careers

Although industry has become more willing to hire women engineers, the opportunities for advancement, higher salaries, and career success are not the same as for men (Auster & Ekstein, 2005; Catalyst, 1992; Jagacinski, 1987). There have been

limited studies on women engineers that look at career satisfaction and success (Auster & Ekstein, 2005). Jagacinski (1987) explored the background and career characteristics of men and women engineers. The focus was on intervals of time in the profession and factors that influenced their careers. A study by Catalyst (1992):

> Examine[d] obstacles to women's recruitment, advancement, and retention; to identify factors known to contribute to the success of female engineers; and to uncover progressive corporate policies or practices that help make the engineering environment more hospitable for women. (p. 2)

This study focused on the corporate environment. Auster and Ekstein (2005) used Auster's multilayered framework of factors to look at women engineers' mid-career satisfaction. Those factors included individual characteristics, career characteristics, organizational characteristics, and stress factors (Auster & Ekstein, 2005). Each of the studies suggested further research is needed to help retain women engineers in the profession.

> It would also be intriguing to begin to look at women at late career and the drivers and dynamics within that demographic category, as well as to compare and contrast drivers and dynamics across stages of women's careers, and particularly professional careers. (Auster & Ekstein, 2005, p. 19)

Purpose of Study

To ensure a diverse workforce in engineering, women need to be made aware and encouraged throughout their lives that engineering is a worthwhile career to pursue. Based on this need and further research suggested by previous studies, I was interested in pursuing the analysis of factors in women perceiving they have had a successful engineering career and determining the need for these factors, the importance of them, and what barriers should be removed (Auster & Ekstein, 2005; Buckley, 2008; Catalyst, 1992; Chavanne, 2008; Jagacinski, 1987).

The current study explored the relationship between personal qualities, such as resilience and goal orientation; environmental variables, such as corporate culture and development opportunities; and the strength of the social support network that include the elements of family, friends, and significant others to career success for women in engineering. Participants included women engineers with 5 to 30 years work experience, many of whom are members of the Society of Women Engineers (SWE). Data were collected through an online survey and analysis included factor analysis, multiple regression, and narrative analysis.

Research Questions

The research questions were:

1. What is the relationship between the personal characteristics (resilience and education) and career success of women engineers?
2. What is the relationship between the environment of the corporation in a woman's career (male/female dominated, professional developmental opportunities, mentoring, and networking) and the career success of women engineers?
3. What is the relationship between the social support structure (demographics of the family and perceived support from family, friends, and community) and career success of women engineers?
4. Is the relationship between social support and career success of women engineers stronger than the relationship between personal characteristics and career success, as well as between corporate culture and career success?

Hypotheses

The hypotheses are that all three components do make a difference in women's leadership and career success. The research hypotheses are:

- H1: there is a positive relationship between personal characteristics (PC) and career success for women engineers.
- H2: there is a positive relationship between corporate culture (CC) and career success for women engineers.
- H3: there is a positive relationship between social support (SS) and career success for women engineers.
- H4: the percent of variance in the dependent variable (career success) explained by social support is greater that the percent of variance explained by personal characteristics or corporate culture.

Based on the research to date, it is hypothesized that the social support variable will make the most difference in a woman's leadership and career success. I used a quantitative approach for my methodology. The research design included a survey that was distributed to professional women in the engineering field. The responses were analyzed using a factor analysis approach to reduce a large set of data into a smaller subset of measurement variables so that further analysis could be carried out on the factor scores. The identified factors were used as the dependent variables in the multiple regression analysis to determine those variables that are significantly related to career success.

Importance of Study

The overall thrust of this dissertation is to gain understanding of how women engineers are faring in corporate America. A deeper look at the research to date shows that women tend to be absent from the engineering field and there is very little research that gives possible explanations for this absence. Some experts believe that a lack of educational and family support, as well as a negative organizational culture may contribute to this absence—however, research in this area is limited. Today's global economy includes both men and women in all facets of business, including engineering. It is important that we have an understanding of why the numbers of women engineers are low and not increasing. The outcome of this research may provide educational institutions and business entities with some insight regarding how to improve their engineering programs so that they can become more diverse.

Background of the Author

The focus of my studies and research during my pursuit of a Ph.D. has been on women in leadership, which is a very broad spectrum to study. Because I am from the for-profit corporate world, I narrowed the focus to women in leadership positions within corporate America. As I progressed through my Ph.D. program, I cultivated an interest in the developmental environment and social support structure for women that have affected their success, especially in corporate America. I wanted to pursue more research and study in this area and bring forward findings for other corporations to use. I also wanted to look at the constructs of whether social support structures are a major factor in a successful career. My main hypothesis is that social support is the most critical variable for women. I have not found much research on the social support structure for women

engineers in corporate America. From personal experience, I have found that many of the women leaders I have known, worked with, and studied have a social support structure conducive to career success. Most women are either single or married (or in a relationship) with no children, or, if there are children, the men are stay-at-home dads. There are very few situations where both the man and the woman work outside the home and have children. That is why I wanted to do research on this topic.

My career has been in the computer engineering field, so I also have an interest in women's development in regards to engineering. I have been a Board Champion for the Northwest Girls Collaborative Project since its inception and I was a Board Champion for the National Girls Collaborative Project that promotes girls' involvement in STEM (see Appendix A for details). Also, the National Academy of Engineering is interested in growth of all engineers in school, as well as once on the job. They are studying what a successful engineer looks like (National Academy of Engineering, 2004). If one accepts that engineers need a more robust set of skills to be successful, one realizes that engineers not only need better preparation in school, they also need nurturing once on the job. What that nurturing looks like for women engineers is part of what I hoped to find with this dissertation.

Conclusion

The research done for this dissertation was to discover the factors related to a successful career path in the engineering profession from the women's perspective, using the following constructs: environmental, personal, and social support structure. The hypothesis is that social support is the make or break variable for women. The scope was women engineers with 5 to 30 years experience because, by focusing on a professional

group, there would be commonality in work and expectations of success criteria. As stated earlier, there is little research across women engineering careers and I wanted to further the research in this area.

Chapter 2 is a literature review of studies to date for women in leadership to demonstrate a gap in research studying women in the engineering professions. Chapter 3 includes the methodological approach I used for the current study. The choice of which approach to be used was based "on whether the intent is to specify the type of information to be collected in advance of the study or to allow it to emerge from participants in the project" (Creswell, 2003, p. 17). The criteria for selecting which type of study to confuct was based on whether there is a match between the problem and the approach to use, the researcher's personal experiences and preferences, and the audience (Creswell, 2003). I chose to do a survey. I piloted the survey for the proposal that was used for this dissertation. Chapter 3 also includes the final survey used for the dissertation, as well as discussion about how I analyzed the findings. Chapter 4 includes the pilot survey plus the findings, results, and feedback used to improve the final version of the survey. Chapter 5 includes the findings of this study. I describe the procedures used, the rationale for the statistical methods, and include sufficient detail to justify my conclusions. Chapter 6 is the summary of my research, evaluation, and interpretation of the results, as well as suggestions for future work.

Chapter II: Review of the Literature

Introduction

The purpose of this chapter is to review the literature on women and leadership in corporate America and to examine what is known about best practices supporting women's leadership development and success in corporate environments. To begin, I searched for research articles on women leaders in corporate America and the influence of career development and corporate cultural influences published in refereed journals. I also researched business-focused journals (e.g., *Harvard Business Review*) plus contemporary literature and popular press on women and leadership.

Leadership

Background research on leadership—Women missing? Leadership studies have been varied, focusing on different aspects throughout the 20th century. There have been multiple definitions from recognized experts. Rost (1993) provided a comprehensive study of these definitions and aspects of leadership in his book, *Leadership for the Twenty-First Century*. The "basic problem of leadership studies—an inability to know and agree upon what leadership is—is pervasive in all the behavioral sciences" (Rost, 1993, p. 14). Scholarly research did tend to be within disciplines and therefore, was narrow in focus. As Rost stated, the major difficulty with trying to come up with a definition is based on the fact that leadership is "a multidisciplinary subject because it has ramifications for more than one of the behavioral sciences and liberal arts, yet scholars study the subject from a unidisciplinary perspective" (Rost, 1993, p. 15). Burns (1978) also saw the controversy of defining leadership: "no central concept of leadership has yet emerged, in part because scholars have worked in separate disciplines

and subdisciplines in pursuit of different and often unrelated questions and problems" (p. 3). I believe this has been a part of the overall fundamental problem of defining leadership. This, and the fact that leadership has been studied primarily from a management perspective, all contribute to the lack of agreement. Rost (1993) backed this with his statement that the "behavioral theory movement was primarily the work of management theorists and social psychologists in the late 1950s" (p. 24).

Distinct theories of leadership throughout the 20th century were misleading because of the unidimensional perspective and were very management-oriented. Leadership and management were often used interchangeably. All of the different theories from the 20th century studied reflected the industrial paradigm. That is, theories were based on hierarchical structures, were management based, and focused only on the leader. "Leadership as good management is a perfect summary of what leadership has meant in the industrial era" (Rost, 1993, p. 94).

The theories were also very male-oriented—the feminine perspective was missing from literature until late in the 20th century. Leadership was seen as rationalistic, linear, quantitative, and scientific in language and methodology. Male traits and styles fit the model—female ones did not (Bunker, 1994; Hoy, 1994; Rost, 1993). Rhode (2003), in the research for her book, *The Difference "Difference" Makes,* found that:

> For most of recorded history, women were largely excluded from formal leadership positions. A comprehensive review of encyclopedia entries published just after the turn of the last century identified only about 850 eminent women, famous or infamous, throughout the preceding two thousand years. In rank order, they included queens, politicians, mothers, mistresses, wives, beauties, religious figures, and "women of tragic fate." Few of these women had acquired leadership positions in their own right. Most exercised influence through relationships with men. Since that publication, we have witnessed a transformation in gender roles . . . . Yet our progress is incomplete. Women remain dramatically underrepresented in formal leadership positions. (p. 3)

Part of the reason for this is fear. Heffernan (as cited in Wilson, 2004) stated:

> Their caution betrays a fear that . . . acknowledgement of difference will come to mean an acceptance of inequality. A fear that "different from" will morph into "less than." And so we find ourselves edged into stereotypes, often acting against female values, trying to fit the male definition of leadership. It has come at a cost, but it has allowed us to slowly infiltrate the locker rooms of business and politics an inch at a time. (p. 3)

Not until the late 1980s and into the 1990s did alternative leadership theories become a part of leadership literature. Before that time, Rost (1993) stated that "theories that speak in a different voice and that represent an alternative paradigm are not part of the story" (p. 29). In Rost's studies, he found that the scholarly definitions (limited to Western literature) were overwhelming male. This did not change much until the 1980s, when there were enough female authors to have an impact on the research and studies of leadership. The absence of the female voice and perspective limited what was considered in the leadership definition to include types of traits, styles, and theories. The patriarchical environment of business and the military perpetuated this perspective. Alexandre (2004b) presented this same viewpoint in her article on patriarchy.

Rost (1993) discussed how leadership evolved in the 1970s to reflect the importance of followers. Leadership studies were now stating that leadership is a process, not a person, and that they needed to look at both the leaders and the followers. "Without responsive followers there is no leadership because the concept of leadership is relational" (Rost, 1993, p. 61). Rost attempted to define leadership based on his extensive research: "Leadership is an influence relationship among leaders and followers who intend real changes that reflect their mutual purposes" (p. 101) .

Robert Greenleaf and James Burns are recognized as fathers of leadership studies. The disappointing factor with both is the absence of the feminine voice. The basic premises can imply application by men or women, but the absence of feminine examples is disheartening. By not including women in scholarly studies or providing role models for women, women have had difficulty in breaking down barriers in business, in communities, and in society as a whole. Both Belenky and Alexandre presented this in their writings. Belenky, Clinchy, Goldberger, and Tarule's (1973) study showed that:

> The women we interviewed spoke, for instance, of science professors who communicated their beliefs that women were incapable of making science. . . . The schools these women attended were very likely to have ignored the works and achievements of women in developing the curriculum. . . . Some colleges we studied had few or no women as senior administrators and few or no women as senior tenured faculty. (p. 44)

Alexandre (2004a) also confirmed this in her writings on gender gap in the *Encyclopedia of Leadership*.

Greenleaf's (2002) concept of servant leadership in business extended past the hierarchical model and the focus on just the leader. The new ethic he proposed is that "the work exists for the person as much as the person exists for the work" (p. 154). He lated stated " I am in the business of growing people" (p. 159). The idea of growing people implies caring and relationships building which women have finally been recognized for in the late 20th century and into the 21st century. As more women have weighed in on the leadership literature and extrapolated the importance of relationships from the likes of Burns and Greenleaf, as well as all of the current studies bringing in the relationship factor, leadership theories are evolving from the hierarchical structures and the industrial paradigm to more shared leadership and the concepts of networking and

inclusion (George, 2003; Graham, 1995; Helgesen, 1995a; Helgesen, 1995b; Raelin, 2003; Rhode, 2003; Wilson, 2004).

Burns (1978) presented the theory of including followers. This fits within the realm of servant leadership that Greenleaf presented.

> Leadership, unlike naked power-wielding, is thus inseparable from followers' needs and goals. The essence of the leader-follower relation is the interaction of persons with different levels of motivations and of power potential . . . in pursuit of a common or at least joint purpose. (Burns, 1978, p. 18)

Burns proposed two types of leadership—that of transactional and transforming. The two approaches describe the interaction between leaders and followers as follows. The first is transactional which "occurs when one person takes the initiative in making contact with others for the purpose of an exchange of valued things" (Burns, 1978, p. 19); and the other is transforming which "occurs when one or more persons engage with others in such a way that leaders and followers raise one another to higher levels of motivation and morality" (Burns, 1978, p. 20) . He wrote that the relations between most leaders and followers are transactional in nature. He showed that transforming leadership goes beyond that. "The result is a relationship of mutual stimulation and elevation that converts followers in to leaders and may convert leaders into moral agents" (Burns, 1978, p. 4). Burns' focus on relationship shows a shift and sets the foundation for women's voice to be heard in regards to leadership. Even though Burns never called out women in leadership, specifically, he did set the stage which leads to the shift from the traditional hierarchical structure to networking and inclusion and the acceptance of what women bring to leadership. The evolution of leadership is set in motion and more/alternative voices begin to be heard.

Bennis (2003), another recognized expert in leadership studies, delved into personal growth and commitment to leadership. He stated three basic reasons why leaders are important:

> First, they are responsible for the effectiveness of organizations. . . . Second, the change and upheaval of the past years has left us with no place to hide. Leaders fill that need. . . . Third, there is a pervasive national concern about the integrity of our institutions. (p. 4)

Bennis (2003) presented basic ingredients to leadership. Regardless the person, when he or she fills a leadership role, they share these common ingredients. They are a guiding vision, passion, integrity (which is the basis of trust), curiosity, and daring (Bennis, 2003). Bennis actually used female examples and explained how some felt the pressure to fit a mold—what was considered appropriate for females. Roles such as wife, mother, caregiver, and homemaker were expected even if a woman wanted to be in business, politics, and other non-traditional female roles (Bennis, 2003). Women's individual problems, as well as collective problems, are caused by social structures and cultures that perpetuate female subordination such as the patriarchal structures, exclusions of their stories from history and leadership literature, and the devaluing of their talents and skills. Women do share their issues and problems in a community of women for support and encouragement. By sharing their experiences with each other, women are able to assert their own worth and dignity as persons. In this process, common themes are shared. Women have been treated as subordinates just because they are women (Andolsen, Gudorf, & Pellauer, 1985; Bunker, 1994; Hostetler, 1994).

To be a leader, you must "know thyself, then, means separating who you are and who you want to be from what the world thinks you are and wants you to be" (Bennis, 2003, p. 48). This applies to both men and women and breaks the traditions of having to

fit a mold, whether you are male or female. Both men and women should explore and invent themselves. Both can take on styles and traits that are traditionally labeled masculine and feminine to be successful in life and as leaders.

Bennis (2003) believed in mentorship. His views included the ideas that:

> We need mentors and friends and groups of allied souls. I know of no leader in any era who hasn't had at least one mentor: teachers who found things in them they didn't know were there, parents or older siblings, senior associates who showed them the way to be, or in some cases, not to be, or demanded more from them than they knew they had to give. (p. 83)

As women have become more prominent in leadership studies, this concept of mentorship has expanded. Relationships, shared leadership, and inclusion to help leaders grow have become staples in leadership theories and literature.

Even though the concept has expanded—a common obstacle or barrier for women to gain leadership positions is the difficulty in obtaining mentors and role models. Women do not have the same access to informal networks of advice, contacts, and support that their male counterparts do, especially because there are so few women in the upper echelons of business, politics, or society. The result is that many women are not given the same chances as men and remain out of the loop of career development. This only perpetuates the problem of advancement of women so they can be mentors and role models. Women are not able to gain familiarity about their organization's unstated practices and politics because of these barriers. Without mentors and without this knowledge, women are not given enough high-visibility assignments to show their leadership skills and abilities, which mean they do not have the same opportunities for advancement as men (Livers & Caver, 2003; Northouse, 2004; Rhode, 2003).

Helgesen, author of both *The Web of Inclusion* and *The Female Advantage: Women's Ways of Leadership*, also commented on the advantage men have had because of their participation in sports. It has only been the last few decades that women have had the opportunities in high schools and colleges to participate in competitive sports, and only the last couple of decades that there have been professional options for women—though going professional is still limited. In the 20th century, hierarchical, industrial paradigm, the games that were considered feminine were not recognized as legitimate for preparation to enter into the business world. Now though, what can be learned from feminine games is considered legitimate. Helgesen (1995a) stated that:

> Much of literature that exalts team sports as providing good preparation for business also derides girls' games as useless for this purpose. Turn-taking games such as hopscotch and jump rope are scorned as particularly pathetic, since they emphasize cooperation over competition and have simple and fluid rules that participants may reformulate as desired . . . games without elaborate rules foster improvisational skills, and reformulating rules to fit situations teaches flexibility. Finally, games that teach cooperation help one to function in organizations where networking provides the structure. Thus girls' games do instill skills and attitudes that have value in the workplace—particularly in today's workplace, where innovation, entrepreneurship, and creativity are in demand, and the authoritarian chain of command is increasingly obsolete. (p. 37)

Northouse (2004) broke down leadership theories into practical applications and understanding. He included a chapter on women and leadership. This seemed to me to be more of an afterthought and outside the mainstream. By calling out a special chapter, it seems that women and leadership is something different and is looked at and applied differently. What Northouse included in the chapter on women and leadership does cover the basic question of why women have been excluded. To start with, his basic definition of leadership is "leadership is a process whereby an individual influences a group of individuals to achieve a common goal" (p. 3).

I have focused on a few of Northouse's approaches to emphasize my interest in women in leadership. The trait approach, which focuses exclusively on the leader, fits the old 20th century hierarchical approach to leadership. The approach provides direction regarding which traits are good to have if one aspires to take a leadership position. In the hierarchical model and most of the 20th century, traits were based on male behaviors. Traits that included relationship building and shared or participatory leadership were seen more as feminine and were not recognized (Livers & Caver, 2003).

We often find this resistance to women's leadership because women are not perceived as tough enough. This is due to the hierarchical model based on the definition of leader as male-dominated and the cultural definition of the female that does not fit within the hierarchical model. The female definition includes being sensitive, self-sacrificing, and nurturing. There is the expectation that a woman must be a good wife and mother first and foremost. These qualities that make up the definition of the female, while valued in the home, are the cause for women to be marginalized in the workplace.

> So once we get to the workplace, we already have two strikes against us: one, that we are females, which doesn't match the physical look of a leader; and two, that the qualities we bring do not match the traditional actions of a leader. (Wilson, 2004, p. 23)

Rhode (2003) also found this to be true. So, even though leadership has been evolving and recent theories of leadership include the importance for interpersonal qualities and relationships more commonly associated with women, Rhode stated that "women aspiring to leadership still face double standards and double binds. They risk appearing too 'soft' or too 'strident,' too aggressive or not aggressive enough. And what is assertive in a man often seems abrasive in a woman" (Rhode, 2003, p. 8). What is even more ironic is that women following male role models and expectations are rated

lower when they adopt masculine, authoritative styles, particularly when the evaluators are men or the role is one typically occupied by men (Bunker, 1994; Hoy, 1994; Northouse, 2004; Rhode, 2003). So, leadership in business and public life is still dominated and populated by men. Belenky et al. (1973) put forth that this starts even earlier than entering into business or public life; in fact, as early as when women enter school:

> The schools that these women attended were very likely to have ignored the works and achievements of women in developing the curriculum. Their male classmates were more likely to have taken and held the floor for presenting their views and to have received a greater amount and more effusive public praise for their achievements than were women. (p. 44)

The style approach emphasizes the behavior of the leader that goes beyond the traits. This style has a focus on task and relationship. I see where this approach could be used to explain the perceived differences between male and female leadership approaches. I believe that one could associate the task behaviors as male-oriented and the relationship behaviors as female-oriented. Task style, being goal-oriented, focuses on a product and is concerned about the task—it fits within the acceptable male traits and style. Relationship style, being concerned about the people, their situation, and how the people interact, fits within the acceptable female traits and style. Leadership literature has been evolving to recognize both as important (task and relationship) and that both can be present in men and women.

Many studies have shown that women can be, and are, leaders. Women are still underutilized and there is still a disproportionate number of females in leadership positions compared to the overall number of females in the workforce. Northouse (2004) showed the only difference is women tend to use participative and democratic style of

leadership more than the autocratic or directive styles men tend to use. Northouse and others believed that the participative and democratic approach is better suited for the 21st century global leadership (Livers & Caver, 2003; Northouse, 2004).

Gardner (1995) did include women in his book, *Leading Minds*. His lessons, his models, and his examples are applicable to all, regardless of gender, race, or any other discriminator. His inclusion of women brought their abilities, skills, and wisdom into the mainstream of leadership literature. His definition of leadership included "individuals who significantly influence the thoughts, behaviors, and/or feelings of others" (Gardner, 1995, p. 6). Other authors also agreed with his definition (Maxwell, 1993, 1998). Gardner's leadership theories revolved around stories. He believed that leaders achieve their effectiveness through the stories they relate to and tell. The types of stories that define the leader include the following:

- Ordinary stories (which are the most common). They simply relate the traditional story of the group as effectively as possible. Gerald Ford is an excellent example of an ordinary leader (Gardner, 1995).
- Innovative stories. They are when the leader "takes a story that has been latent in the population, or among members of his or her chosen domain and brings new attention or a fresh twist to the story" (Gardner, 1995, p. 10). Margaret Thatcher and Ronald Reagan are excellent examples of innovative leaders.
- Visionary stories (the rarest kind). These are when the leader is "not content to relate to a current story or to reactivate a story from a remote or recent past" (Gardner, 1995, p. 11). Instead, the leader "creates a new story, one not

> known to most individuals before, and achieves at least a measure of success in conveying this story effectively to others" (Gardner, 1995, p.11). Gandhi and Jesus are prime examples of visionary leaders.

Gardner (1995) argued "that the story is a basic human cognitive form; the artful creation and articulation of stories constitutes a fundamental part of a leader's vocation. Stories speak to both parts of a human mind—its reason and emotion" (p. 43). Pink (2006) agreed:

> Stories are easier to remember—because in many ways, stories are *how* we remember. . . . But as important as story has been throughout humanity, and as central as it remains to how we think, in the Information Age it got something of a bad rap. (pp. 101-102)

Pink (2006) went on: "What stories can provide—context enriched by emotion, a deeper understanding of how we fit and why that matters" (p. 115).

Stories are a way to influence and build relations. Because it speaks to both reason and emotion, the blend is like the blend of masculine and feminine traits. Both are used by both men and women for the most effective form of leadership. This is because adults never lose touch with the basic story. Gardner's (1995) concept of the unschooled mind is based on this. He believed that the five-year-old mind is black and white, the ten-year-old mind is fair to a fault. The 15-year-old mind revels in relativism and the 25- to 50-year-old mind is personal integration (Gardner, 1995). The subject and content of stories that leaders bring to their stories include the origins that go back to early childhood. These include the "issues of self, identity, group membership, past and future, good and evil" (Gardner, 1995, p. 50).

Heifetz (2001) stated "adaptive work consists of efforts to close the gap between reality and a host of values not restricted to survival . . . involves not only the assessment

of reality, but also the clarification of values" (p. 31). Heifetz distinguished the differences between *technical* and *adaptive* work using situation types. Technical is more of a quick fix—one knows what the problem is and the solution is clear. Adaptive work is not clear, one is not sure what the problem is, and hence, the solution is not known (Heifetz, 2001) .

Too often, people look to leaders to fix every problem. Leaders do not always have the answer and they need to help the people learn that this is not always the case. The leader can "induce learning by asking hard questions and by recasting people's expectations to develop their response ability" (Heifetz, 2001, p. 84).

Heifetz (2001) listed the principles of adaptive work and leadership. The first principle is that an:

> Authority exercising leadership has to tell the difference between technical and adaptive situations because they require different responses. . . . "Does it require a change in people's values, attitudes, or habits of behavior?" . . . [If so,] authority must look beyond authoritative solutions. (p. 87)

As leadership evolves to better meet the 21st century needs, this becomes even more critical. The lone leader at the top of a hierarchical model is often regarded by his followers as all-knowing and able to handle all problems. This is no longer feasible in the 21st century because of complexities, globalization, and rapid rate of change. Now, the leader has to look at the situations and set the proper expectations.

The next principle Heifetz (2001) explicated was:

> Having authoritative relationships with people is both a resource and constraint . . . a resource because it can provide the instruments and power to hold together and harness the distressing process of doing adaptive work; . . . [and a] constraint because it is contingent on meeting expectations of the constituents. (p. 88)

There is a fine balance a leader must achieve when doing adaptive work and making sure the followers understand that it is adaptive, not technical. Followers will become frustrated and look for new leaders if they do not think the present leader is fixing the problems if the expectations are not made clear by the leader.

These principles are applicable to both male and female roles and are needed now more than ever as we move into the second decade of the 21st century. Rapidly changing technologies and globalization have increased the complexities of being a leader in today's world.

Heifetz (2001) distinguished between two forms of authority. The first is formal authority where power of office or position is the authority and there are promises to meet explicit expectations. The other is informal authority where the power is through influence. It is implicit and extends beyond the job. It can change with one's popularity and reputation (Heifetz, 2001). The people without authority are able to "push us to clarify our values, face hard realities, and seize new possibilities, however frightening change may be" (Heifetz, 2001, p. 183). The advantages of leadership without authority include the following:

> First, the absence of authority enables one to deviate from the norms of authoritative decision making. Instead of providing answers that soothe, one can raise questions that disturb, . . . second . . . permits focusing hard on a single issue . . . [and] . . . third . . . places one closer to the detailed experience of some of the stakeholders in the situation. . . . One has frontline information. (Heifetz, 2001, p. 188)

For most of the 20th century, women have been more in the informal authority role. Not many have had authoritative positions.

To tear down the barriers that have been in the way for women to be recognized as leaders, we need to address authority. Women must be recognized as being capable of

command and to be seen as powerful. It is not an easy thing to do, "especially when our society upholds 'the masculinity of authority and the authority of masculinity'" (Wilson, 2004, p. 33). For too long, women only had leadership roles without authority. Belenky et al. (1973) believed that "women's growing reliance on their intuitive processes is . . . an important adaptive move in the service of self-protection, self-assertion, and self-definition. Women become their own authorities" (p. 54). So, as women do become their own authorities and

> expand the definitions of authority, ambition, and ability, they begin to bridge the disconnect between "leader" and "woman." As we rewrite the rules, we begin to change perceptions. We can stop mimicking men as a pathway to authority. We can gain strength from our ambition as we offer every bit of our natural and learned abilities. We can finally be valued for the original we are, rather than the man we sometimes try to be. (Wilson, 2004, p. 97)

By being authentic and true to themselves, women can be leaders without compromising themselves. They are able to succeed and help their businesses exceed because they are true to their core values and building enduring organizations through trust, relationship building, and empowerment (George, 2003; Northouse, 2004).

Evolution of leadership—A place for women? Leadership has had to evolve as we move from the industrial age to the information age. The explosion of technological changes, the exponential growth of information, and globalization factors all contribute to the need for leadership to evolve. In the patriarchal style of leadership, the hierarchies enabled business and the military to function throughout the 20th century:

> There was time when leadership metaphors favored the physiological, with the leader as the head, and the organization as the body. Today we read that such things cut across the grain of nature. Nature is not hierarchical. Wisdom is distributed throughout the system. (Bridges, 1996, p. 12).

Alexandre (2004b) also covered the impacts of patriarchy on women leadership.

Wheatley (1999) stated, in her *Leadership and the New Science* book:

> Leadership, an amorphous phenomenon that has intrigued us since people began organizing, is being examined now for its relational aspects. Few if any theorists ignore the complexity of relationships that contribute to a leader's effectiveness. Instead, there are more and more studies on partnership, followership, empowerment, teams, networks, and the role of context. (pp. 13-14)

She went on to say:

> Our concept of organizations is moving away from the mechanistic creations that flourished in the age of bureaucracy. We now speak in earnest of more fluid, organic structures, of boundaryless and seamless organizations. We are beginning to recognize organizations as whole systems, construing them as "learning organization" or as "organic" and noticing that people exhibit self-organizing capacity. (p. 15)

Because of this, we are moving away from the traditions of the male-dominated hierarchical model so prevalent in the industrial era of the 20th century.

The 21st century world class leaders need to be cosmopolitan leaders who are comfortable operating across boundaries, can forge links between organizations, and master collaboration. The cosmopolitan leader has to have vision, skills, and resources to form networks, as well as open minds and not be afraid to reach out to partners across their business, communities, and the world (Kanter, 1996; Raelin, 2003). This is because of the many challenges of the new century. These challenges include the lack of clear lines of authority, the increased complexity of the world, the exponential increase in the rate of change, the explosion in technology, and globalization—leadership has had to evolved (Beckhard, 1996). We also have to shift from our industrial paradigm because:

> Here we sit in the Information Age, the Knowledge Age, the Meaning Age—whatever it's called, we all feel besieged by more information than any mind can handle. While information may be immaterial, we are all suffering under its weight. Information overload is a major problem. (Wheatley, 1999, pp. 165-166)

As Rosen, Digh, Singer, and Phillips (2000) stated "technology has created a world of speed and complexity. Only collaborative leaders who build productive networks will thrive. By communicating deeply, they inspire others to action and greatness" (p. 96).

Pink (2006) stated:

> The last few decades have belonged to a certain kind of person with a certain kind of mind—computer programmers who could crunch code, lawyers who could craft contracts, MBAs who could crunch numbers . . . the future belongs to a very different kind of person with a very different kind of mind = creators and empathizers, pattern recognizers, and meaning makers. (p. 1)

With the accelerated rate of change, it is true that leaders must lead change. Technology has created a borderless world and economy and the exponential growth of globalization. Distance and time are no longer factors in conducting business, in world politics, and in society. Work, communication, and politics can be done anywhere and anytime. The male-dominated hierarchical model no longer can meet the needs of business because of all of these factors (Bardwick, 1996; Lowney, 2003).

Ulrich (1996) listed five assumptions for the evolution of leadership, moving:

1. From leadership at the top to shared leadership. The future and real heroes of business will be unnamed leaders.
2. From one-time events to ongoing processes.
3. From individual champions to team victories. In an increasingly interdependent world, leadership must be created through relationships more than through individual results.
4. From problem solvers to pioneers.
5. From unidimensional to paradoxical thinking (learn to live in ambiguity and balance competing demands). (pp. 212-213)

Pink (2006) confirmed that we are moving into the conceptual age, where the right-brain (creative, big picture thinking) is moving into the mainstream so people can adjust, understand and react to events in the 21st century.

In the old hierarchical models, leaders of the past would tell people what to do. Nowadays, leaders will not know enough to tell because of all the rapid changes and complexities so leaders of the future will be asking instead of telling. Also, because of all the rapid changes, leaders have to constantly be willing to learn and grow (Goldsmith, 1996; Kouzes & Posner, 1997). This ties directly back to Heifetz and his concept of technical and adaptive approaches of leadership covered earlier.

"Hierarchy and defined power are not what is important; what's critical is the availability of places for the exchange of energy" (Wheatley, 1999, p. 72). This is where the decisions need to be made. Goldsmith et al. (2003) emphasized this:

> The hierarchical model of leadership, once so prevalent in organizations around the world, is being replaced with a new kind of leadership that relies on partnerships and persuasion through the power and value of ideas. Global leaders will use influence rather than command and control management as their operating style. . . . Business boundaries are becoming looser, and communities are converging across organizations, regions, and industries. (p. 67)

Rosen et al. (2000) also supported this when they said "organizations are less brick and mortar and more communities of networks these days. Leaders must be community builders. By creating a climate of trust and teamwork, they focus on three key strategies: managing knowledge, developing networks, and building alliances" (p. 281). All aspects that once were not recognized as leadership characteristics, are attributable to women's characteristics.

All this shows how globalization has added to the complexities of leadership and why leadership is evolving to meet the 21st century. Building partnerships and alliances is now important not only within organizations but across the organization as well. As the business environment has become more complex and the information so prevalent, it has become necessary to coordinate and work in cross-functional teams and not rely on

the traditional hierarchy. Participatory management, consensual decision making and two-way flows of information is critical to be an effective global leader. Hierarchical organizations are not set up to handle any of these factors (Harari, 2002; Kouzes & Posner, 1997; Raelin, 2003).

Many companies are transitioning from the old, top-down approach of management to a flatter, more decentralized work environment to better meet the competitive and economic issues of doing business in the 21st century. The importance of leadership at all levels is key. It behooves all leaders to grow the leadership skills of all their people (Harari, 2002; Maxwell, 1993, 1998; Raelin, 2003).

> In flattened organizations, responsibility and accountability are shared at all levels of the company. . . . Flattening also means that power, authority, and decision making are more widely and deeply dispersed, both laterally and vertically, giving each individual an opportunity to show his or her prowess in certain areas of the company. The global leaders who recognize, develop, and make use of the expertise of each individual will further the company's success. (Goldsmith et al., 2003, pp. 97-98)

What fascinated me in my research is when I read Pauline Graham's book, *Prophet of Management*, about Mary Parker Follett. Follett was writing and presenting these concepts of empowerment and decentralized work environment back in the 1920s. Bennis (as cited in Graham 1995) wrote:

> Just about everything written today about leadership and organizations comes from Mary Parker Follett's writings and lectures. . . . Effective leaders look for good people from many molds, and they encourage them to speak out, even to disagree. Aware of the pitfalls of institutional unanimity, some leaders wisely build dissent into the decision-making process. Like good leaders, good followers understand the importance of speaking out. (p. 179)

Wilson (2004) also recognized Follett as an authority on leadership and management. She stated:

> Before there was an Internet, before there was television—in fact, before talking movies—there was Mary Parker Follett, who may quite possibly be ground zero in the study of female-oriented management theory. . . . Follett saw a work world filled with interconnections. Of course, when she spoke on the topic (which was often), she would have been addressing men, since there were virtually no women leading at that time. Follett, being a woman of her own era, also didn't point out that these qualities were most often found in females; she "simply advocated the democratic, participatory style as more effective and more sound from a business perspective." (pp. 7-8)

Unfortunately, her ideas and theories were not accepted in the United States. Great Britain and Japan did take her theories and implement them in their businesses. Follett's theories are now re-emerging in the United States. I believe this is because United States businesses look to Japan for better ways of conducting business in the global environment. I wonder if her philosophy and ideas were not heard because she was a woman, or if it was because she was so far ahead of her time that people were not able to make the leap to her paradigm. Graham (1995) stated "she was neither an academic who could build a cadre of devoted students nor a chief executive who could create a model organization, so she lacked two means for ensuring lasting impact" (p. xvii).

Follett's research and papers envisioned a future that the current hierarchical and industrial era of her time could not see, let alone implement. She was interested in the individual. She believed that by fulfilling the individual's potential one can also strengthen and develop the groups to which one belonged. "Bureaucratic institutions with hierarchical structures are not appropriate for the purpose and should be replaced by group networks in which members can analyze their problems and produce and implement their own solutions" (Graham, 1995, p. vii).

Graham (1995) stated that:

> Follett proposed that a leader is one who sees the whole situation, organizes the experience of the group, offers a vision of the future, and trains followers to be leaders. Many decades and hundreds of how-to-be-a-leader books later, her definition cannot be improved upon. (p. xiv)

A theme throughout all of her work is the importance of relationships, not just transactions, in organizations.

> Her identification of the importance of "horizontal authority," which she described in terms of cross-functional committees and "conferences of parallel heads," fits exactly a shift many companies are making toward recognizing the importance of cross-functional collaboration and peer networks in running flatter, leaner organizations. (Graham, 1995, p. xvi)

She was definitely ahead of her time and not recognized in the United States.

Changing paradigms—Women's characteristics needed? The old paradigm where "male children learn to put winning ahead of personal relationships or growth; to feel comfortable with rules, boundaries, and procedure; and to submerge their individuality for the greater goal of the game" (Helgesen, 1995a, p. 39) is no longer applicable. The fact that "females learn to value cooperation and relationships; to disdain complex rules and authoritarian structures; and to disregard abstract notions like the quest for victory if they threaten harmony in the group as a whole" (Helgesen, 1995a, p. 39) is why they are ready to lead in the 21st century. In the hierarchical, industrial paradigm, "these feminine principles had little chance for influence in the days when corporations were still 'strictly male cloning production,' . . . when 'the ideas, brains, and creative instincts of women had no part in fashioning our society's organizations'" (Helgesen, 1995a, p. 39). But, as the business world enters into the 21st century, the paradigm has shifted from the industrial age to the information age, from the hierarchical model to the networking model. Countries, companies, and communities have had to change because of rapidly changing technologies, globalization, inundation of information, and the

shortage and diversity of skilled labor that includes a large percentage of women. Companies:

> are reinventing themselves to accommodate a wider focus, to foster creativity and nurture new ideas—simply in order to survive. Thus, they are finding common ground with the values that women have been raised and socialized to hold, the values that underlie the feminine principles. (Helgesen, 1995a, p. 39)

In the hierarchical model and industrial paradigm, reaching the top, being the one in control, and having the power over others, are the ultimate goals; whereas, in the networking model or, as Helgesen (1995a) called it, in the web, the top is not the optimum place to be because it is too far from the center. "The ideal center spot in the web is perceived in the hierarchical view as 'being stuck' in the middle—going nowhere" (Helgesen, 1995a, p. 50). She stated:

> the web is particularly suited as an architecture for our era because it's very design mirrors the structure of our primary technology, the integrated network . . . . Indeed, nothing proves the obsolescence of hierarchical structures or underlines their essential inappropriateness for our era so profoundly as today's technology; nor is anything so responsible for their demise. (Helgesen, 1995b, pp. 13-14)

With the shift from the industrial paradigm to the information age, from hierarchical to networking models, organizations are struggling with the challenges of how to meet the demands of the 21st century and the people that work within the structure. Because information is now available to just about everyone, it no longer is power to the elite or the top of the hierarchical structure. Decisions need to be made at all levels by those that know what is happening. Communications need to be quick and efficient. Stovepipes of the hierarchical structure cause too many delays in a time sensitive environment of current business. Thus, the idea of the web better fits these

demands than the hierarchical model. The web organization is more organic and mimics life instead of being mechanistic, closed and static (Helgesen, 1995b; Wheatley, 1999).

> We also move away from perhaps the essential aspect of the estrangement of human beings from nature that took root in the Industrial Revolution: the belief that, to be efficient, organizations must mimic the design and workings of a machine. (Helgesen, 1995b, p. 17)

Pink (2006) also emphasized this: "In the Conceptual Age, we will need to complement our L[eft]-Directed reasoning [logical, sequential, and analytical] by mastering six essential R[ight]-Directed aptitudes" (p. 65). The R-Directed aptitudes include the following:

1. Not just function but also DESIGN
2. Not just argument but also STORY
3. Not just focus but also SYMPHONY
4. Not just logic but also EMPATHY
5. Not just seriousness but also PLAY
6. Not just accumulation but also MEANING. (Pink, 2006, pp. 65-66)

Both the hierarchical model and the networking model, or web, using Helgesen's (1995b) term, reinforce themselves:

> Hierarchies . . . tend to reinforce one another. Since hierarchies are pyramidal, information must travel up and down a strictly defined vertical chain of command, which discourages direct communication across levels. The adherence to channels accentuates the importance of rank within the organization, keeping the focus on what position a person has attained rather than on what he or she actually does. (p. 21)

The networking model/web structures also reinforce themselves. Because they are not pyramidal:

> Those who emerge in them as leaders tend to be people who feel comfortable being in the center of things rather than at the top, who prefer building consensus to issuing orders, and who place a low value on the kind of symbolic perks and marks of distinction that define success in the hierarchy . . . enables people to focus on what needs to be done rather than who has the authority to do it. . . . Webs also allow for great flexibility. As one woman business leader I interviewed pointed out, "When you have a circular arrangement, you can shift

> people around with relative ease. Since they don't perceive themselves as moving up or down, they don't worry that a shift really means they're being demoted, or assume they're being promoted and demand a raise." (Helgesen, 1995b, pp. 20-21)

The contrasting models of hierarchical and networking or web also reveal different notions of what constitutes effective communications. Helgesen (1995a) noted that "hierarchy, emphasizing appropriate channels and the chain of command, discourages diffuse or random communication; information is filtered, gathered, and sorted as it makes its way to the top" (p. 50). In today's world, the length of time for communications to span the business has to be rapid. Using a business phrase *the sun never sets,* means work is being conducted anytime and anywhere, and emphasizes the need for rapid communication. The hierarchical model does not lend itself for rapid communications. Also, with all the complexities and globalization, how can one person know what should or should not be filtered. Critical information can be lost in the hierarchical structure. That is why the networking or web model fits the 21st century needs of communication. "The web facilitates direct communication, free-flowing and loosely structured, by providing points of contact and direct tangents along which to connect" (Helgesen, 1995a, p. 50).

So, the networking or web model is obviously more suited to the 21st century information age than the hierarchical structure. There are still obstacles to the acceptance of the networking/web model though. As Helgesen (1995a) stated,

> Yet hierarchical concepts have continued to influence institutional structures because they represent a particular manifestation of male psychology, meeting male needs for limits and boundaries on relationships in the workplace, and satisfying the male value for ends over means. But as women continue to assume positions of influence in the public sphere, they are countering the values of the hierarchy with those of the web, which affirms relationships, seeks ways to

> strengthen human bonds, simplifies communications, and gives means an equal value with ends. (p. 52)

In the 21st century, the focus is not only on the best model to use to meet all of the demands for business, but also on the people working in business.

> Employees today are less likely to put up with a workplace that emphasizes efficiency at the expense of meeting human needs . . . leaders must create an ambiance that reflects human values, and devise organizational structures that encourage and nurture human growth. (Helgesen, 1995a, p. 235)

Helgesen(1995a) also stated that "what business needs now is exactly what women are able to provide, and at the very time when women are surging into the work force" (p. 39). So, as women's leadership qualities are becoming recognized in the business and organizational arena, people are open to possibilities that the evolution of leadership brings, "a more collaborative kind of leadership, and changing the very idea of what strong leadership actually is. The old lone hero leader is increasingly being recognized as not only deadening to the human spirit, but also ultimately inefficient" (Helgesen, 1995a, p. 249).

Leadership of the 21st century—Women recognized? As stated in the previous sections, for the 21st century, the industrial paradigm does not fit the needs of a world rapidly being transformed by a massive paradigm shift in social values. "In the face of increasing chronic organizational chaos and dysfunction, some recognize that the ways they have been conditioned to lead are insufficient; they are primed to explore a greater wholeness" (Cannon & Anderson, 2003, p. 2). In the 21st century, the evolution of leadership involves developing ways out of the industrial problems. Bureaucracy and position are no longer the drivers. Mechanistic structures and fixes do not fit the new paradigm. Values are what are important. "We need new leadership. We need authentic

leaders, people of the highest integrity . . . who have a deep sense of purpose and are true to their core values" (George, 2003, p. 5). People are looking for authenticity. They trust people who are transparent, who say what they mean, mean what they say and do what they say. Their actions match their words and their behaviors align with their belief systems (Arrien, 1993; George, 2003; Wilson, 2004). But, as Wilson (2004) stated:

> Unfortunately, they're not the norm. Both genders leave a little of themselves at the office door when they choose to lead. Men, for instance, must often "get with the program" and conform to the expectations of male leaders. The difference is, men conform to other men and, in that conformity, retain the essence of being a man. Women, on the other hand, often find they must lose qualities associated with being female to blend in with the boys. Once gone, it is terribly difficult to reestablish this voice. (p. 96)

Yet, with the demands of the 21st century, "the female view that one strengthens oneself by strengthening others is finding greater acceptance, and female values of inclusion and connection are emerging as valuable leadership qualities" (Helgesen, 1995a, p. 233). Collins (1999), in his article "And the Walls Came Tumbling Down" also talked about values in that "core values and purpose provide the glue that holds our organizations together as it expands, decentralizes, globalizes, and attains diversity" (p. 2) .

Pink (2006) offered the concept of moving from the information age to the conceptual age:

> The Industrial Age, massive factories and efficient assembly lines powered the economy. . . . The Information Age, the United States and other nations began to evolve. Mass production faded into the background, while information and knowledge fueled the economies of the developed world. . . . The Conceptual Age . . . fed by affluence (the abundance that characterizes Western life), technological progress (the automation of several kinds of white-collar work), and globalization (certain types of knowledge work moving to Asia) . . . progresses . . . to a society of creators and empathizers, of pattern recognizers and meaning makers. (pp. 48-50)

Bennis and Nanus (1997), in their book *Leaders: Strategies for Taking Charge*, provide their expertise on the future of leadership. They believed that leadership is about character; what is most important in leadership cannot be easily quantified. As Collingwood and Kirby (2001) noted, "there is far more interest in leadership . . . than there is agreement on it. No topic in business is more hotly debated" (p. 51). All aspects of leadership are now being studied from all sources that also lead to debate.

"We live in a hyperlinked, 24-hours-a-day world where everyone is swimming, if not drowning, in information and options. Wealth and techno-gadgets have brought us more stress and more discontent, not less" (Freiberg & Freiberg, 2004, p. 212). The explosion of access to computing and technologies has made it so easy now to participate in the global information super-highway using the internet. There is so much information that it is very difficult to discern the big picture. Because of the internet, mass media coverage, and technologies available, there is an erosion of the distinction between private and public life. The multinational, global businesses are a prominent fact of life in the 21st century. Because of these trends, Heifetz (2001) believed that leadership requires a learning strategy. Especially in today's world, "a leader has to engage people in facing the challenge, adjusting their values, changing perspectives, and developing new habits of behavior" (Heifetz, 2001, p. 276). To keep organizations competitive, leaders should be less concerned about structure than about what to do to motivate and create a balanced culture of respect, caring, and trust. As George (2003) stated:

> Balanced leaders develop healthier organizations. By appropriately delegating their work, balanced leaders are able to make more thoughtful decisions and lead more effectively. Their employees make higher levels of commitment to the organization. In the end they achieve better results on the bottom line. (p. 46)

Bennis and Nanus (1997) emphasized the significance of realizing a vision. They believed:

> Focusing attention on a vision, the leader operates on the *emotional and spiritual resources* of the organization, on its values, commitment, and aspirations. It remains for the effective leader to help people in the organization to know pride and satisfaction in their work. (p. 85)

Now more than ever, the importance of vision is proving to be critical. Reliance on the old paradigm hinders vision and peoples acceptance of that vision. Because of the complexities, everyone is involved in making the vision a reality. Kotter (1998) stated "what's crucial about a vision is not it's originality, but how well it serves the interests of important constituencies—customers, stakeholders, employees—and how easily it can be translated into a realistic competitive strategy" (p. 43). So, a main ingredient of leadership is the capacity to generate and sustain trust. George (2003) linked trust to relationships. "Enduring relationships are built on connectedness and a shared purpose of a common goal. . . . Trust is built and sustained in the depths of these relationships" (pp. 40-41). Flattened organizations depend on trust and relationships to getting work accomplished. The networking model emphasizes the connectedness and communication necessary. The vision holds the organization and the business together and gives direction for success.

I believe the end result of leadership is empowerment. This is supported by the literature. "Organizational culture helps employees generate a sense of meaning in their work and a desire to challenge themselves to experience success" (Bennis & Nanus, 1997, p. 203). Collingwood and Kirby (2001) stated "one thing that makes a good leader is the ability to offer people intrinsic rewards, the tremendous lift that comes from being

aware of one's own talents and wanting to maximize them" (p. 64). Freiberg and Freiberg (2004) also commented on this:

> All in all, the typical employee is now likely to welcome and often yearn for more community, meaning, and altruism in the workplace. Give people a crack at something noble and fulfilling, and they will show you a level of dedication and productivity that may well transform your company. (p. 212)

Pink (2006) also emphasized the need for meaning being sought by people now to make up for the abundance we have in the western civilizations. As we go forward, empowerment is key.

Collins (1999) noted that "the organization of the future, one in which the walls that have traditionally defined organizational boundaries—what you own, what you control, whom you employ, where they work—will cease to have any significant meaning" (p. 1). He also stated:

> Technology allows us to access Harvard lectures without being admitted inside the exclusive gates of the Harvard student body. The internet allows us to share databases directly with colleagues at organizations around the world, without being on the staff of those organizations. (p. 5)

This is where Helgesen's (1995b) showed, in the concept of web structure, the new model for the 21st century:

> In the process of devising ways of leading that made sense to them, the women I studied had built profoundly integrated and organic organizations, in which the focus was on nurturing good relationships; in which the niceties of hierarchical rank and distinction played little part; and in which lines of communication were multiplicitous, open, and diffuse. I noted that the women tended to put themselves at the centers of their organizations rather than at the top, thus emphasizing both accessibility and equality, and that they labored constantly to include people in their decision-making. This had the effect of undermining the boundaries so characteristic of mainstream organizations, with their strict job descriptions, categorizing of people according to rank, and restrictions on the flow of information. (p. 10)

> Cannon and Anderson (2003) also stated:

> We believe that women leaders are at the bleeding edge of a potential historic shift from Dominator society guided by control, power over, and conquest, to a Partnership society characterized by linking, mutual respect, and equality, and are well positioned to influence the outcome. (p. 3)

The reasons for this are many. There is no security for the employees in exchange for loyalty from companies anymore. Downsizing and sourcing work to businesses around the world have nullified security. Employees are disillusioned with and distrustful of traditional chain-of-command leadership because of bad decisions made by executives at the top of hierarchy and all of the scandals that have rocked corporate America. Plus, the fact that the lines between men and women's domains have blurred, causing some men to be more open to learning things from women (Helgesen, 1995b; Hostetler, 1994; Northouse, 2004).

Today's organizations are very different because of all the new demands of the 21st century. The hierarchical structure has given way in businesses that have embraced new technologies, globalization, and adjusted to the complexities involved. They have shifted to less formal structures of networking or web that deemphasize the hierarchical chain of command. Belenky et al. (1973) believed this shift will bring women's values and principles of leadership to the forefront:

> When scientific findings, scientific theory, and even the basic assumptions of academic disciplines are reexamined through the lens of women's perspectives and values, new conclusions can be drawn and new directions forged that have implications for the lives of both men and women. (pp. 8-9)

Wilson (2004) also stated "a core of what women bring to leadership—a tendency toward greater inclusiveness, empathy, communication . . . focus on broader issues—makes stronger government and richer business" (p. 6). She emphasized "fresh eyes and fresh solutions applied to old and abiding problems, unique skills honed through family and

community service, the opportunity for a true democracy, transforming business and politics: There are the advantages of the leadership of women" (Wilson, 2004, p. 37) . Wilson (2004) concluded:

> The ways women lead are embraced by management consultants because they're transformational and good business practice. Employees are happier and more productive with women's style. . . . In every sector, in every business and legislature, the power of women's work and women's values is our best hope, our best intervention, the only solution we haven't tried, and the one that is guaranteed to succeed. (pp. 147-148)

Women in Corporate America

My research on women in corporate America was based on the timeframe after 1999 because leadership studies of women have changed over the last 10 years. As stated before, the literature in the 1980s and 1990s focused on whether women's style was their own or mimicked of a masculine style (Andolsen et al., 1985; Helgesen, 1995a, 1995b; Wolfman, 1984). More recently, the focus on masculine or feminine styles to characterize women's leadership has been criticized because gender labeling reinforces stereotypes and further marginalizes women. The focus now is on different styles not based on masculine or feminine, but on personality, work environment, and the situation (Chapman & Luthans, 1975; Due Billing & Alvesson, 2000; Hostetler, 1994).

As stated earlier, since the turn of the century, leadership studies have been focused on the shift of the definition and characteristics of leadership because of globalization and technology. Leadership has evolved as we move from the industrial age to the information age because of the many challenges of the new century (Goldsmith et al., 2003; Rosen et al., 2000). These challenges included the lack of clear lines of authority, the increased complexity of the world, the exponential increase in the rate of change; the explosion in technology; and globalization (Beckhard, 1996). Technology

created a borderless world and economy. Distance and time are no longer factors in conducting business, in world politics, and in society. Work, communication, and politics can be done anywhere and anytime. The hierarchical model no longer can meet the needs of business because of all of these factors (Bardwick, 1996; Lowney, 2003).

The demands of the 21st century being placed on organizations, businesses, and society as a whole are opening doors for alternative voices. Women and people of color are bringing their abilities and skills to the work force. These abilities and skills are being accepted because the old industrial paradigm and hierarchical structures cannot keep up with the demands of globalization. Diversity, understanding, and acceptance, is the driver now for going into the 21st century. This means that the industrial paradigm does not fit the needs of a world rapidly being transformed by a massive paradigm shift in social values.

In corporate America, there is still a need to understand at a deeper level gender stereotyping, the lack of progression of more women in higher management, and how to address the buried discriminatory practices in corporations. I did research on women's access to higher leadership in corporations to understand what has been studied and where there were gaps for further study.

Glass ceilings and access to corporate boards. Many studies have dealt with the subject of women's access to corporate boards (Bennett, 2002; Burke & McKeen, 1996; Cooper, 2001; Lyness & Thompson, 2000). Some focused on the company level and others studied corporations within the United States. Many of the samples for the research were from annual studies of public companies. Many researchers are using the internet to gather information about corporations. A lot of the studies arrived at the same

conclusion—that more women need to be on corporate boards and that the lack of growth in numbers of women directors on corporate boards is disappointing (Adams & Flynn, 2005; Arfken, Bellar, & Helms, 2004; Burgess & Tharenou, 2002). One reason for this is the lack of gender equity in top corporate executive positions. Healy and Zucca (2004) used Standard & Poors' (S&P) CompustatExecuComp database for 1992-1997 to "confirm that the significant differences between male and female executives (after controlling for job title, company size, and industry membership) are human capital differences such as age and years of service in their job positions rather than compensation" (p. 56). By looking at the five most highly compensated executives for each company in the S&P database, they were able to compare salaries, time in position, look at what industries, job level, and firm size.

> This study indicates that although female executives do not earn significantly less than their male counterparts in the same company positions, they do not occupy the same highly paid positions in the company, and they do not occupy executive positions in all industry segments. . . . Access of women to all job titles and the power inherent in those positions is not equal. (Healy & Zucca, 2004, p. 61)

Other studies researched the glass ceiling effect on women reaching higher levels of leadership and management (Bajdo & Dickson, 2001; Bennett, 2002; Cooper, 2001; Dreher, 2003; Dwyer, Richard, & Chadwick, 2003; Feyerherm & Vick, 2005; Goldberg, Finkelstein, Perry, & Konrad, 2004; Goodman, Fields, & Blum, 2003; Krishnan & Park, 2005; Maume, 2004). Maume (2004) looked at the glass ceiling concept to prove that a previous study about the glass ceiling being a unique form of discrimination does increase at higher levels of management. He did a longitudinal analysis of managerial attainment of women and Blacks compared to white men. He used data from the Panel

Study of Income Dynamics (PSID)—about 7,000 households with 26,000 individuals over a 12-year period.

> Granting control over the firm's human and fiscal resources is an important symbolic display of trust in the worker. If firms are more willing to promote White men to managerial status than women and minorities, then a significant mechanism by which inequality is created and sustained has been identified. (Maume, 2004, p. 255)

The study did confirm the findings of Cotter (as cited in Maume, 2004) and "add[ed] weight to the contention that the glass ceiling is a unique form of racial and gender discrimination that increases in severity at higher levels of attainment and later in the life cycle" (p. 267).

Corporate culture, networking, mentoring, and leadership development. As I read through a number of studies, there was a reoccurring theme of corporations needing to examine the organizational culture, corporate characteristics, and human resource management practices in place to support women's career growth and advancement. It is critical for corporations to take advantage of all talent pools to be competitive.

> Huitt (1998) argues that the ascent of women in organizations is occurring at a time when organizations are making their transition from the industrial to the information age, an era that is witnessing considerable diversity in the work place. Organizations are creating a climate that is more likely to assimilate cultural differences in order to capitalize on opportunities in the global environment. Organizations operating in this information era are shifting to network and knowledge-based, and holistic- and facilitating-type structures, which are androgynous and more conducive to the management style of women. (Krishnan & Park, 2005, p. 1718)

To take advantage of what women can bring to the organization, career development issues need to be addressed, as well as adequate mentoring and opportunities to operate in line functions (Krishnan & Park, 2005).

> In a Business Week survey of 400 American women in management, 70% cited "the male dominated corporate culture as an obstacle to their success" . . . and Lyness and Thompson (2000) found that female executives reported greater barriers to their advancement including lack of culture fit and exclusion from informal networks than did male executives. (Bajdo & Dickson, 2001, p. 400)

Many studies have been able to show correlations between women's advancements and having a corporate culture in place that supports growth, development, opportunities, and work-life human resource practices. Research supports that corporations looking for good talent need to ensure that their organizational culture is supportive of women (Bajdo & Dickson, 2001; Catalyst, 1992; Dreher, 2003; Dwyer et al., 2003; Forret & Dougherty, 2004; Krishnan & Park, 2005). I want to expand these types of studies by also looking at the social support structure and personal characteristics needed for a successful career.

Corporations should focus on personal growth for leadership development (Boags, 2004; Buckley, 2008; Catalyst, 1992; Corporate Leadership Council, 2003a, 2003b; Hernez-Broome & Hughes, 2004; Northouse, 2004). A couple of examples that supports this include a look at executives at midlife—a study of eight senior executives, four women and four men (Lyons, 2002). The other is a study of leadership development with black professional women (King & Ferguson, 2001). Both did in-depth reviews using different tools for thorough analysis and feedback for personal growth. The midlife study used "a psychologically rigorous executive development process, . . . termed New Leader . . . [including] in-depth 360-degree feedback, . . . client observations, leadership assessment instruments, . . . and personality tests" (Lyons, 2002, p. 16). In the black professional women study, deep talk was used. "Deep talk [is] a West African concept that is an ever-deepening spiral of conversation. . . . There is no end point or answer, but a sustained level of revelation and discovery" (King & Ferguson, 2001, p. 123). Both

found that self-study was instrumental in gaining insights to both micro-level relationships and macro-level dynamics which helped in personal growth and leadership. This ties to the factor of personal characteristics I am using in my dissertation.

Corporations should also focus on networking and mentoring, and understanding the differences between male and female advancement based on these two factors (Catalyst, 1992; Livers & Caver, 2003; Lyness & Thompson, 2000; Northouse, 2004; Rhode, 2003; Rothstein, Burke, & Bristor, 2001). An example of this is a study that focused on executive careers. "The overall findings suggested that although their developmental experiences and career histories were similar, the women faced greater barriers and they relied on different strategies for advancement than did their male counterparts" (Lyness & Thompson, 2000, p. 97). Successful women reported mentoring did not help them in their career advancement like men have reported. This could be because women do not have as many same-sex opportunities for mentoring that men do within their area and women have to look to other organizations within their corporation to find mentors and to be able to network.

> By going further afield, women were tapping into different networks than men. This was further supported by the lower levels of status and power in the networks of women managers. . . . It may be that these lower status and power networks are a contributing factor to the difficulty women experience getting promoted to senior management. (Rothstein et al., 2001, pp. 21-22)

Another example researched the setting up and ultimate failure of a women's network in a corporation. The network (Women's Advisory Council) was to improve women's opportunities and place in the organization (Bierema, 2005). The network consisted of 10 of the top corporate executives. Bierema (2005) used the stages of concern model by Hall and Hord (as cited in Bierema, 2005). "The model was developed

using a concerns-based approach and conceptual framework known as the concerns-based adoption model (CBAM)" (Bierema, 2005, p. 9):

> The findings presented show that the executive women had many concerns about the innovation of the Women's Advisory Council. The concerns fell most significantly into the Stages of Concern model's task areas of personal and management and the impact cluster of consequence. The women felt that the corporate structure and culture were inhospitable toward the initiative and that the Council agenda was not clear, nor was its purpose. (p. 16)

Bierema believed that the culture of the organization has to be evaluated and conscious steps taken to address the concerns and inhospitable environments for women.

There are steps that women and organizations can take to counter these findings. First, female managers need to look at more senior levels of management for mentors and networking. And second, the senior female managers need to be mentors and serve as role models. Organizations need to "make explicit efforts to facilitate the development of social networks to provide the support and benefits of these relationships to their managers as part of their career and succession planning programs" (Rothstein et al., 2001, p. 23). Organizations "that are interested in helping female managers advance should focus on breaking down the barriers that interfere with women's access to developmental experiences" (Lyness & Thompson, 2000, p. 98).

Male-female comparisons. There have been many studies that compare men's career progression to women's based on gender identity and stereotypes (Agosto, 2004; Atwater, Brett, Waldman, DiMare, & Hayden, 2004; Auster & Ekstein, 2005; Catalyst, 1992; Dennis & Kunkel, 2004; Feyerherm & Vick, 2005; Jandeska & Kraimer, 2005; Larsen & Stubbs, 2005; McColl Kennedy & Anderson, 2005; Moss, Barbuto, Matkin, & Chin, 2005; Simpson & Lewis, 2005).

Several studies focused on the perception of leadership styles and roles, whether the styles were masculine or feminine, and what the implications to women's advancements and opportunities were because of these perceptions (Atwater et al., 2004; Dennis & Kunkel, 2004; Eddleston, Baldridge, & Veiga, 2004; Kim & Shim, 2003; Kirchmeyer, 2002a, 2002b; Powell, Butterfield, & Parent, 2002). "Despite the progress of women in corporate America and small signs of change detected in previous perceptual studies, being male and possessing masculine characteristics continue to be associated with positions of leadership in organizations" (Dennis & Kunkel, 2004, p. 166).

> Despite the considerable increase in the proportion of women managers . . . [from 1976-1999] and the emergent call for a greater emphasis on feminine characteristics in management, men and women of varying age, education, and work experience still describe a good manager as possessing predominantly masculine characteristics. (Powell et al., 2002, p. 188)

Atwater et al. (2004) went deeper and looked at sub-roles in management positions within organizations to see what was considered masculine and feminine. Further research needs to be done to ensure that gender typing is fully understood and to help understand why women face obstacles in advancing in corporate America. For example:

> Research has demonstrated that strategic decision-making, delegating, and resource allocation are more important at higher levels of management. Our findings suggest that both men and women see each of these roles as more masculine. It follows that if the top-level management positions in organizations include more masculine than feminine sub-roles, women would be perceived as less capable to assume these higher level positions. (Atwater et al., 2004, p. 197)

Corporations need to pay closer attention to gender typing to ensure that men and women have equal chances of advancing:

> If the proportion of women in top management positions becomes more similar to the proportion of men in such positions and/or further evidence is accumulated about the advantages of feminine leadership to organizations, managerial

> stereotypes may continue to change in the direction of placing less emphasis on masculine characteristics. However, for the time being, managerial stereotypes continue to emphasize a belief of "think manager-think masculine." (Powell et al., 2002, p. 191)

One case I studied was about the character of Captain Kathryn Janeway from the television series *Star Trek: Voyager* in an attempt to "uncover the way in which research on leadership has been constrained by a reliance on the categories male-female and/or masculine-feminine" (Bowring, 2004, p. 381). Bowring (2004) studied television episodes and examined the multiple constructions of Janeway's character. She also used other studies of the *Star Trek* series to compare results. For example, Bowring used Helford's (as cited in Bowring, 2004) study on Captain James Kirk. She researched academic journals and books related to the *Star Trek: Voyager* series. Bowring found that we need to:

> Move beyond the binary distinctions that imprison so much organizational research, even research that seeks to uncover women's experience. . . . It should stop assuming that there are only two types of leaders, two gender identities, male and female, and that one male or one female speaks for all males or females respectively. . . . It should replace these presuppositions with the acknowledgement that gender, identity, and leadership are constituted of many parts: body, culture, desire, experience, and relationships are only some of them. (pp. 401-403)

Bowring took women and diversity a step further to make the point that we should look at leadership beyond the male/female characteristics and focus on all aspects that make up leadership. I hope to find what those aspects are based on the women's perceptions that answer the survey to include corporate culture, social support, and personal characteristics.

Engineering/resistance to diversity. Simpson and Lewis (2005) reviewed the literature on gender and organizations through the lenses of voice and visibility. They further differentiated between *surface* and *deep* conceptualizations:

> With "voice," we therefore distinguish between the "surface" act of speaking/being heard as discussed within "women's voice" literature and, at a deeper level, the power of silence as discursive practices eliminate certain issues from arenas of speech and sound. Similarly, we can see visibility as a "surface" state of exclusion and difference while, at a deeper level, conceptualizations can usefully explore the power of "invisibility" and the battle for the (male) norm. (Simpson & Lewis, 2005, p. 1253)

Simpson and Lewis used this review to show how voice and visibility are interrelated and contribute to an understanding of gendering of organizations.

More work and research is needed to understand the multifaceted aspects of gender and the organization though. This study was a starting point to look more deeply at voice and visibility and can be used as a foundation for future studies and research. I am basing my studies on the voice of the women in my survey.

Another study explored the language in leadership that may lead to invisible discriminatory practices in an organization. Lamsa and Sintonen (2001) focused on women-in-management literature and Eicher-Catt (2005) focused on the concept of servant leadership. For the women-in-management literature, Lamsa and Sintonen (2001) developed a framework that "de-essentializes the mechanisms of the 'natural and taken-for-granted traditions' of culture and emphasizes the possibility of multiple discourses and their usefulness" (p. 263). They believed by studying more than just style and glass-ceiling concepts, research will challenge the current male-dominated discourse that is so prevalent in corporations, organizations, as well as in literature.

Eicher-Catt (2005) put forth that not only is servant leadership not genderless, it actually perpetuates patriarchal norms. Servant leadership promotes an either/or logic (servant being feminine and leader being masculine) and perpetuate differences and stereotypes. Eicher-Catt stated "at the discursive level, my semiotic analysis reveals servant leadership's overriding masculine connotations stemming from religious, patriarchal ideology" (p. 23). If servant leadership is really genderless, there should be more women in senior management in corporate America. There are not, so Eicher-Catt contended that servant leadership is not innocent speech and proposed that new ways to understand leadership is needed, and "we need more leaders—male and female alike—who engage not in sedimented speech, but in 'authentic speech'" (p. 24).

Specifically for the male-dominated field of engineering, women are in a definite minority (Auster & Ekstein, 2005; Buckley, 2008; Burack & Franks, 2004; Catalyst, 1992; Chavanne, 2008; Jagacinski, 1987; National Academy of Engineering, 2004, 2005). Burack and Franks (2004) studied the engineering field and the resistance to diversity. They used a psychodynamic approach to group social identity to understand the resistance in the engineering field to institutionalizing diversity. "Group psychoanalysis uses clinical and social observation to analyze the ways in which shared defenses and unconscious assumptions influence processes and outcomes in groups, organizations, and larger social collectivities" (Burack & Franks, 2004, p. 81). They also focused on the leadership of the groups and how the leaders influenced the group's thinking/beliefs. Like the studies about women on corporate boards, this study concluded that diversity is needed in the engineering field for greater success and meeting future

needs. Also, the engineering culture needs to be further researched and ways to address the resistance to diversity studied.

Even though women have been earning engineering degrees since 1892, it is still a very male-dominated field. Engineering is the lowest of all STEM fields in recruiting and retaining women and minorities (Bell et al., 2003; Boyle Single et al., 2005; Busch-Vishniac & Jarosz, 2004; Capobiance, 2006; House et al., 2003; Nicholls et al., 2007; Tonso, 2006; Vogt, 2003).

> While some research exists; relatively little attention is directed toward retaining women engineers employed in the profession . . . given the lack of attention paid to these factors [supportive work environment; interesting and challenging work; balancing work-life] by many companies combined with a failure by companies to take women's complaints or suggestions seriously, it is not surprising that many of these women opt to leave the field. (Auster & Ekstein, 2005, pp. 18-19)

Studies have also shown that more women engineers are single or divorced and childless (Catalyst, 1992; Jagacinski, 1987). Also, gender differences favor men for advancement, supervisory roles, and salary (Auster & Ekstein, 2005; Catalyst, 1992; Jagacinski, 1987). Even in today's world, there is a need to push for legislation to improve the policies with federal agencies and academic institutions to eliminate gender biases in the STEM professions (ASCE joins in supporting women in science and engineering legislation, 2008). I used this as part of the basis for my chosen topic for my dissertation. By asking women in a survey for their perceptions, I hope to provide more findings on the topic.

Summary of women in corporate America. My review of existing literature suggests numerous recommendations for more women leaders at higher management levels in corporations. Unconscious assumptions still exist, as well as hidden and

underlying stereotypes and resistance to diversity. Where women are present in higher management, the corporations are producing better business and financial results.

Learning and growing is key to leadership and personal growth. Corporations need to ensure that the environment is in place to address for both men and women. "Male-dominant corporate cultures, while slowly and seemingly adjusting to increasing numbers of women in the workforce, continue to be a barrier for women leveraging their talents within the corporate setting" (Feyerherm & Vick, 2005, p. 222). The questions asked in a many studies focused on personal development and skills and abilities the individual could bring to corporate leadership. I was particularly impressed with the King and Ferguson (2001) study and their use of deep talk. Understanding at the micro-level is just as important as the macro-level in researching women in leadership. The more we can focus on individual needs and move away from stereotypical thinking, the more opportunities there will be for women in corporate America.

The surface of gender stereotypes and women's career progression has been studied thoroughly. Generalization and stereotyping is not the answer to understanding leadership. Getting to the individual characteristics and styles and understanding the importance of authenticity is where more research is needed. Another level of research and findings is needed to address how to eliminate obstacles and further women's opportunities in corporations. I am using the survey method to find out more about the obstacles and opportunities, how successful women were able to overcome them, and why some do not consider themselves successful. Many studies made suggestions for follow-up research. Further research should be done to understand more fully the gaps in opportunities for women and to expand the research to other minority groups. Also, there

was a call for future research on how to breakdown the stereotypes and evolve organizations that celebrate diversity. Finally, studies are needed to understand what the best networking and mentoring relationships are for men and women, and how organizations should develop programs to ensure equal opportunities for advancement.

Conclusion

In summary, here is a quote from Hill (2003):

> Through [her] research on leadership and globalization, [she has] come to understand that the best leaders are those individuals—women and men—who have an appetite for learning and are willing to work on themselves. Leadership is very hard, and even the most gifted individuals must commit themselves to lifelong learning and self-development. (p. 144)

Hill continued:

> In the 21st century, world-class companies will act, look, and feel like the most successful entrepreneurial ventures. . . . What will the leaders of these world-class companies look like? Leaders will be architects of these collectives. . . . Fundamentally, outstanding leaders today are comfortable sharing power and creating leadership opportunities for others. Despite all the talk about empowerment, many people are afraid to give up the control it implies. But the outstanding leaders are secure in themselves; they know their strengths and weaknesses. They know they don't have to have all of the answers. (p. 161)

There are a lot of how-to books, suppositions, and opinions available for the 21st century leader. Concentrated efforts on what women and people of color bring to leadership would be a welcome addition to leadership literature that is accepted and recognized, not only from the margins. As is often stated in the business world, the only constant is change. Leaders need to embrace change and lead their followers through the change because that is the hallmark of 21st century leadership.

I believe that this dissertation covers a gap in understanding women in leadership in corporate America, specifically the engineering field. The focus is on women engineers in corporate environments and the impacts of social support, career

development, and corporate culture on their career progression and the personal characteristics needed for a successful career. The aspects of social support include the factors of family, friends, and significant others and the level of support during the woman's career. The aspects of the culture of the corporation relevant to my focus in this study are a combination of gender consciousness and the types of networking, mentoring, and career development opportunities available for women. The culture of the organization is also based on whether it is male- or female-dominated. The aspects of personal characteristics include the level of perseverance (being persistent despite adversity or discouragement) and self-reliance (a belief in oneself and capabilities). As chapter 3 describes in detail, the research attempts to discover the factors related to a successful career path in the engineering profession from the women's perspective, using the following constructs: environmental, personal, and social support structure. The hypothesis is that social support is the make or break variable for women.

Chapter III: Research Method

Introduction

Chapter 3 covers the methodologies and procedures for this study of influences on the success of women engineers. I was interested in analyzing the factors supporting women engineers' leadership development and success. My particular focus was on women engineers in corporate environments, the personal characteristics needed for a successful career, and the impacts of social support, career development, and the corporate culture on their career progression.

Research Approach

There are many ways to conduct research today. Simply put, there are qualitative, quantitative, and mixed method approaches to research. I chose to do a quantitative study using survey research for data collection. The quantitative approach, as described by McMillan and Wergin (2002), "involves the use of numerical indices to summarize, describe, and explore relationships among traits. There is a reliance on control, statistics, measurement, and experiments" (pp. 3-4). Creswell (2003) stated "a quantitative approach is one in which the investigator primarily uses postpositivist claims for developing knowledge, . . . employs strategies of inquiry such as experiments and surveys, and collects data on predetermined instruments that yield statistical data" (p. 18).

The thesis for this study is that career success is a function of three interacting variables: personal qualities, such as resilience and personal development; environmental variables, such as corporate culture and professional development opportunities; and the strength of the social support network. The current study addressed the following specific research questions:

1. What is the relationship between the personal characteristics (resilience, education, age, and race/ethnicity) and career success of women engineers?
2. What is the relationship between the environment of the corporation in a woman's career (male/female dominated, professional developmental opportunities, mentoring, and networking) and the career success of women engineers?
3. What is the relationship between the social support structure (demographics of the family and perceived support from family, friends, and community) and career success of women engineers?
4. Is the relationship between social support and career success of women engineers stronger than the relationship between personal characteristics and career success, as well as between corporate culture and career success?

See Figure 3.1 for a graphical representation of the overall research question diagram.

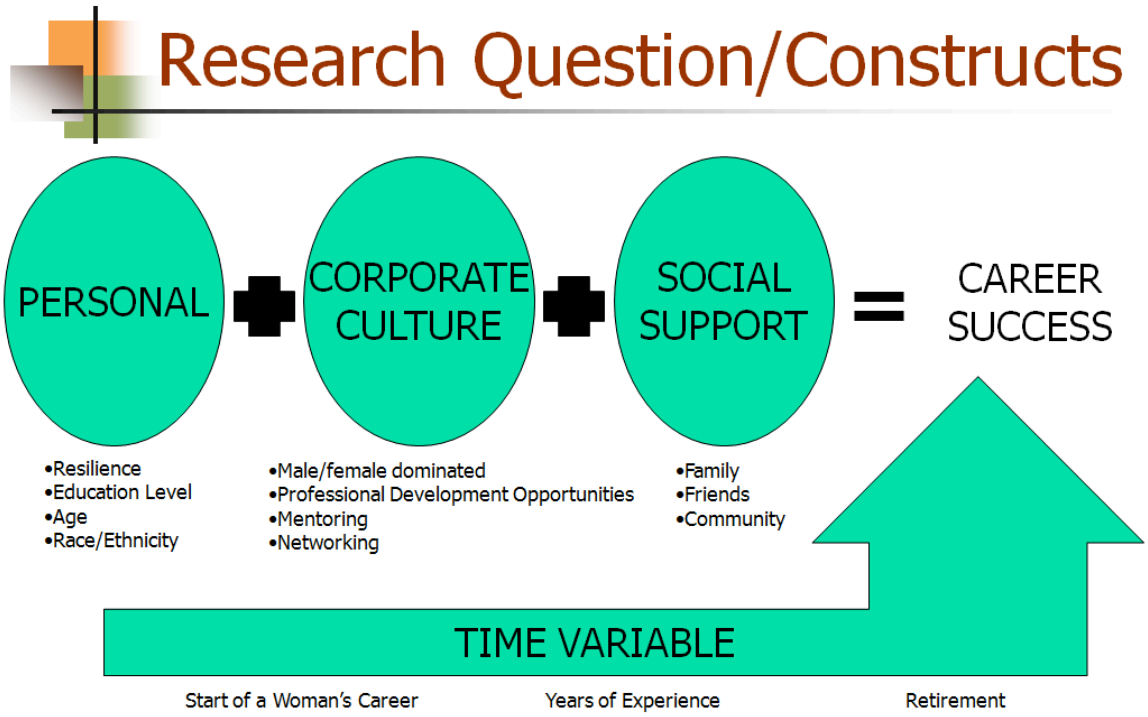

Figure 3.1. Research question diagram.

Design of the Study

The current study was based on survey research using a sample from the Society of Women Engineers (SWE), as well as requests made through professional connections via the LinkedIn professional network. I belong to the Society of Women Engineers and was able to use their newsletters to request participation for my survey. I used the LinkedIn professional network to request participation from women engineers through three SWE networks: Boeing employees network, Washington State University Alumni network, and Creighton University network. Analysis included exploratory factor analysis to establish and validate scales covering the constructs of personal, corporate culture, and social support, as well as multiple regression analysis to identify the relationship of these factors to personal career success.

Hypotheses used to develop survey. The central research question was: What are the factors related to a successful career path in the engineering profession from the women's perspective? The hypothesis was that all three factors—personal characteristics, corporate culture, and social support—make a difference in women's career success. I also hypothesized that the social support variable had the greatest influence on success. The research hypotheses are:

1. H1: there is a positive relationship between personal characteristics (PC) and career success for women engineers.
2. H2: there is a positive relationship between corporate culture (CC) and career success for women engineers.
3. H3: there is a positive relationship between social support (SS) and career success for women engineers.
4. H4: the percent of variance in the dependent variable (career success) explained by social support is greater that the percent of variance explained by personal characteristics or corporate culture.

The sample. I used the Society of Women Engineers (SWE) as my target population to stay within the scope of the research outlined in chapter 1. The SWE is the largest non-profit educational and service organization representing both collegiate and professional women in engineering and technical fields. Founded in 1950, SWE has 20,000 members, 300 collegiate sections, and 100 professional sections. Its annual budget is approximately $8 million. Located in downtown Chicago, Illinois, SWE offers its members a full range of services including professional development, K-12, and collegiate outreach, publications, and member benefits. The mission of SWE is to

stimulate women to achieve full potential in careers as engineers and leaders, expand the image of the engineering profession as a positive force in improving the quality of life, and demonstrate the value of diversity (SWE website).

I wanted to focus on women with 20 to 30 years experience looking back over their careers. By collecting from all SWE members, I thought that I would have enough responses for planned statistical analysis. After 2 months, I only had 27 responses. I then changed the request to more than 5 years experience and expanded the request to the professional LinkedIn network. After another month, I ended with 127 responses. The arrangements to contact the SWE population/sample were:

- Agreement with SWE—Contacted Betty Shanahan, Executive Director and CEO for SWE and gained approval.
- Provide a link to survey—via the SWE monthly newsletter, distributed the third Friday of every month.
- Identify a contact person within SWE—Marcia Lampela.
- Provide letter for distribution by SWE in their newsletter.

The arrangements for the LinkedIn Network were to request membership of the groups for the different SWE networks, the Washington State University and Creighton University Alumni networks, and the Boeing employees network. Once I was accepted as a member of the network, I requested participation by posting the request and link to the survey on their sites.

For this population, I was able to answer the following questions. For those who consider themselves successful in their careers, what factors enabled them to be successful? For those who do not consider themselves successful, what obstacles and

factors impeded their chances for success? I used "work experience total" and "in engineering" as my variables to gauge years of experience.

The survey. The title of the survey was "Women Engineering Leadership in Corporate America." The survey was about factors leading to women's career success. The variables of interest were personal characteristics needed for a successful career and the impacts of social support and corporate culture that included development opportunities on their career progression. The aspects of social support included the factors of family, friends, and significant others and the levels of supports during the woman's career. The features of corporate culture considered in this study were whether the culture was male- or female-dominated and a combination of gender consciousness, networking, mentoring, and career development opportunities available for women. Personal characteristics included the level of perseverance, persistence despite adversity or discouragement, and self-reliance—a belief in oneself and capabilities. The constructs and measurements are covered in the following sections.

Survey constructs and measurements. The survey included two existing scales for personal resilience and social support and a scale covering corporate culture and career success that I developed with the data from this research. Personal and organizational demographic characteristics were also included. (Reference Appendix B for a breakdown of the survey constructs and measurements.)

The Resilience scale was based on five interrelated components: equanimity (a balanced perspective of one's life and experiences), perseverance (being persistent despite adversity or discouragement), self-reliance (a belief in oneself and capabilities), meaningfulness (life has a purpose), and existential aloneness (each person's path is

unique). The scale items were based on narrative responses from interviews with 24 women who had adapted successfully following a major life event. Validity and reliability tests included the following:

- Regarding priori content validity, items selected reflect generally accepted definitions and were reviewed by qualified psychometricians and two nurse researchers.
- Internal consistency reliability coefficient was .89.
- The scale was assessed for concurrent validity by exploring the relationships between the scale and measures of adaptation (morale, life satisfaction, depression, and somatic health). Instruments for the measures were well-established ones. By comparing the scale to these other measures, the authors showed the strength of the scale. (Reference Wagnild & Young (1993) for the psychometric properties of the Resilience scale).

All items were pulled from the interviews and worded positively. The authors of the original scale addressed the use of all positives by saying, "Although the use of all positively worded items may have led to a response set bias, the investigators were concerned that reversing the items would change the meaning and decided to write the items as they were expressed by participants."

The Multidimensional Scale of Perceived Social Support (MSPSS) (Zimet, Dahlem, Zimet, & Farley, 1988) is worded positively. I added five items worded negatively so the social section of the survey would not be all positive. The original MSPSS (1988) was based on a survey given to undergraduate students at Duke University (n=275). A new study was done to show a broader applicability of the scale.

This was given to three separate groups: pregnant women (n=265), adolescents (n=74), and pediatric residents (n=55). In the original study, a principal components factor analysis confirmed the subscale structure. The coefficient alphas ranged from .85 to .91, indicating good internal reliability. Test-retest values showed stability (.72 to .85). Construct validity was demonstrated by correlations between the MSPSS and the Depression and Anxiety subscales of the Hopkins Symptom Checklist (HSCL). The expanded study was comparable to the original 1988 study. The expanded study confirmed the subscale groupings of the original study (family, friends, and significant other). The coefficient alpha was .84 to .92 for the scale as a whole (internal reliability measure) and comparable to the original study. The expanded study proved that the MSPSS is psychometrically sound across several different subject groups. (For further information on the reliability and validity of MSPSS, refer to Zimet, Powell, Farley, Werkman, & Berkoff, 1990).

The Corporate Culture scale was developed to capture the perception of importance, effectiveness, and availability of developmental opportunities that include training, mentoring, networking, and special assignments. This is a scale that I developed, so I used SPSS to run a Cronbach's Alpha test on the pilot results to measure the internal consistency for the scale. The closer the alpha is to 1, the greater the internal consistency of the scale. There were 23 items measured using the pilot participants' responses (n=16). Even though this is a small sampling, it does give an idea of whether the scale would work for my dissertation. The Cronbach's Alpha score was .914. Field (2006) cautions that "the value of [alpha] depends on the number of items on the scale . . . it's possible to get a large value of [alpha] because you have a lot of items on the

scale, and not because your scale is reliable!" (p. 668). I checked for inter-item correlations to see whether the items inter-related well. The mean score was .306. "If our questionnaire is reliable then we would not expect any one item to affect the overall reliability greatly" (Field, 2006, p. 671). I checked the Cronbach's Alpha to see if any items deleted showed an effect. There was little variation if any of the items were deleted. It should be noted that the scale was modified for clarity after the pilot based on the feedback of the pilot participants. Reference Appendix C for the actual survey used.

Data Collection

The survey development and the data collected from the survey were via a survey management tool called Survey Monkey (http://www.surveymonkey.com). An initial request was made via the SWE newsletter. I did not receive enough responses in the 30 days allotted, so I sent a reminder notice via the next month's newsletter.

A cover letter sent to Betty Shanahan (SWE CEO) and Marcia Lampela (responsible for the SWE newsletter publication). Reference Appendix D for a copy of the letter.

The newsletter was published late (at the end of May), so I changed the date to June 30. A reminder was needed the following month, so I sent a follow-up letter to Betty and Marcia as well as a letter to Kelly Griswold of the Pacific Northwest SWE group (reference Appendix D for a copy of the follow-up letter).

Again, I did not receive enough responses, so a request was sent via the LinkedIn Professional Network to specific groups—three SWE networks, Boeing employees network, Washington State University Alumni network, and Creighton University Alumni network. I also changed the request for women engineers with more than 5 years

experience. At the middle of September, 2009, I had 127 responses when I closed the survey.

Data Loading and Cleaning

Once the deadline passed and I had received all the responses to date, I reviewed the data in Survey Monkey, moved the data from Survey Monkey to EXCEL and then to SPSS, and prepared the data for analysis. I made sure I had valid and clean data by ensuring that the data loaded correctly and looked for any incomplete surveys. I checked for incomplete surveys as well as those that opted out. Those were eliminated from my analysis. By using the option in Survey Monkey, I made it mandatory for the participants to answer the point-and-click answers to ensure completed surveys. There were some surveys that were not completed so I eliminated them from the dataset. I set up the survey through Survey Monkey to only allow valid point-and-click answers so there was no need to check for invalid answers. I input the variable label names, the response labels, and did the necessary recoding to make sure the data were loaded accurately.

Data Analysis

First, I wanted to make sure I had a sufficient sample. If I had more than 300, I could be assured of the test parameters tending to be stable:

> Indeed, Tabachnick & Fidell (2001) agree that "it is comforting to have at least 300 cases for factor analysis" (p. 640) and Comrey & Lee (1992) class 300 as a good sample size, 100 as poor, and 1000 as excellent. (Field, 2006, p. 639)

I was able to collect only 127 responses, of which, 111 were complete. I selected the Kaiser-Meyer-Olkin measure of sampling adequacy (KMO) within SPSS to test whether the distribution of values was adequate for conducting factor analysis. The calculation for KMO is the ratio of the squared correlation between variables to the squared partial

correlation between variables. The value from the KMO statistic varies between 0 and 1. It is recommended that a value of .7 or higher is good.

> Kaiser (1974) recommends accepting values greater than .5 as barely acceptable (values below this should lead you either to collect more data or to rethink which variable to include). Furthermore, values between .5 and .7 are mediocre, values between .7 and .8 are good, values between .8 and .9 are great and values above .9 are superb. (Field, 2006, p. 640).

The KMO value was 0.605. Even though that is low (considered in the mediocre range), the skewness and kurtosis for the dependent variables are within normal range (as reported below). Considering that I was working with a smaller sample than desired, the results were within range to continue analysis.

I used SPSS to generate the descriptive statistics to obtain information about the participants and the data. Those included the number of participants, their ages, marital status, dependent responsibilities, race/ethnicity, education level, industry sector, and work experience, as well as the opportunities, importance, and level of leadership/management. The variables that I wanted to use for the factor analysis and regression testing needed to be checked to see if they were normally distributed by evaluating the distribution for skewness and kurtosis. It was important to check for normal distributions because normally distributed variables are assumed for the types of analysis that I conducted.

Next, I checked on the strength of relationships and their patterns among the variables. I did this by checking for multicollinearity by evaluating the correlation matrix to ensure that the intercorrelations were not too high. High collinearity between variables makes it difficult to obtain unique estimates for regression coefficients and poses a threat to the validity of multiple regression analysis (Field, 2006). I also checked to see if any

variable should be eliminated because it did not correlate with any other variables. These checks were important to determine whether the data were suitable for the factor analysis and multiple regression testing I wanted to do.

I used exploratory factor analysis/principal component analysis (PCA) for the three scales included in the survey (personal characteristics (PC), social support (SS), and corporate culture—satisfaction with amount (CC)). I was looking at the variables for each of the scales to "reduce a large set of data into a smaller subset of measurement variables, . . . [so that] any further analysis can be carried out on the factor scores rather than the original data" (Field, 2006, p. 628). Using SPSS, I examined the eigenvalues associated with each factor before extraction, after extraction, and after rotation via the total variance explained output. The most commonly-used convention for determining the number of factors is to include only those with eigenvalues greater than 1—that is, those factors which extract at least as much variance as the equivalent of one original variable. I adopted this convention for my analysis. By using varimax rotation, I maximized the distribution of factor loading within factors. In this way, I could assess the statistical significance of a factor loading (Field, 2006). By looking at the rotated correlation matrix, I could identify common themes based on the content of the questions that load onto the same factor. "The use of factor analysis is purely exploratory, it should be used only to guide future hypotheses, or to inform researchers about patterns within data sets" (Field, 2006, p. 666). I then had the derived factors I needed to do multiple regression analysis and eliminated items that did not fit decision rules. I also used SPSS to calculate Chronbach's Alpha for the items loaded to test internal consistency. The results of all this are reported in chapter 5.

The two dependent variables were overall career satisfaction and success. By doing regression analysis, I was able to determine how much of the unique variance each of the independent variables explained for each of the factors (predictors and outcomes). I entered in the predictor variables on a block-by-block manner. Based on the hypotheses, I wanted to check each of the factors individually, as well as together (PC, SS, and CC) predicting success. "The fit of the regression model can be assessed using the Model Summary and ANOVA tables from SPSS. . . . The ANOVA also tells us whether the model is a significant fit of the data overall" (Field, 2006, p. 190). I chose multiple regression analysis because this showed me which set of predictor variables accounted for the most variance in the dependent variable—success. Reference Table 3.1 for a breakdown of my procedures.

Table 3.1

Procedures for Analyses

Category	Task	Details
Data Collection	Send out survey	Use of SWE monthly newsletter
	Send out follow-up	If response is too low in the first 30 days, follow-up in the next month's newsletter
	Send out additional requests	Request to professional networks via LinkedIn
	Check for completeness in Survey Monkey	
Data Loading	Move Survey Monkey data to EXCEL	Prepare data for imrpot to SPSS
	Move EXCEL data file to SPSS	
Data Cleaning	Check that surveys are complete	
	Check for missing data	
	Check for outliers	
Data Analysis	Descriptive statistics	Means and standard deviations
		Skewness and kurtosis
		Percentage distributions for demographic characteristics
	Correlations	Bivariate correlations all scale items
	Factor analysis	PCA for 3 scales
		Decision rules used for analysis include eigenvalues, scree plot, varimax rotation, Chronbach's alpha
		Results and use of factor scores in further analysis
	Regression analysis	Block by block
		Decision rules used for analysis include individual factors and all factors
		Results

Limitations of Study

The population was based on self-selection. This may cause some limitations on results collected based on the type of responses. Also, there was a low response rate of 127, with only 111 responses complete. There was no way to know what the potential population was for this study. Society of Women Engineers has approximately 10,000 professional members from all the STEM fields. Because the only opportunity given to me by SWE to contact members was through their monthly newsletter, I was not able to get the number of women that received and read the newsletter. If I had been given permission to receive a list of names and emails, I would have been able to state the total number of requests made.

Summary

This chapter described the methods used to develop, distribute, collect, and analyze data on the factors that predict the level of success for women engineers in corporate America. The population included the members of the Society of Women Engineers (SWE) and members of the professional LinkedIn network. A web-based survey created using Survey Monkey was used to collect the data. Factor analysis and regression analysis was used to determine which of the factors most influenced the success of women engineers and these analyses are described in detail in chapter 5.

Chapter IV: Pilot Survey

Introduction

Because I was combining two scales (personal characteristics and social support) and developed a third (corporate culture), I ran a pilot survey. I collected feedback from this pilot test of the survey to refine the final survey used in this dissertation. This chapter reviews the feedback received and how I used it.

Pilot of Survey

There were 24 women in the technical industry whom I know via my professional connections and I asked to participate in the pilot survey. Sixteen participated in the survey and all 16 returned feedback to me about the survey, which was extremely helpful in finalizing the survey for my actual dissertation. See Appendix E for the letter sent to the pilot participants via email asking them to participate in my pilot survey.

Pilot Survey Results

I received great insights from the comments that I would not have gotten from the point-and-click answers alone. I used the comments to ensure that I captured all of the elements I needed for the point-and-click questions.

The first 10 questions dealt with environment (corporate culture). It amazed me that there has not been much training, mentoring, or networking available. Participant comments suggested that most corporations did not see the need for mentoring and networking. Opportunities for training were not available to a lot of the respondents. Some comments expressed hope for change.

The next section was the scale for personal sharacteristics. The original scale was all positively worded. I added a few negatively worded questions. The importance of

adding the negative comments dealt with having enough range in responses so that I did not run into the situation previous research did—having truncated results. The social support section showed a good spread across options whether worded positively or negatively.

The overall career responses and comments were also spread across the spectrum with the majority on the positive side. Comments about work/life balance and how children affected their careers were included. All participants expressed that gender and race did impact their careers, mostly negatively. Education was seen as helpful. There were mixed comments about marital status and dependents. Using the comments, I verified that the questions used in the survey were appropriate for my final study.

Feedback from the Pilot Participants

I received great feedback from the pilot participants. Overall, they found the survey easy to understand and use. Some excerpts from the feedback included:

- The survey was very clear, easy to complete and well “chunked up" so I was not overwhelmed with a list of questions—three questions per screen was a good amount.
- This survey was easy to follow and easy to use. Questions were clear and straightforward.
- Nice job. I found the survey easy to read and understand.
- Overall, I found the survey to be quite good.
- The survey was very easy to use. (excerpts from participant feedback, 2009)

Constructive suggestions from the pilot participants included:

- The first nine questions started the responses positively (very important). Question 10-19 started the responses negatively (strongly disagree). Four of the respondents said that was confusing and suggested all responses start positively. I made the changes for the full study.

  After looking at the results, I realized I needed to split the questions—the pilot survey combined whether the opportunities were important and whether they were available in one question for each of the opportunities. The following is an example of the question for the leadership training opportunity: "Thinking about your overall career, what LEADERSHIP TRAINING have your employers made available to you? If the following has been made available by your employers during your career, how important do you think this opportunity was to your overall career development? If any of these training opportunities were not available to you, please mark the last column." Response choices were very important, important, somewhat important, not too important, not at all important, and not available.
- I changed the corporate culture questions to address first availability and then importance.
- Three respondents checked to see if they could skip through the survey and found they could. I had not made any question mandatory. They all suggested making the point-and-click questions mandatory to help alleviate incomplete surveys. I made these changes.
- Three respondents did not like the negatively worded questions (10 and 16) that were added to the survey for both the social support section and personal

section. They wanted the questions worded more positively or have counterpoints to them so they were not so negative. Also, question 16 was seen as a reverse duplicate of 15. Fifteen was worded positively and 16 negatively. To make sure that there is a good range in the findings, I kept both positively and negatively worded questions.

- Three respondents were confused by the first few questions. Two others commented on needing clearer definitions of the difference between leadership and management and specify what "made available" meant. They were wondering what results I was looking for. Made available sounded passive to them. It also was not clear if I was looking for just what the employer provided or if the respondent was a self-motivator and found her own training, mentoring, and networking. I rephrased for clarity. I also added a short description of leadership and management so that respondents knew what I was asking.
- One suggestion was to state at the end that I would share the results so that the respondents could see how the research turned out. I added such a statement.
- The last suggestions dealt with construction. One felt that there were too many requests for comments. As she stated, "people are lazy today and don't read and will take even less time to enter comments." There was also a suggestion to put the demographics first to provide better scope for the answers that follow. I decided to make the point-and-click mandatory but not the comments. That way, those that did not want to comment would not have

to. I left the demographics at the end of survey as most of the pilot respondents were fine with the location.

There were a couple of suggestions that I felt were good but for future study. One was to see the differences between young career survey results and those over 50 years of age and 30 years of experience. The other was to look at what leadership the experienced women have given to others, not just what they have received. The last participant comment received was confirmation that this was a good topic to study:

> I certainly appreciated the personal aspect of the survey. For example, asking the tough questions about what is going on in our lives that sometimes causes us to make decisions or do actions at that time. It takes into account how we answer those questions at that particular time. (participant feedback, 2009)

Chapter V: Results

Introduction

This chapter shows the results of my study. The results include the tests run for factor analysis, reliability, and regression analysis. I have also included the demographics and descriptors from the study. Part of the survey included a chance for the participants to share a narrative about each of the sections of the survey. I have used these comments to illustrate in words what I found in my research.

Overall Response Rate

Overall, 127 women responded to the survey. After clean-up by removing incomplete surveys, there were 111 responses. Because I used a passive method of soliciting participants, I do not know the total population I solicited. There are 10,000 members in the professional side of the Society of Women Engineers (SWE). The professions in SWE span more than just engineering and technology. They also include all the math and sciences—I do not have the break-out by professions. I also do not know the total number of members in any of the LinkedIn networks I solicited. I was allowed to include my survey request in newsletters and posted on the LinkedIn networks so there is no way to tell how many are in the total population.

Descriptive Statistics

All respondents to the survey were women. Table 5.1 lists all of the descriptive statistics information requested in the survey and the percentages of the results. Detailed graphs of the percentages for each area are also provided.

Table 5.1

Descriptive Statistics

Descriptive Category	Descriptive Option	% Results
Age	18-45 (gen X and Yers)	51.4
	45+ (baby boomers)	48.6
Work Experience—Total	0-10 years	22.5
	11-20	19.8
	21-30	37.8
	30+	19.8
Work Experience—Engineering	0-10 years	34.2
	11-20	26.1
	21-30	31.5
	30+	8.1
Ethnicity	Asian	4.5
	African-American	6.3
	Caucasian	79.3
	Hispanic-Latino	2.7
	Other	7.2
Marital Status	Married	73.0
	Significant other	5.4
	Single	9.0
	Divorced	11.7
	Widowed	0.9
Dependents	No	72.7
	Yes	27.3
Education Level	AA	1.8
	Bachelors	50.5
	Masters	40.5
	PhD	4.7
	Other	2.7
Position Level	Senior VP	2.7
	Executive Director	11.7
	Manager	37.8
	Lead	29.7
	Other	18.0

Field of Work	Corporate	82.9
	Military	3.6
	Self-Employed	0.9
	Other	12.6
Industry Sector	Aerospace	27.0
	Automotive	2.7
	Engineering	38.7
	Health Care	0.9
	IT	10.8
	Manufacturing	6.3
	Retail	1.8
	Other	11.7

I requested both total work experience and experience in the engineering field to see if there was a difference. As Figure 5.1 indicates, there was little difference between years employed in general and years in the engineering field until the later years, which suggests that the opportunities for women in the engineering field may not have been there 20 or 30 years ago.

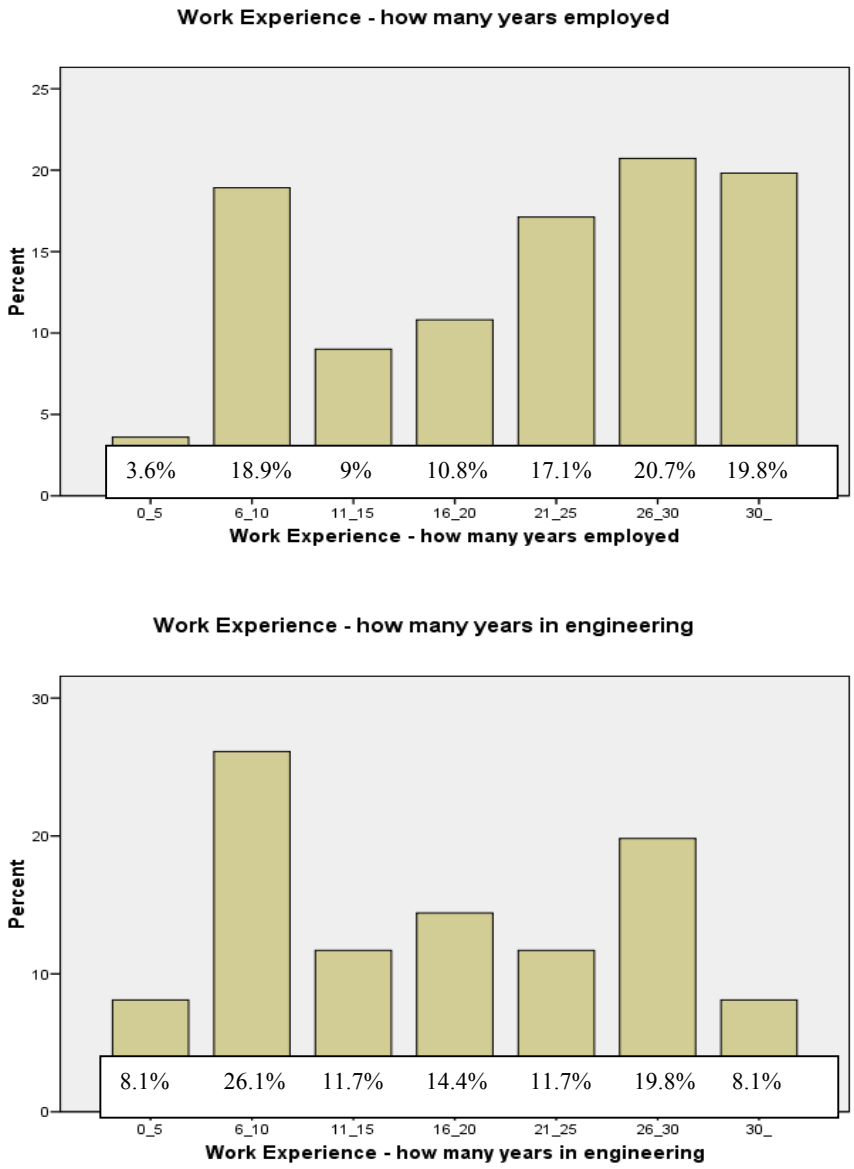

Figure 5.1. Years of work experience in total and in engineering.

Most of the women were Caucasian (over 79%) and married (73%). The majority did not have any dependents during their career (over 72%). Figure 5.2 shows the breakdown for these statistics.

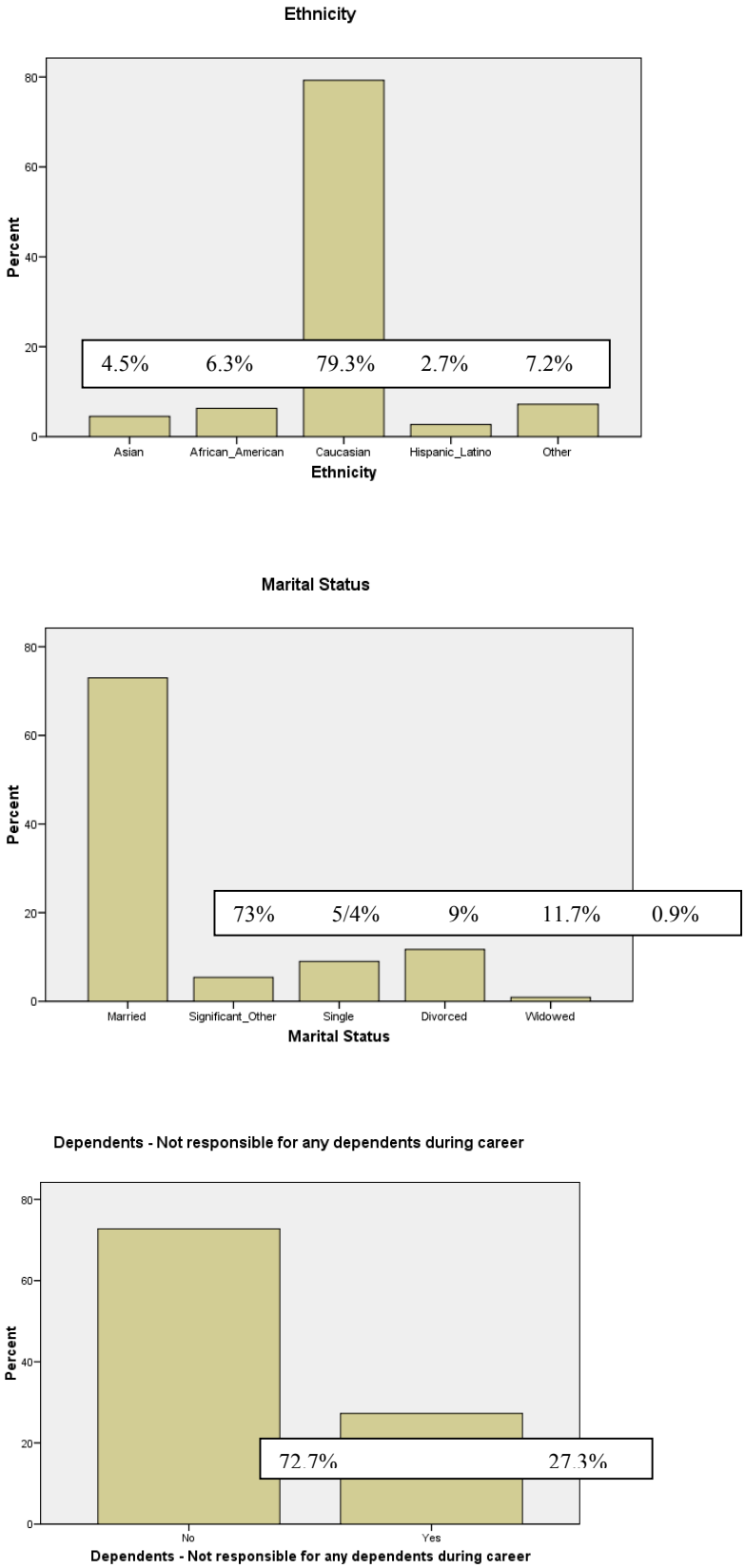

Figure 5.2. Personal demographics of participants.

Nearly all of the participants (95%) had some form of degree, mainly bachelors (50.5%) and masters (40.5%) degrees. The majority of the participants had been leads (almost 30%) or managers (almost 38%). Few were at the executive level (14.4%). Figure 5.3 shows the results.

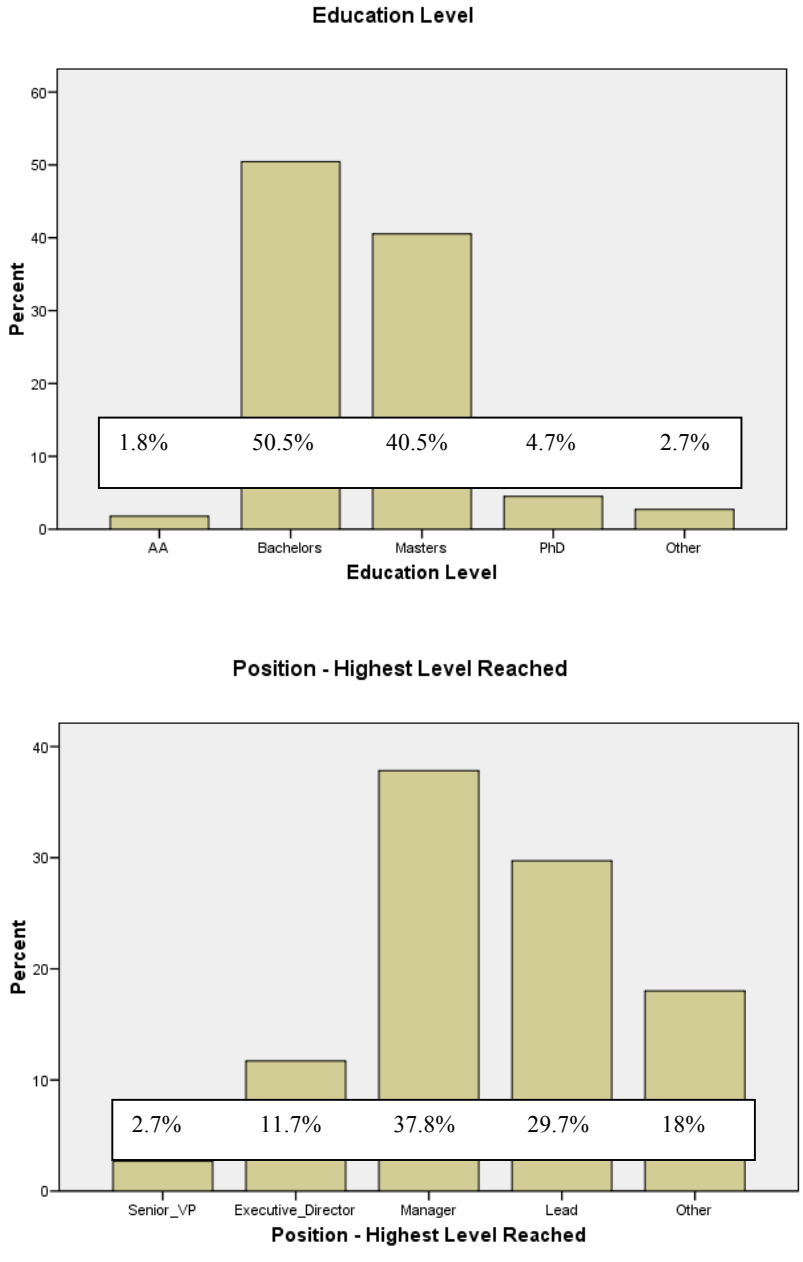

Figure 5.3. Education and position levels.

The majority of the participants were from the corporate world (almost 83%), as well as male-dominated fields (over 85%, reference Figure 5.4).

Figure 5.4. Field and industry experience.

The male-dominated fields are concentrated mostly in engineering and technology fields. They include aerospace, automotive, engineering, information technology, and manufacturing. This is in line with overall population of engineering and technology work.

Before completing my factor and regression analyses, I first checked to make sure that the scale items used in these analyses were normally distributed, by evaluating the distribution for skewness and kurtosis. For personal characteristics and social support, all the variables were used. For corporate culture, the variables used were satisfaction with amount and quality of opportunities. The distribution tables showed the items were, with a few exceptions, within the $\pm$ 2.0 for both kurtosis and skewness. A few items in the Personal Characteristics scale and the Social Support scale had high levels of kurtosis. Specifics include personal characteristics (nine variables under 2, three variables under 3, two variables under 4, and one variable at 6.23 out of 15 variables) and social support (11 variables under 2, three variables under 3, two variables under 4, and one variable at 4.2 out of 17 variables). Based on these results, I eliminated the three highest kurtosis variables from the Personal Characteristics scale and the four highest variables from the Social Support scale before I ran any other tests. Based on these findings, the following variables were eliminated before any other tests were run:

Personal characteristics variables eliminated (> 3 kurtosis).

1. PC I usually manage one way or another.
2. PC My life has meaning.
3. PC When in a difficult situation I can usually find my way out.

Social support variables eliminated (> 3 kurtosis).

1. SS I have no one around to help me when I am in need.
2. SS There is no one to talk about my problems with.
3. SS There is no one who is a real source of comfort to me.
4. SS There is a special person who cares about my feelings

Reference Table 5.2 for the results of the kurtosis and skewness tests.

Table 5.2

Mean, Skewness, and Kurtosis

Category	Item	Mean	Skewness	Kurtosis
Personal Characteristics	Can manage one way or another*	6.0541	-1.708	3.470
	Proud of accomplishments	6.2703	-1.260	2.182
	Takes things in stride	5.3243	-0.983	0.203
	Friends with myself	5.9550	-1.501	2.588
	Determined	6.3964	-1.614	2.405
	Helpless	2.4144	0.849	-0.376
	Hard to keep going	3.3604	0.327	-1.268
	No energy	3.4685	0.214	-1.247
	Feel Overwhelmed	3.3514	0.212	-1.188
	Feel Alone	2.6667	0.927	-0.417
	Keep interested in things	5.8559	-0.889	0.421
	Belief in myself	5.9009	-1.226	1.370
	Life has meaning*	6.2523	-1.742	3.229
	Can find way out of difficult situations*	6.1532	-2.020	6.229
	Have energy to do what I have to do	5.5495	-1.285	1.054
Social Support	Special person around in time of need	5.7297	-1.353	0.569
	Special person to share joys and sorrows	5.8559	-1.539	1.491
	Family helps me	5.4324	-1.221	0.468
	Emotional help and support from family	5.4144	-1.196	0.363
	Special person a source of comfort	5.7297	-1.408	1.172

	Friends help me	5.7387	-1.272	1.612
	I have no one when in need*	2.0000	1.827	3.047
	Family removed from my life	2.2252	1.341	0.521
	Hard to make friends	2.5856	0.878	-0.480
	No one to talk about problems with*	1.9279	1.710	2.934
	No one a source of comfort*	1.8649	1.809	3.503
	Can count on friends when things go wrong	5.6126	-1.125	0.722
	Can talk with family about problems	5.3964	-1.195	0.519
	Friends to share joys and sorrows	5.9369	-1.566	2.298
	Special person who cares about my feelings*	6.0180	-1.996	4.154
	Family helps me make decisions	5.2162	-0.985	-0.027
	Can talk with friends about problems	5.8198	-1.582	2.846
Amount of Satisfaction	Leadership and Management Training	4.0901	-0.149	-1.352
	Networking Opportunities	4.3333	-0.439	-0.970
	Mentoring Opportunities	3.9820	-0.048	-1.193
	Special Assignment Opportunities	4.3063	-0.398	-1.034
	Teaming on Special Projects	4.3514	-0.406	0.455

Note. Items marked with asterisks above are the ones that were deleted because of the high Kurtosis scores.

Leadership Development Opportunities

Part of my survey included finding out what type of opportunities were available to the participants. Table 5.3 shows the breakout of answers for the percentage of opportunities in each of the training and assignment areas.

Table 5.3

Availability of Training and Assignment Opportunities

Opportunity	Frequently	Occasionally	Not Available
Leadership Training	30%	54%	16%
Management Training	23	52	25
Upper Management Mentoring	19	47	34
Peer Mentoring	30	49	22
Networking	42	48	10
Special Assignments	29	55	16
Participation on Special Projects	33	51	15

I also wanted to see how important training and assignments were to the participants. Training included leadership and management as well as networking. Assignments included both special assignments and participation on special projects. Figure 5.5 shows the percentage of agreement with how important these opportunities were to their careers. Over 62% responded that training was important and over 65% responded that special assignments were critical, yet less than 37% agreed with the amount of opportunities they had. In fact, almost 40% did not agree or were neutral about their opportunities.

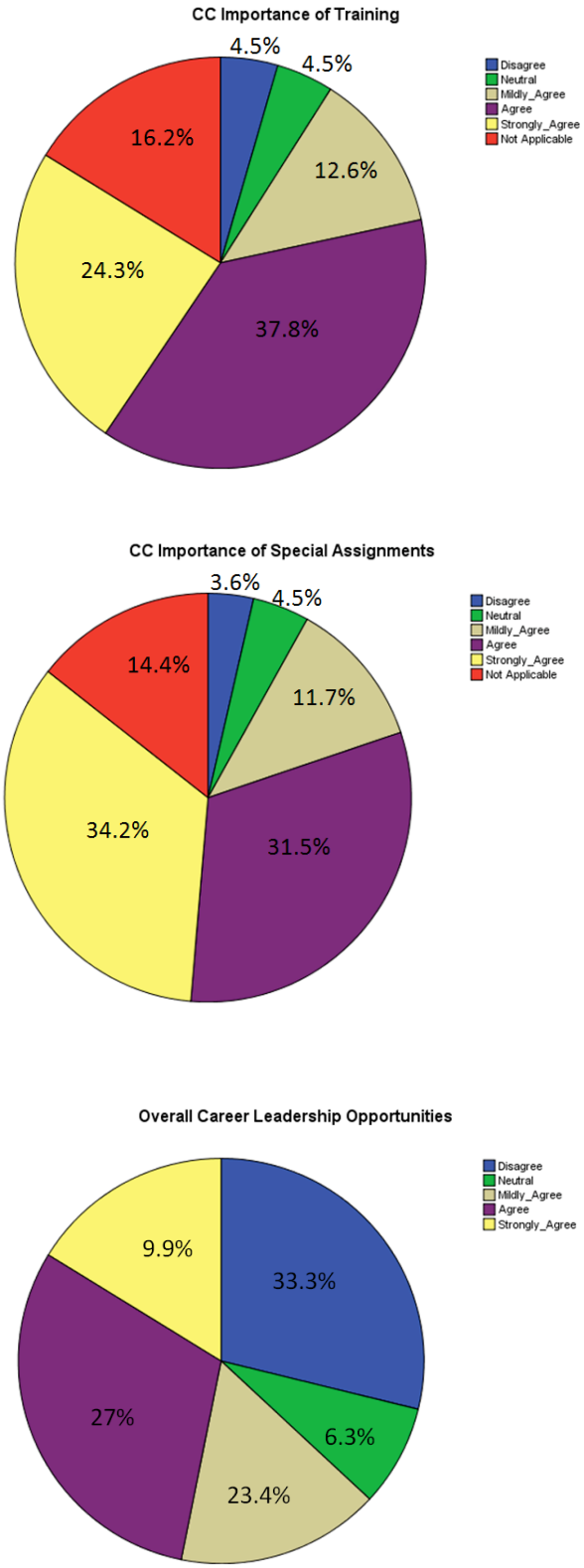

Figure 5.5. Importance of training and assignments to career success.

The following participant narrative supports the quantitative data showing the frustration at the amount and quality of opportunities that the participants received:

> I have in the course of my career seen others (men) pass me by and be given opportunities, with less capability than myself, over and over and over.
>
> Opportunities ended when my mentors retired.
>
> I have never been "given" any career opportunities—there was no mentoring program for management at my company, I have never been offered networking opportunities, I was only once given an opportunity to attend the Leadership Center in St. Louis and that had minimal value to my career.
>
> I think mentoring is very important. Although I have received informal mentoring throughout my career, I never had the opportunity to participate in a formal mentoring program, which I think could have been valuable (especially early on). Being given opportunities to attend conferences and training has also expanded my knowledge base and allowed me to network within my industry. (participant response, 2009)

Factor Analysis

I used exploratory factor analysis, or principal component analysis (PCA) with varimax rotation for the two scales included in the survey (Personal Characteristics (PC) and Social Support (SS)).

Using SPSS, I examined the eigenvalues associated with each factor before extraction, after extraction, and after rotation via the total variance explained output. The most commonly used convention for determining the number of factors is to include only those with eigenvalues greater than 1—that is, those factors which extract at least as much variance as the equivalent of one original variable. I adopted this convention for my analysis. By using varimax rotation, I maximized the distribution of factor loading within factors. In this way, I could assess the statistical significance of a factor loading (Field, 2006). By looking at the rotated correlation matrix, I could identify common themes based on the content of the questions that load onto the same factor. If an item had a value less than .40, the item was eliminated. Also, if an item had loadings of .40 or

higher on more than one factor, it was eliminated. I then had the derived factors I needed to do multiple regression analysis and eliminated items that did not fit decision rules. I also used SPSS to calculate Chronbach's alpha for the items loaded to test internal consistency. Table 5.4 shows the factor analysis decision rules and steps I used to derive my factors for regression analysis.

Table 5.4

Factor Analysis Decision Rules and Steps

Task	Details
Factor Analysis	Principle Component Analysis for 3 scales 1. Personal Characteristics 2. Social Support 3. Corporate Culture Decision rules used for analysis include 1. Eigenvalues—look at those greater than 1 2. Scree plot—pictorial view of factors 3. Varimax rotation—maximizes the difference between factors 4. Component loading decision rules—what loadings eliminated items from inclusion in the final scale based on the amount of the loading—if an item had a value of .4 or higher on more than one item, that item is eliminated 5. Delete items that do not fit the decision rules and rerun 6. Chronbach's alpha—run reliability tests on the final components and see if deletion of any items from the component results in higher reliability Results and use of factor scores in further analysis 1. Name the components 2. Identify variables includes in the component 3. Average all the variables into the new component 4. Use components in regression analysis

Personal characteristics detailed factor analysis. For the Personal Characteristics scale, I eliminated the variables that had high kurtosis, leaving 12

variables for the factor analysis. The first rotated solution showed that three items loaded on more than one component. These three items (feeling alone, belief in myself, and have energy to do what I want) were eliminated before the second run.

After the second run, two factors were identified—overwhelmed and positive. The breakdown of the two factors is shown in Table 5.5.

Table 5.5

Personal Characteristic Factors

Factor	Variables Included
Overwhelmed	PC Helpless PC Hard to keep going PC No energy PC Feel overwhelmed
Positive	PC Proud of accomplishments PC Takes things in stride PC Friends with myself PC Determined PC Keep interested in things

I averaged responses from all the overwhelmed items into the new PC_Overwhelmed variable and responses from the positive items into the new PC_Positive variable. Cronbach's alpha reliability for the new variables was .8 for PC_Overwhelmed and .71 for PC_Positive. Looking at the reliability if item removed analysis, showed that no other items needed to be eliminated. The two factors derived for personal characteristics were used in the regression analysis.

Social support detailed factor analysis. For the Social Support scale, I eliminated the variables that had high kurtosis leaving 13 variables for the factor analysis.

After the first run, two items (family helps me, and emotional help and support from family) were eliminated because they loaded on more than one component.

After the second run, following the decision rules described earlier in Table 5.4, three factors (support from friends, support from special person, and support from family) were identified. The items loading on each of the three factors is shown in Table 5.6.

Table 5.6

Social Support Factors

Factor	Variables Included
Support from friends	SS Friends help me SS Hard to make friends SS Can count on friends when things go wrong SS Friends to share joys and sorrows SS Can talk with friends about problems
Support from special person	SS Special person around in time of need SS Special person to share joys and sorrows SS Special person a source of comfort
Support from family	SS Family removed from my life SS Can talk with family about problems SS Family helps me make decisions

I averaged the responses for all the friends items into the new SS_Friends variable, responses to all of the special person items into the new SS_Special_Person variable, and responses to all of the family items into the new SS_Family variable. I ran the Cronbach's alpha test for all of the new variables (SS_Friends = .906, SS_Special_Person = .961, and SS_Family = .931). The item-total statistics showed that Cronbach's alpha reliability for the three subscales would not increase if items were deleted. The three new variables derived for the Social Support scale were used in the regression analysis.

Corporate culture detailed factor analysis. The last scale items were intended to measure aspects of corporate culture. The items addressed satisfaction with amount and satisfaction with quality for six career development training and networking opportunities. I did not run factor analysis for the Corporate Culture scale items because only some of the respondents had experience with some of the career development options, resulting in missing data for the satisfaction with quality items. To be able to retain all of the 111 responses in the regression analysis, only the satisfaction with amount items were included in the regression analysis. After running correlations tests on the amount variables, I found that the two variables (amount of special assignments and amount of teaming on special projects) were highly correlated (.891). Given the high correlation, I combined these variables into one variable. The other satisfaction with amount items addressed distinctly different career development options. Thus, the items were each included in the regression model separately. The four satisfaction with amount items measuring corporate culture are shown in Table 5.7.

Table 5.7

Corporate Culture Factors

Factors
Satisfaction with amount of leadership and management training
Satisfaction with amount of networking opportunities
Satisfaction with amount of mentoring opportunities
Satisfaction with amount of special assignments and projects

These four corporate culture variables were used in the regression analysis.

Regression Analysis

Two variables (overall career satisfaction and success) served as the dependent variables in the regression analysis. I ran the correlation between the two (.786). Based on this high correlation, I combined overall career satisfaction and success variables into one dependent variable (overall career success and satisfaction) by averaging responses to the two variables into the one dependent variable to use for my regression testing. By doing regression analysis, I was able to determine how much of the variance in the dependent variable, overall career success and satisfaction, each of the independent variables explained. I entered in the independent variables on a block-by-block manner, also called hierarchical regression. "Hierarchical Regression predictors are selected based on past work and the experimenter decides in which order to enter predictors into the model" (Field, 2006, p. 160). The Personal Characteristics scale was picked first because of my research for this dissertation. There was more research and literature found in this area than the other two and I wanted to see what the others added to what personal characteristics already explained. Corporate Culture scale data were input next and then Social Support scale responses (based on my fourth hypothesis that it would have the most influence) were input last. Putting social support last is the most conservative test of this hypothesis. Based on the hypotheses, I wanted to check each of the factors individually as well as together (PC, SS, and CC) predicting success. I chose multiple regression analysis because this showed me which set of predictor variables accounted for the most variance in the dependent variable—success.

Based on the factor analysis, I had nine factors to run my regression analysis (see Table 5.8).

Table 5.8

Factors Used for Regression Training

Factor	Category
PC Overwhelmed	Personal Characteristic
PC Positive	Personal Characteristic
Amount of Special Project Recode	Corporate Culture
Satisfaction with Amount of Leadership and Management Training	Corporate Culture
Satisfaction with Amount of Networking Opportunities	Corporate Culture
Satisfaction with Amount of Mentoring Opportunities	Corporate Culture
SS Friends	Social Support
SS Special Person	Social Support
SS Family	Social Support

I ran a block-by-block stepwise regression test on the factors with the results shown in Table 5.9. This procedure is a method of multiple regression where variables are entered into the model one at a time based on $F > 1.00$ and will drop variables from the model run if the inclusion requirement drops below 1.00 when other variables have been entered. Once a new variable has been entered into the model, all variables in the model are looked at to see if they should be removed (Field, 2006).

Table 5.9

Regression Analysis Results for PC, SS, and CC Scales

Variable	B	SE B	Standardized Beta	R	R^2	ΔR^2
Step 1				.45	.20	.20
PC Positive	.78	.15	.45			
Step 2				.64	.41	.21
PC Positive	.59	.13	.34			
Amount Special Project Recode	.33	.05	.47			
Step 3				.67	.44	.04
PC Positive	.58	.13	.33			
Amount Special Project Recode	.20	.07	.29			
Satisfaction w/Amount of Leadership/Mgmt Training	.17	.07	.26			
Step 4				.68	.47	.02
PC Positive	.51	.13	.29			
Amount Special Project Recode	.17	.07	.24			
Satisfaction w/Amount of Leadership/Mgmt Training	.17	.06	.26			
SS Family	.31	.14	.17			

The results of the regression run for step 1 revealed an R^2 of .20. This means that 20% of overall career success and satisfaction was accounted for by the "positive" Personal Characteristic scale construct which consisted of these items: being proud of accomplishments, taking things in stride, being friends with oneself, being determined, and keeping interested in things. For step 2, the R^2 was .41. Because PC_Positive was 20%, that means that an additional 21% of overall career success and satisfaction was accounted for by the amount of special assignments and teaming on special projects. For step 3, the R^2 was .44, which means that an additional 3% of overall career success and satisfaction was accounted for by satisfaction with the amount of leadership and

management training. For step 4, the R^2 was .47. This means that an additional 3% of overall career success and satisfaction was accounted for by the factor of social support of family which consisted of these items: being able to talk to family about problems, the family helping one make decisions, and the inverse of family removed from my life.

Based on the B value, there is a positive relationship between the outcome and all of the predictors. The value of beta shows the relative influence of each predictor has on the outcome. The beta shows that PC_Positive had the most influence (.29). The amounts of special assignments/projects (.24) and leadership/management training (.26) were close second and third influences. SS_Family was a distant fourth influence (.17).

The adjusted R^2 gives an idea of how well this model generalizes. R^2 and the adjusted R^2 should be the same or very close to each other. Table 5.10 shows the comparison of the R^2 and adjusted R^2 for the model. The comparison shows that the difference for the final model is small (2%). Based on what Field (2006) stated, "this shrinkage means that if the model were derived from the population rather than a sample it would account for approximately [2%] less variance in the outcome" (p. 188). This gives me confidence that my sample may be representative of the population.

Table 5.10

Comparison of R^2 and Adjusted R^2 for Generalization Test

Model	R	R^2	Adjusted R^2	Difference
1	.45	.20	.19	.01
2	.64	.41	.40	.01
3	.67	.44	.43	.01
4	.68	.47	.45	.02

I wanted to check to see if any of the demographics for the participants would change the results for the regression tests. I ran individual regression tests and added a dummy variable to one of the blocks to see what the effects would be. I kept the block-by-block run of PC first, CC second, and SS third for each of the regression runs like I did in the original regression run. Table 5.11 shows which dummy variables I added to the individual blocks for the separate regression runs to see if there were any effects on the results. Ideally, all of the demographic variables would be added to a regression model in the Personal Characteristics scale block, controlling for all of the demographic variables in the same model. However, sample size did not allow for inclusion of all of the demographics in the same run. Thus, separate models including each of the demographic variables one at a time were run in the block that the variable belonged to.

Table 5.11

Individual Regression Runs with Dummy Variables Added to Check Effects

Regression Runs	Dummy Variable Inserted	Variable	Inclusion in the Block	Change Results
1	Education	Education level 0 = up to bachelors 1 = masters/doctoral	Personal Characteristics	None
2	Dependent care	Dependent children present sometime in career	Social Support	None
3	Dependents none	No dependents throughtout career	Social Support	Slight
4	Dominate field	Male/female domincate fields	Corporate Culture	None
5	Marital status	Marital status 0 = Married/Sig Other 1 = Single/Divorced/ Widowed	Social Support	None
6	Ethnicity	Ethnicity 0 = Caucasian 1 = All others	Personal Characteristics	None
7	Age	Generational split 0 = Baby boomers (before 1965) 1 = Gen X/Y (after 1964)	Personal Characteristics	None

I ran a regression with dependent care that resulted in no change. I then ran a model with no dependents throughout their career. There were very minor changes to the R^2 when having no dependents was added when looking at the results to the third decimal point—not enough for significance. There was no change in the significant independent

variables for education, marital status, ethnicity, or age. It should be noted, though, that my small sample was predominately Caucasian (over 79%), married (73%), and had some form of a degree (95%). I ran the age dummy variable to see if there would be a difference accounted for between baby boomers (born before 1965) and gen X/Yers (born after 1964). There was no change there either. There were 51.4% gen X/Yers and 48.6% baby boomers in my population. Just because there is no change does not mean these variables are not important. There was not enough variance to make a difference.

Other Analyses

Further analysis was done to see why some of the variables did not contribute significantly to overall career success and satisfaction. Neither mentoring nor networking showed up in the regression. First I looked to see if the participants had the opportunity. Mentoring opportunities did show "not available" at a higher percentage than the other opportunities. Forty percent of the "not available" results were mentoring. Networking showed there were opportunities for most of the participants. Checking the crosstabs of satisfaction with amount of networking opportunities with availability of all the opportunities did show a higher degree of disagreement for those for whom that it was not available. The same is true for the crosstabs of satisfaction with amount of mentoring opportunities with availability of all the other opportunities. See Appendix F for all the crosstab results.

Results of the Findings for the Four Hypotheses

The hypotheses are that all three constructs—personal characteristics, social support, and corporate culture—do make a difference in women's leadership and career

success. The following sections review the relationship of these research hypotheses to the overall career success and satisfaction.

Personal characteristics. The first hypothesis (H1) was that there is a positive relationship between personal characteristics (PC) and career success for women engineers. Based on the regression analysis, 20% of the PC factor of positive accounted for the overall career success and satisfaction of the participants. The beta value for personal characteristics was the highest (.29). I ran regression tests to see if any of the demographic factors would change the results for PC. Ethnicity did not change the results as most of the participants were Caucasian (79%). Education was not a factor either as most participants had a bachelors and/or masters degree (91%). To illustrate this, I have included a couple of comments that the participants shared in the corporate culture comment section of the survey:

> Men got promoted faster. I had to be twice as good. This is because I was in the first wave. We didn't mind being twice as good, but promotions came so slowly. For women 15 years younger/later, it was so much easier. In the first wave, you could not get yourself taken seriously. A woman would say something in a meeting and it was ignored. A few minutes later a guy the same age would say the very same thing . . . it was a brilliant idea. We used to joke about it at <company name> research, but it hurt and was utterly frustrating.
>
> I always felt pressure to prove to my male coworkers that I was just as capable as they were, and that I did not get in on the "woman quota." At work, I have had to use placating behavior to fit in with many of my male peers, and I resent that. Strong, smart women were often referred to as "bitches" behind their backs by my male peers, whereas men with those characteristics were praised if not envied for their assertive behavior. (participant comment, 2009)

Younger women are entering into the field based on the age demographics. Based on my research, there still needs to be more encouragement to retain these young women. An example from a participant:

> No participation or encouragement in assisting young female engineers to identify pathways to more interesting, creative, challenging, and fulfilling opportunities

> including engineers in sales and business development, product enhancement, or other areas where women find the satisfaction of visible accomplishment. Women are results-oriented and at my firm the results were invisible. I left engineering last month, after 5 years at age 25 as an aerospace engineer, very discouraged and vowing to not go back. I do wish there was specific career development assistance for young female engineers by female engineers, perhaps in smaller firms, perhaps women-owned firms could mentor some of us. I love aerodynamics, but I am not sure what I could do with it now? I hope your survey is made available to SWE board members and perhaps they could post their feedback on the local SWE sites. There are many of us out here that would probably jump at the chance to get a little expert guidance, mentoring, or open brainstorming about options we cannot currently visualize. Thanks for doing this survey. It is truly the only outreach or open discussion I have seen on this topic. Thanks for letting me vent. (participant comment, 2009)

Part of the effort should be on women going for higher degrees in engineering.

Corporate culture. The second hypothesis (H2) was that there is a positive relationship between corporate culture (CC) and career success for women engineers. Based on the regression analysis, an additional 21% of the CC factor of amount of special projects accounted for the overall career success and satisfaction of the participants, as well as an additional 3% for amount of leadership and management training. The beta values were very close for these two factors (.24 for special projects and .26 for leadership and management). I ran a regression test to see if any of the demographic factors would change the results for CC. Whether the field was male- or female-dominated did not make a difference—mainly because 107 of the 111 responses for field most worked was male-dominated.

Twenty percent of all the respondents indicated that none of the opportunities I asked about were available. Particularly noteworthy was the lack of mentoring from upper management and peers (rated “not available” for more than 40% of the sample).

Overall, the respondents rated the training and assignments as important—56% for training and 59% for assignments. Many of the comments from the participants

stated that they needed to use their own initiative and contacts to get opportunities. Some stated that volunteering in their communities to gain leadership experience helped them advance and be more satisfied with their careers. Based on the number of comments received about the corporate culture, many women had to rely on their personal resilience and perseverance to be successful which supports the findings of the regression analysis. A few examples from the participants that illustrate this are:

> I was often overlooked because it was assumed that a woman would not be interested in such assignments. This caused me to leave a company after 14 years and go to a different one. The upper management manager was shocked because he assumed that since I had children, I was not a career-motivated scientist. Therefore leaving for more money and promotion was a shock. (participant comment, 2009)

> I am looking at leaving engineering. I am 38 and I have realized that engineering is not what brings all of who I am to work. It drains me physically and emotionally. I really feel that I can bring more contributions in a different setting that is not corporate America. The rules are still created by men and dictated by men. It is hard to be my true self and bring forth my creativity and ideas, when I am labeled by my sex and age. My current work environment is extremely resistant to change and open to new ideas of doing the job. It is hard for me to continue to be the change agent and be motivated at work. (participant comment, 2009)

> I have a young-looking appearance and a higher pitched voice, both of those work against me in terms of first impressions. Many times I'm not offered a handshake as people are unsure of whether to offer one to a woman. I work at an organization where men have been here for 30 to 40 years with their "old school" thinking about genders and capabilities. (participant comment, 2009)

> I've learned that being in a male-dominated career has made me think a lot harder about how I communicate. I probably could have been a more effective leader earlier in my career if I had been aware of the difference in communication and perceptions between men and women. The book *Hardball for Women: How to Win the Game of Business* was a real help, in addition to a women's forum that was informally started in our office to help women talk about leadership, communication, etc. One woman in our office took it upon herself to get this started, and it has been a tremendous help in many of our careers. (participant comment, 2009)

This supports the research about the voice of women and corporations not taking women's complaints seriously. The examples above also support that the leaders' influence on a group or organization's thinking and beliefs do have a tremendous impact on acceptance, trust, and opportunities.

Where opportunities were available, the participants were grateful and able to grow and have satisfaction with their careers as illustrated by the following comments:

> Supervisor and senior management have been incredibly supportive of my interest in developmental assignments. I brought the ideas forward (taken ownership of my career versus having them offered to me) to management and they have been supported. (participant comment, 2009)

> The opportunity to be involved with a wide variety of professionals and operators in my industry. Relationship building with a wide variety of people related to my industry has made the work more interesting and my career more successful. (participant comment, 2009)

> The appropriateness of opportunities and participation with peers and mentors has been quite valuable. (participant comment, 2009)

> Excellent mentoring during my early career. Excellent opportunities working for a woman-owned business at a critical period in my career. Supportive family and spouse. (participant comment, 2009)

These examples support the research about having meaningful work to be motivated and stay involved, as well as having mentorship and opportunities really do foster a feeling of overall career success and satisfaction.

Corporations need to focus on filling senior level positions within the company with women. They need to be aware that being female can carry a stigma—you may leave because of family so why invest in you? An example from one of the participants illustrates this:

> Having the stigma that I am a woman and most likely I will have a baby and then leave, so why do we spend time and money making you a manager and giving you more responsibility type of mentality. (participant comment, 2009)

Not many executives or higher are reflected in the statistics I gathered. The demographics of the participants are shown in Table 5.12. An interesting observation from one of the participants:

> I have always been empowered to accomplish anything I set out to do. If the support isn't there I find another away. I was entirely surprised when I was put on a task team at work to look at the "glass ceiling" for women and minorities in engineering. I saw no ceiling to get anywhere except for myself until I started looking into it. Biggest finding, the ceiling is with middle management. (participant comment, 2009)

Table 5.12

Position Level Reached

Position	Frequency	%	Valid %	Cumulative %
Senior VP	3	2.7	2.7	2.7
Executive Director	13	11.7	11.7	14.4
Manager	42	37.8	37.8	52.3
Lead	33	29.7	29.7	82.0
Other	20	18.0	18.0	100
Total	111	100	100	

Another participant comment illustrates the findings with the glass ceiling:

> The pervasive glass ceiling and seeing men promoted—consistently —where I believe I should have been. They were often younger, less experienced but not always. Many times they were my peers. Even though it has gotten better, this highly male-dominated field has blatant tokenism still. (participant comment, 2009)

The corporate environment that is in place has a direct impact on women's perception of support. Even if you have programs to support diversity, there needs to be follow-up and actions taken when something happens. Also, the feelings of alienation because you are the only woman can lead to frustration and lack of satisfaction. Some examples from the participants:

> No women friends in engineering who I met at work or at school to talk with as work challenges occurred. There were no other women in engineering at work who were looking for more gratification and opportunities to create outcomes. I felt really lonely. (participant comment, 2009)

> One critical incident that affected my career and my attitude was when I was sexually harassed by several male co-workers at once, in front of other male co-workers, over the course of a week. I reluctantly reported the incidents to Human Resources and after the investigation, in which the perpetrators denied my allegations and the witnesses denied them as well, my manager told me that he had a meeting with all of my co-workers and asked them how they felt about working with me after the investigation. He told me that since they were all uncomfortable having me as a coworker that I had to leave the group, so I did. I was mortified and felt betrayed by my manager, who was a senior manager at the time. I took it personally and was too ashamed and emotionally exhausted to report this "retaliation" to Human Resources. It shook my trust in management and my sense of loyalty for the company. My self-esteem took a big hit from that. I didn't trust my future managers after that, despite how polite some of them were. That senior manager retired a year after I transferred to a different workgroup, so there was nothing to officially report to HR anyway by the time I recovered enough strength to do what I thought was right, which was to report the inappropriate behavior of that manager. Since my trust in management was so deeply affected, I no longer saw managers as people who could help me grow if I was willing to do my part. Actually, this realization has occurred to me while typing this response to your survey. So, I have more healing to do. Working for a new company would definitely freshen my perspective. (participant comment, 2009)

> When I graduated from college as an aerospace engineer, we were a class of 25 and only three women. When I got my first MS in aerospace, we were 80 people and only two women. My last MS (also in aerospace), we were again only 2 women. I have listened to plenty of professors telling me that this is not for women and I could be doing other things. So, I got tougher and continued on, without their help and support. In my work group, I am the only woman instructor engineer among 10 other men, and the youngest. I've had to work very hard to get to that position and bring down a lot of walls. When I teach performance engineer's courses to airlines from around the world, I have had some chief engineers asking me when the instructor was coming to start class!! So, being a woman has not made it easy at all and I had to prove myself and gain their trust. (participant comment, 2009)

Social support. The third hypothesis (H3) was that there is a positive relationship between social support (SS) and career success for women engineers. Based on the regression analysis, an additional 3% of the SS factor of family accounted for the

overall career success and satisfaction of the participants. The beta value was .17. I ran regression tests to see if any of the demographic factors would change the results for SS. I first ran the test with the dummy variable of having children that did not make a difference. I then ran a test of no dependents versus any type of dependents. This also did not change the results of the regression analysis. Following are excerpts from participant comments showing examples of support, or lack thereof, from participants that affected their careers:

> Factors to success:
> - Raised by a strong father figure who taught me discipline and hard work and the love of math.
> - Raised by a mother who taught me to be courageous because she was not.
> - Began my working life in health care which helped me learn psychology, to be comfortable with human bodies (sexuality), and to work with strong personality types (doctors).
> - Obtained my engineering degree in my 30s—knew who I was and what I wanted (greater sense of self).
> - Decision not to have children (after I helped raise my 3 siblings).
> - Decision to marry a man willing to follow me for career purposes rather than vice versa.
> - Ability be myself and not be pressured by societal issues from my own gender (why are you the breadwinner, when are you going to have children, why aren't you more feminine, etc.) .
> - Being the oldest child in my family (out of 4 children) indicates management training started young!
> - My family moved 4 times by the time I was in 3rd grade. Had to learn to be both self-sufficient and how to make new friends. (participant comment, 2009)

> My family's support in my career, along with my friends. Also I have been blessed to work for and alongside some great people. I think moving around to a few different jobs in my life and having traveled a lot when I was younger. A lot of exposure to different people, different ways of life, and different companies helped a lot, too. (participant comment, 2009)

> My parents are not educated so both my brother and I were encouraged to study and perform well. We both have several masters, though in different fields. I was attracted to aerospace engineering because it was rare and an exotic career for a woman. I knew it was going to be challenging, not only because the field is

> challenging itself, but also because I was a woman and I encountered obstacles just because of that. (participant comment, 2009)
>
> Having my parents around and good friends and neighbors helps me to have a peace of mind for my child. (participant comment, 2009)
>
> My career path was definitely influenced by my spouse's assignments, promotions, and reassignments. Several times I had to pass up on interesting assignments and potential opportunities for promotions in deference to his career. Our mutual employer considered his career a higher priority. When I took a job with a different company, my career quickly advanced and my spouse then moved with my reassignments. (participant comment, 2009)
>
> My husband has been a constant source of support throughout my career. I couldn't have done it without him. I think having a partner at home and someone who knows you intimately to give you an honest perspective on situations is critical. He is always available to discuss ideas with or to sort through situations with. I am lucky to have him. (participant comment, 2009)

These comments reinforce the fact that work/life balance is extremely important to women.

Most impact and explained variance factor. The fourth hypothesis (H4) that the percent of variance in the dependent variable (career success) explained by social support was greater than the percent of variance explained by personal characteristics or corporate culture was not supported. I wanted to look at the constructs of whether social support structures were a major factor in a successful career. My main hypothesis was that social support was the make or break variable for women. Even though this hypothesis was not supported by the survey data, 73% of the participants did not have responsibility for any dependents during their careers. As one participant said:

> I am married, but did not have any children and that allowed me to focus more on my job than might have been the case otherwise; including in the last half of my career much business travel and overtime. (participant comment, 2009)

Also, 78% of participants were married or had a significant other so they may be receiving support to the point that it is not recognized as a major factor to their success.

> Having a supportive husband who is a stay at home dad, and supervisors who agree that balancing career and family is important. (participant comment, 2009)
>
> A supportive husband made it possible for me to set and achieve high goals. (participant comment, 2009)
>
> Support from my husband and children helped me reach the level I am at. Their belief in me kept me going at the difficult times. (participant comment, 2009)

Summary

The survey produced 127 responses of which I was able to use 111. The descriptive analysis showed that the data were normally distributed except for a few instances. I eliminated those variables with a high kurtosis before continuing with my analysis. I was able to show that the factors that I derived from my analysis had acceptable reliability as indicated by Cronbach's alpha. I was able to reduce the number of variables down to nine factors for the regression analysis using the block-by-block method with the stepwise approach. The results showed that personal characteristics—positive accounted for 20% of the overall career success and satisfaction. The PC items included being proud of accomplishments, taking things in stride, being friends with oneself, being determined, and keeping interested in things. Corporate culture accounted for an additional 21% and 3%. CC items included satisfaction with the amount of special projects and with the amount of leadership and management training. Social support—family accounted for an additional 3%. SS items included being able to talk with family about problems, family helping one make decisions, and the inverse of family removed from one's life. Mentoring and networking did not contribute to the variance in overall career success and satisfaction.

Chapter 6 delves into the reasons and implications of the results that I found, as well as areas for further research.

Chapter VI: Conclusion

Introduction

This chapter summarizes, evaluates, and interprets the results found from my study. I was interested in analyzing the factors that support women engineers' leadership development and success. The focus was on the personal characteristics needed for a successful career and the impacts of social support, career development, and the corporate culture on their career progression. The aspects of social support include the factors of family, friends, and significant others and the levels of support during the woman's career. The features of corporate culture considered in this study were whether the culture was male- or female-dominated and a combination of gender consciousness, networking, mentoring, and career development opportunities available for women. Personal characteristics included the level of perseverance, persistence despite adversity or discouragement, and self-reliance (a belief in oneself and capabilities).

Summary of the Study

I was interested in pursuing the analysis of what factors there are in women perceiving they have had a successful engineering career and determining the need for these factors, the importance of them, and what barriers need to be removed (Auster & Ekstein, 2005; Buckley, 2008; Catalyst, 1992; Chavanne, 2008; Jagacinski, 1987).

This study explored the relationship between personal qualities such as resilience and goal orientation; environmental variables, such as corporate culture and development opportunities; and the strength of the social support network that include the elements of family, friends, and significant others to career success for women in engineering. Participants included women engineers with 5 to 30 years work experience, many of

whom are members of the Society of Women Engineers (SWE). Data were collected through an online survey and the analysis includes factor analysis and multiple regression. Narrative comments were collected for each of the sections to round out the quantitative findings.

Questions. Three scales were used to address the following research questions:

1. What is the relationship between the personal characteristics (resilience and education) and career success for women engineers?
2. What is the relationship between the environment of the corporation in a woman's career (male- or female-dominated, professional developmental opportunities, mentoring, and networking) and the career success for women engineers?
3. What is the relationship between the social support structure (demographics of the family and perceived support from family, friends, and community) and career success for women engineers?
4. Is the relationship between social support and career success for women engineers stronger than the relationship between personal characteristics and career success, as well as between corporate culture and career success?

Two of the three scales were based on previous ones—Personal Characteristics and Social Support. I developed the third scale to measure corporate culture. Descriptive and demographic questions were also included in the survey.

Hypotheses. The hypotheses are that all three constructs do make a difference in women's leadership and career success. The following sections review the

interpretations of the relationships of these research hypotheses to the overall career success and satisfaction.

Personal characteristics. The first hypothesis (H1) was that there is a positive relationship between personal characteristics (PC) and career success for women engineers. This hypothesis was supported leading to a conclusion that women still believe that they need to be strong, smart, and self-reliant to be successful.

Based on the age demographics, it is encouraging to see younger women are entering into the field. Corporations need to make sure they encourage the retention of these young women. Discouragement can cause a reduction in force which can hurt the corporation. Part of the effort should be on women going for higher degrees in engineering. Many of the participants have bachelors and/or masters degrees. Recruitment of women into technical Ph.D. programs would further the growth of engineers which is so needed in the United States.

Corporate culture. The second hypothesis (H2) was that a positive relationship exists between corporate culture (CC) and career success for women engineers. This hypothesis was also supported. What was surprising to me was that quite a few participants did not have opportunities in their careers for training, mentoring, and special assignments. As stated in chapter 5, 20% of all the respondents indicated that none of the opportunities I asked about was available.

With these numbers showing what is not available, it is amazing that more is not done in this area, especially since 63% of the respondents rated upper management mentoring as important (agree or strongly agree) and 59% rated peer mentoring as important. Corporations need to invest more into both types of mentoring for their up

and coming leaders. With this overwhelming evidence that having a corporate culture that promotes training, mentoring, networking, and special assignments contributes to overall career success and satisfaction for women, corporations need to put concerted effort into having these in place. Corporations need to invest in the structure, processes, and effort to put more in place for leadership growth and career success for women, specifically, and everyone in general. It is important to look beyond the male or female aspects of leadership and focus on all aspects that make up leadership. Focusing on the individual will help reduce stereotypical thinking and gender bias in the STEM fields. Corporations that only provide superficial diversity awareness and allow situations like what was presented by the participants in chapter 5 will lose out on the battle to recruit and retain the best talent to make the company competitive.

The other critical area that corporations need to focus on is filling senior level positions within the company with women. Corporations need to find ways to grow women mentors so that they are available for new women engineers entering the company as mentors and role models. Corporations need to be aware of the environment that they have in place. Even if there are programs to support diversity in place, there must also be follow-up and action taken by the corporation when something happens.

Social support. The third hypothesis (H3) was that there is a positive relationship between social support (SS) and career success for women engineers. This hypothesis was supported. Looking at the level of agreement for the importance of the other social support variable for overall career success and satisfaction showed that 82% agree or strongly agree on the importance of friends support, and 81% agree or strongly agree on the importance of a special person (40% strongly agree). The results reinforce the fact

that work/life balance is extremely important to women. Even though the second hypothesis was supported, social support was not the factor with the most influence. One reason could be that women see work/life balance as a corporate responsibility, not a social support issue. Corporations that support work/life balance, promote family, and ensure there are role models for women will have more success, more committed employees (men and women), and be more competitive in their industry.

Most impact and explained variance factor. The hypothesis (H4) that the percent of variance in the dependent variable (career success) explained by social support would be greater than the percent of variance explained by personal characteristics or corporate culture was not supported. I had not found much research on the social support structure for women engineers in corporate America. From personal experience, I have found that many of the women leaders I have known, worked with, and studied have a social support structure conducive to career success. Most women were either single, married or in a relationship with no children, or, if there were children, the men are stay-at-home dads. There are very few relationships where both the man and the woman worked outside the home and have children.

Noteworthy in this connection is that 73% of the participants did not have responsibility for any dependents during their careers. This could be because of a conscious choice by the women to pursue a career instead of parenthood, believing one could not have a family and a career at the same time. Also, 78% were married or with a significant other so they may be receiving support to the point that it is not recognized as a major factor to their success. Another note would be that this survey is of those who have survived the corporate culture and feel that they did so because of their own

personal characteristics and thus may not reveal the importance of a social network for those just entering the profession.

Motivation factors. This research has raised several additional questions about the intrinsic motivation of female engineers. Based on my research and the narrative portion of the survey, I found the following results.

The environment in both higher education and corporations for engineering is male-dominated. Success is measured in individual achievements, competition, and specialization. Male engineers' motivation has been focused in these areas to achieve success. Female motivation, in any career field, is around team achievements, collaboration, and breadth of experience that can make a difference (Auster & Ekstein, 2005; Jagacinski, 1987). Comments from the participants that illustrate this are:

> Community projects and serving on the Board of Directors for several non-profit organizations added to the dimensions and/or depth of my leadership skills. (participant comment, 2009)
>
> For me, it's really been based on the people I work with and the variety of work. (participant comment, 2009)
>
> I love this profession, not only are my projects contributing positively to society, but I get to work with a very diverse group of people. The job continues to bring challenges, which for me makes for a diverse work experience—very satisfying. (participant comment, 2009)
>
> The opportunity to mentor under engineers that I respect has significantly increased the satisfaction I feel for my career. (participant comment, 2009)
>
> Support from management is very important to job satisfaction. Support from co-workers is very important to job satisfaction. (participant comment, 2009)
>
> The sense of being part of a successful team with clear goals and support from outside the team. Or alternatively, if not well supported outside there is satisfaction when the team is very strong and supportive of each other and achieves the goals set despite less than enthusiastic outside support; a highly synergistic team. Such a team can overcome lack of outside support (up to a point). Being on a team where in a crunch everyone helps whatever way they

> can, even if it isn't their assigned task is satisfying. I took great satisfaction when able to work with an international team with all the diversity of that situation. Lack of upper management support due to their lack of understanding of what it takes to reach the goals they set can lead to dissatisfaction. Being told by a contract manager that we were doing our job the wrong way caused great dissatisfaction in particular since it was the way he had taught us to do it based on expediency. (participant comment, 2009)

An inclusive and collaborative environment appeals to female engineers. Examples taken from the participants' narrative include:

> Interfacing with the community and the external business world kept me challenged and helped me hone both my business and interpersonal skills. (participant comment, 2009)

> I love what I do at work. It's very interesting, engaging, satisfying, and I feel like I am doing something worthwhile for my community and the environment. (participant comment, 2009)

Having challenging work that makes a difference also motivated women as long as work/life balance is taken into consideration. Examples to illustrate this include:

> Key has been ability to adjust my schedule to meet children's needs. (participant comment, 2009)

> Having a life outside of work, including kids and husband. It's difficult to fit it all in and to make everything work. (participant comment, 2009)

> I like being an engineer, but I don't like the lack of work-life balance or the effect having children has on your career. (participant comment, 2009)

> The biggest challenge is having opportunities that are compatible with taking care of a family. Many training and networking opportunities require travel/after hours time investment that are difficult for working mothers. (participant comment, 2009)

> Prior to having children I had a good network of professional women that I regularly interacted with either through affinity groups or other professional networking opportunities. Once I had children it was hard from me to participate in these activities during off-hours. Limited involvement in professional affinity groups greatly reduced my professional network. The bottom-line is that it is difficult to network with other professional women with young families like myself because there really isn't an organization that is geared toward professionals with young children. (participant comment, 2009)

Corporations that focus on collaboration, inclusion, opportunities at all levels, and the importance of work/life will attract, retain, and motivate women. Many of the participants in this study are not satisfied with what is available today for work/life balance and leadership opportunities. Less than half of the participants of this study were satisfied with what is available today for work/life balance. Almost 29% disagree that they are satisfied with work/life balance and over 33% disagree that they are satisfied with leadership opportunities (see Figures 5.6 and 5.7).

> Having children, and figuring out how to be a mom and have a career has been my biggest challenge. Before my kids, I gave 100% to my career. After my kids I had to learn how to be okay with not always exceeding expectations. (participant comment, 2009)

> Having two children slowed my career down as far as time missed from work, promotions missed, missed pay raises, not being available for business travel, etc. (participant comment, 2009)

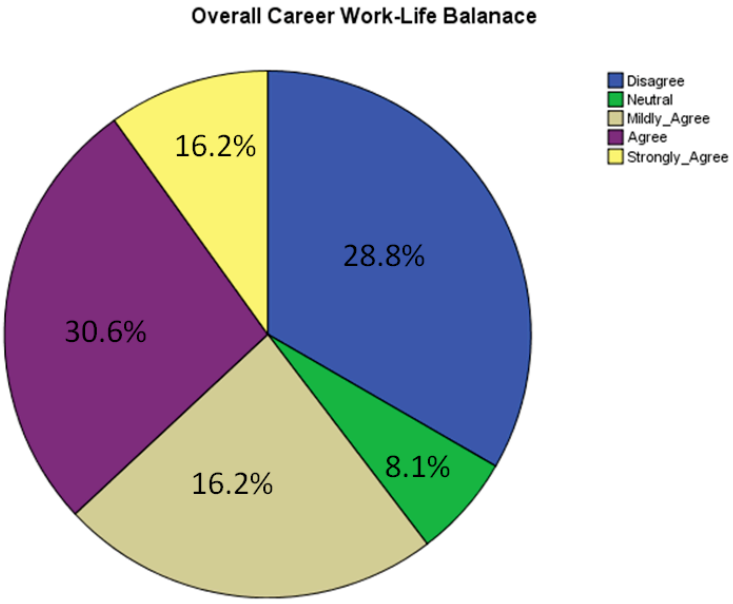

Figure 6.1. Satisfaction with overall work/life balance.

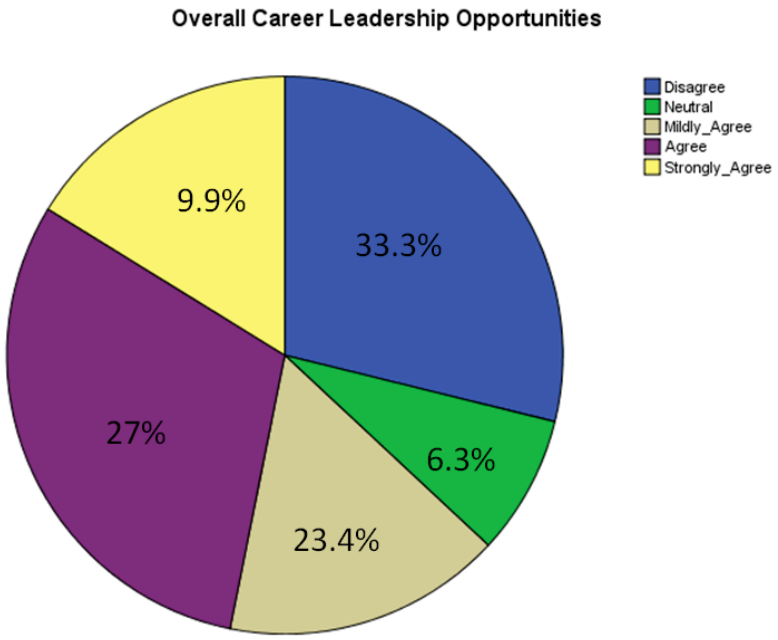

Figure 6.2. Satisfaction with overall leadership opportunities.

The environment for studying and working in STEM fields, especially engineering, need to change from exclusion to inclusion, competition to collaboration, and narrow specialization to appreciation for diverse ideas to attract and retain women (Busch-Vishniac & Jarosz, 2004; Ferreira, 2003; Larsen & Stubbs, 2005). Emphasizing interaction with other people, making the benefits of engineering studies and work more apparent, stressing social relevance and the value to subcultures are ways to appeal to more women and minorities (Gokhale & Stier, 2004; O'Callaghan & Enright Jerger, 2006). Recruitment and retention need to emphasize the atmosphere of inclusion to make the study and work in engineering fields more attractive.

Cross-department integration of course material is a way of retaining more women and minorities in engineering programs and continuation into the work world. Because of the complexities of world issues, globalization, and the need to meet societal

needs, students need to understand and make connections among disparate areas, environments, issues, and topics. Cross-department integration affords the opportunity to prepare students for future careers by linking technical classes with course work in business management, liberal arts, entrepreneurship, and systems thinking (Garrett-Ruffin & Martsolf, 2005; Larsen & Stubbs, 2005).

This study has shown that there are many opportunities corporations can focus on to recruit, retain, and support women engineers. It should be noted that as generation Yers enter into the workplace, corporations will be forced to make changes for all workers. Generation Yers, as a whole, are more interested in all of these factors. They are the generation that work-to-live, not live-to-work, like the baby boomer generation (Hambert, unpublished).

Study Limitations

There were some limitations in conducting this study. The method of collecting the data was via a web-based survey that was included in newsletters and on-line professional networks. Even though there was potential for a large population, I did not receive many responses, only 127. I believe that there is a very small population of women engineers based on my research (reference Figure 1.1), hence, my response rate was low (U.S. Bureau of Labor Statistics, 2008). My research found that there was a range of 8% to 27.8% of women in the different engineering and technology fields (Catalyst, 2009). Also, this quantitative study provided empirical evidence about the factors affecting overall career success and satisfaction but does not answer the question of why. I did include open-ended questions to collect some input, but this was limited. Further qualitative research would be useful.

Implications for Women Engineers and Corporations

The overall thrust of this dissertation was to gain understanding of how women engineers are faring in corporate America. A deeper look at the research to date shows that women tend to be absent from the engineering field and there is very little research that gives possible explanations for this absence. Some experts believe that a lack of educational and family support, as well as a negative organizational culture may contribute to this absence. Research in this area is limited, which is why I conducted this study. Today's global economy includes both men and women in all facets of business, including engineering. It is important that we have an understanding of why the numbers of women engineers are low and not increasing. I hope that the outcome of this research may provide educational institutions and business entities with some insight on how to improve their engineering programs so that they can become more diverse. Engineering majors have only a limited number of curricular paths to their degrees. This alone causes lack of interest and the loss of many people to study and work in engineering fields. Other fields have multiple options for degrees (Busch-Vishniac & Jarosz, 2004; May & Chubin, 2003). Many researchers believe that gatekeeper courses can cause undue pressures, foster too much competition among students, and are not conducive to teaming among students (Busch-Vishniac & Jarosz, 2004; Capobiance, 2006; Khan, 2005; Nicholls et al., 2007; O'Callaghan & Enright Jerger, 2006). "Many academically capable students that left the STEM track appeared to have become disenchanted by teaching methods that focused on 'weeding-out' less-determined students" (Nicholls et al., 2007, p. 35). By losing talent in higher education, corporations have less to choose from when

recruiting. If the key factors identified in this study are improved, the environment would be more welcoming, making it easier to recruit women.

This research was based on the opportunities women engineers receive. Further research could look at the leadership experience that women give others (not just receive). This could result in valuable insights into how to grow more female engineering role models and mentors. Because a concerted effort is needed by K-12 programs to promote engineering and colleges and universities to recruit both female students and faculty so there are role models for young women to follow, corporations need to support these recruiting efforts to ensure there is a steady pipeline of women into the field. Other areas for research possibilities are extending this research to include international participants, studying the perceptions of women who have left engineering, research the generational differences of the factors, and looking into corporation where the climate is inviting.

Conclusion

Based on my research, I believe that corporate America can do a lot more to recruit and retain women in the engineering fields and to help them be satisfied and successful in their careers. A gap continues to exist in what corporations offer women in terms of training, mentoring, networking, and special assignments. This means that corporations need to invest in a structure and put processes in place that enables equal opportunities for all. Superficial efforts can be damaging because women will lose confidence and faith that their company is sincere in removing barriers and leave the company—or worse, leave the field.

With the lack of a pipeline from colleges and universities to the corporate world, American companies are going to lose many talented women due to lack of interest in gaining engineering degrees. This, in turn, will hurt their competitiveness in a global economy. Retention is just as critical. Women need to see a career path, whether through the technical or management ranks. If opportunities are not available, they will leave. Research has shown that companies with women in executive positions, especially on company boards do better financially (Salvaterra, 2008). My research has shown that corporations are still not doing all they can to bring women into the field and keep them there.

I believe my research has also shown that corporations need to work hand-in-hand with colleges and universities to promote engineering as challenging, rewarding, socially conscience, and open to diversity. Studies and work need to be inclusive, collaborative, and focus on making a difference in the world.

Women still believe that they have to do a lot on their own to gain satisfaction and success. The personal characteristics results show that they have to be strong and resilient to be successful. I was surprised that the social support results were not as strong as I thought they would be. I believe this is because a lot of women have given up the idea of a family (dependent care) to be successful. Also, the results show that women see work/life balance as a corporate responsibility, not a social support issue.

Based on the results and the narratives, all three factors had a positive effect in a woman's perception of career satisfaction and success, supporting my hypotheses. The model I presented in chapter 3 holds true, but my hypothesis that social support was the biggest factor was not supported by the current research. I do believe my research has

shown that there is still a long way to go for corporate America, especially in the engineering fields, in employing women and their talents to the fullest degree. Hopefully this study will help corporations put structures in place to support women and women will see that they do not have to choose between a career and a family—they can have both.

APPENDIX

Appendix A: National Girls Collaborative Project

Numerous gender equity programs and initiatives in the areas of **Science, Technology, Engineering, and Mathematics (STEM)** have been implemented only to lose effectiveness or fade away. Often these projects do not address sustainability as resources declined, personnel changed, or priorities shifted.

The purpose of the **National Girls Collaborative Project** is to replicate the Northwest Girls Collaborative Project in three regions (California, Wisconsin, and Massachusetts) throughout the United States in an effort to strengthen the capacity, impact, and sustainability of existing and evolving girl-serving Science, Technology, and Engineering and Mathematics (STEM) programs. Through collaboration among organizations, institutions, and businesses committed to expanding participation of women in STEM, the existing and evolving projects will have a much greater chance of maintaining interest and participation of girls in STEM within their regions.

The Northwest Girls Collaborative has experienced tremendous success during the 18 months of funding from the National Science Foundation. The collaborative has provided many opportunities for individuals in the region to meet or reconnect, learn about each other's work, and develop ways to work together to better serve girls and young women in STEM in the northwest. Representatives from various organizations, businesses, and educational institutions in the region have come together in person at NWGCP events and through mini-grant projects, and virtually through the NWGCP Web site and listserv.

Reference:
http://www.pugetsoundcenter.org/ngcp/.

Appendix B: Survey Constructs and Measurements

Constructs	Sub-Factors	Variable(s)	Response Codes/Categories	Source
Personal Characteristic	Resilience	Resilience Scale	15 items scored on 7 point scale from 1=strongly disagree to 7=strongly agree	Wagnild & Young, 1987
	Demo-graphics – personal	Age Race/ Ethnicity Highest Level of Education	18-35, 36-45, 46-55, 56-65, 65+ Asian, Caucasian, African American, Hispanic/Latino, Other PhD, Masters, Bachelors, Associate Degree, High School, Other	Basic demo-graphic questions
Corporate Culture	Professional Development	Training Mentoring Networking Special Assignments	7 items scored yes/no on whether professional development was available 14 items scored on 7 point scale for both satisfaction and importance	New scale deve-loped by author
	Demo-graphics – organiza-tional	Position Level Industry Sector Work Experience – overall and in engineering	CEO, Sr. VP, Exec Dir, Manager, Lead Male-Dominated: IT, Aerospace, Automotive, Manufacturing, Engineering Female-Dominated: Health Care, Education, Retail 0-5, 6-10, 11-15, 16-20, 21-25, 26-30, 30+	Basic demo-graphic questions

Social Support	Family Friends Significant Other	Multidimensional Scale of Perceived Social Support	17 items scored on 7 point scale from 1=strongly disagree to 7=strongly agree	(Zimet et al., 1990)
	Demo-graphics – personal	Marital Status Dependent Responsibility	Married, Single, Divorced, Widowed, Significant Other Children, Parents, Siblings, Family, None	Basic demo-graphic questions
Dependent Variable **Career Success**		Career Satisfaction Career Success Leadership Opportunities Work-Life Balance	4 items scored on 7 point scale from 1=strongly disagree to 7=strongly agree	New scale deve-loped by author

Appendix C: Dissertation Survey

Dissertation Final - Women Engineering Leadership in Corporate

1. Women Engineering Careers

This survey is about factors affecting women's careers in the engineering field. One in four women entering the engineering profession leave after age 30. Why? Often, women in engineering careers struggle with being accepted or not being given challenging and/or development opportunities. Why?

This survey is for women who have worked in the engineering field for more than 5 years. Your response will help us understand those factors that affect a women's career in the engineering field. Completing this survey is strictly voluntary and your anonymity and confidentiality will be protected. Participation in this survey will be considered consent to use the aggregate data in a research report. It should take about 15 minutes to complete the survey.

My name is Letha Joye Jepson and I am an Executive Director in the IT field with 26 years of experience in both the Military and Corporate America. I am a member of the Society of Women Engineers (SWE) and I am also a PhD Student/Practitioner. I am studying Women in Leadership with a focus on women in technical fields. I have developed this survey to use in my research for my dissertation on women in leadership in technical fields. I will be sharing the aggregate results with SWE and I hope you are willing to support this study. I want to thank-you in advance for participating in this survey.

If you have questions about this survey, contact the surveys author. Letha Joye Jepson at jjepson@phd.antioch.edu.

2. Environmental - Corporate Culture

Corporate Culture is a combination of networking, mentoring, training and other career development opportunities.

Networking includes belonging to affinity groups like the Society of Women Engineers, internal company affinity/networking groups and external networking groups.

A mentor is someone who guides/advises you. Mentoring includes formal programs internal as well as external to your company.

Career development opportunities include training within and external to your company for both leadership and management. Training in leadership involves how to shape and elevate the motives and goals of followers, visioning, trust and the quest for the knowing why. The focus is on people - the emotional and spiritual resources of the organization. Training in management involves the knowing how, problem solving, administration and the efficiently run organization. The focus is on the physical resources, the systems and the structure.

Development opportunities can also include special assignment opportunities and/or working on teams for special projects.

*** 1. Over the course of your career, have you been given any of these professional opportunities?**

	YES - FREQUENTLY Available During My Career	YES - OCCASIONALLY Available During My Career	NO - Not Available During My Career
Leadership Training	○	○	○
Management Training	○	○	○
Upper-Management Mentoring	○	○	○
Peer/Lateral Mentoring	○	○	○
Networking Opportunities	○	○	○
Special Assignments	○	○	○
Teaming on Special Projects	○	○	○
Other	○	○	○

Other (Specify)

3. CAREER SUCCESS

*** 2. How strongly do you agree or disagree that these professional opportunities were important to your CAREER SUCCESS?**

	Strongly Disagree	Disagree	Mildly Disagree	Neutral	Mildly Agree	Agree	Strongly Agree	Not Applicable (N/A)
Leadership Training	○	○	○	○	○	○	○	○
Management Training	○	○	○	○	○	○	○	○
Upper-Management Mentoring	○	○	○	○	○	○	○	○
Peer/Lateral Mentoring	○	○	○	○	○	○	○	○
Networking Opportunities	○	○	○	○	○	○	○	○
Special Assignments	○	○	○	○	○	○	○	○
Teaming on Special Projects	○	○	○	○	○	○	○	○
Other	○	○	○	○	○	○	○	○

Other (please specify)

4. CAREER SATISFACTION

*** 3. How strongly do you agree or disagree that these professional opportunities were important to your CAREER SATISFACTION?**

	Strongly Disagree	Disagree	Mildly Disagree	Neutral	Mildly Agree	Agree	Strongly Agree	Not Applicable (N/A)
Leadership Training	○	○	○	○	○	○	○	○
Management Training	○	○	○	○	○	○	○	○
Upper-Management Mentoring	○	○	○	○	○	○	○	○
Peer/Lateral Mentoring	○	○	○	○	○	○	○	○
Networking Opportunities	○	○	○	○	○	○	○	○
Special Assignments	○	○	○	○	○	○	○	○
Teaming on Special Projects	○	○	○	○	○	○	○	○
Other	○	○	○	○	○	○	○	○

Other (please specify)

5. AMOUNT/FREQUENCY OF PROFESSIONAL OPPORTUNITIES

*** 4. Thinking about your professional opportunities, how strongly do you agree or disagree with the following statements:**

"I am satisfied with the AMOUNT of professional opportunities given to me for ..."

	Strongly Disagree	Disagree	Mildly Disagree	Neutral	Mildly Agree	Agree	Strongly Agree
...Leadership and Management Training	○	○	○	○	○	○	○
...Networking Opportunities	○	○	○	○	○	○	○
...Mentoring Opportunities	○	○	○	○	○	○	○
...Special Assignments	○	○	○	○	○	○	○
...Teaming on Special Projects	○	○	○	○	○	○	○
...Other	○	○	○	○	○	○	○

Other (please specify)

6. QUALITY OF PROFESSIONAL OPPORTUNITIES

*** 5. Thinking about your professional opportunities, how strongly do you agree or disagree with the following statements:**

"I am satisfied with the QUALITY of professional opportunities given to me for ..."

	Strongly Disagree	Disagree	Mildly Disagree	Neutral	Mildly Agree	Agree	Strongly Agree
...Leadership and Management Training							
...Networking Opportunities							
...Mentoring Opportunities							
...Special Assignments							
...Teaming on Special Projects							
...Other							

Other (please specify)

6. What, if any, factors have affected your satisfaction or dissatisfaction with the professional opportunities you have had during your engineering career?

7. Personal Characteristics

*** 7. Thinking about your personal strengths and weaknesses, how strongly do you agree or disagree with the following statements.**

	Strongly Disagree	Disagree	Mildly Disagree	Neutral	Mildly Agree	Agree	Strongly Agree
I usually manage one way or another.							
I feel proud that I have accomplished things in life.							
I usually take things in stride.							
I am friends with myself.							
I am determined.							

*** 8. Thinking about your personal strengths and weaknesses, how strongly do you agree or disagree with the following statements.**

	Strongly Disagree	Disagree	Mildly Disagree	Neutral	Mildly Agree	Agree	Strongly Agree
I often feel helpless.							
There are days it is hard to keep going.							
At times I have no energy to do what I need to do.							
I often feel overwhelmed by my responsibilities.							
I frequently feel alone in the world.							

*** 9. Thinking about your personal strengths and weaknesses, how strongly do you agree or disagree with the following statements.**

	Strongly Disagree	Disagree	Mildly Disagree	Neutral	Mildly Agree	Agree	Strongly Agree
I keep interested in things.							
My belief in myself gets me through hard times.							
My life has meaning.							
When I am in a difficult situation, I can usually find my way out of it.							
I have enough energy to do what I have to do.							

10. Thinking about your overall career, what, if any, personal factors affected your career?

8. Social Support

*** 11. Thinking about the SUPPORT you have had from family, friends, and/or significant others OVER THE MAJORITY OF YOUR CAREER, how strongly would you agree or disagree with the following statements.**

	Strongly Disagree	Disagree	Mildly Disagree	Neutral	Mildly Agree	Agree	Strongly Agree
There is a special person who is around when I am in need.							
There is a special person with whom I can share my joys and sorrows.							
My family really tries to help me.							
I get the emotional help and support I need from my family.							
I have a special person who is a real source of comfort to me.							
My friends really try to help me.							

*** 12. Thinking about the SUPPORT you have had from family, friends, and/or significant others OVER THE MAJORITY OF YOUR CAREER, how strongly would you agree or disagree with the following statements.**

	Strongly Disagree	Disagree	Mildly Disagree	Neutral	Mildly Agree	Agree	Strongly Agree
I have no one around to help me when I am in need.							
My family is removed from my life.							
It is hard for me to make friends.							
There is no one to talk about my problems with.							
There is no one who is a real source of comfort to me.							

*** 13. Thinking about the SUPPORT you have had from family, friends, and/or significant others OVER THE MAJORITY OF YOUR CAREER, how strongly would you agree or disagree with the following statements.**

	Strongly Disagree	Disagree	Mildly Disagree	Neutral	Mildly Agree	Agree	Strongly Agree
I can count on my friends when things go wrong.							
I can talk about my problems with my family.							
I have friends with whom I can share my joys and sorrows.							
There is a special person in my life who cares about my feelings.							
My family is willing to help me make decisions.							
I can talk about my problems with my friends.							

14. Thinking back over your career, what, if any, social support factors particularly affected your career the most and why.

9. Overall Perception of Leadership/Career Success

*** 15. Overall, how would you rate your career success and satisfaction?**

	Strongly Disagree	Disagree	Mildly Disagree	Neutral	Mildly Agree	Agree	Strongly Agree
I am satisfied with my overall career in engineering.							
I have had a successful career in engineering.							
I have had good leadership opportunities in my career in engineering.							
I am satisfied with the Work-Life Balance in my career.							

16. Why did you rate your overall career satisfaction and success as you did?

17. Thinking back over your overall leadership/career experience, were there one or two critical incidents that affected your career? Please describe.

10. Personal Data

*** 18. Age**

- 18-35
- 36-45
- 46-55
- 56-65
- 66+

*** 19. Gender**

- Female
- Male

20. In what ways, if any, did your gender affect your engineering career? Please describe.

*** 21. Race/Ethnicity**

- Asian
- African American
- Caucasian
- Hispanic/Latino
- Native American
- Other

If you chose Other for Race/Ethnicity please list what race/ethnicity you are.

22. In what ways, if any, did your ethnic background affect your engineering career? Please describe.

11. Personal Data (continued)

*** 23. Marital Status**

- Married
- Significant Other
- Single
- Divorced
- Widowed

24. In what ways, if any, did your marital status affect your engineering career? Please describe.

* **25. Dependent responsibilities at anytime during career**

- [ ] Children
- [ ] Parents
- [ ] Siblings
- [ ] Other Family Members
- [ ] None

26. In what ways, if any, did having dependents affect your career? Please describe.

* **27. Level Of Education (highest degree achieved)**

- ( ) High School
- ( ) AA
- ( ) Bachelors
- ( ) Masters
- ( ) PhD
- ( ) Other

Other (please specify)

28. In what ways, if any, did your level of education affect your engineering career? Please describe.

12. Personal Data (continued)

* **29. Pick the highest level you have held at work.**

- ( ) CEO
- ( ) Senior VP
- ( ) Executive Director
- ( ) Manager
- ( ) Lead
- ( ) Other

Other (please specify)

* **30. Field of Work- Pick the field of work that you have been employed in the most.**

- ( ) Corporate
- ( ) Non-Profit
- ( ) Academic
- ( ) Military
- ( ) Self-employed
- ( ) Other

Other (please specify)

*** 31. Field of Work - Check all fields of work that you have been employed in.**

- [ ] Corporate
- [ ] Non-Profit
- [ ] Academic
- [ ] Military
- [ ] Self-employed
- [ ] Government
- [ ] Other

Other (please specify)

*** 32. Industry Sector - Pick the industry sector that you have worked in the most.**

- ○ Aerospace
- ○ Automotive
- ○ Education
- ○ Engineering
- ○ Health Care
- ○ IT
- ○ Manufacturing
- ○ Retail
- ○ Other

Other (please specify)

*** 33. Industry Sector - Check all industry sectors that you have worked in.**

- [ ] Aerospace
- [ ] Automotive
- [ ] Education
- [ ] Engineering
- [ ] Health Care
- [ ] IT
- [ ] Manufacturing
- [ ] Retail
- [ ] Other

Other (please specify)

*** 34. Work Experience - how many years have you been employed?**

- 0-5 years
- 6-10 years
- 11-15 years
- 16-20 years
- 21-25 years
- 26-30 years
- 30+ years

*** 35. Work Experience - how many years have you worked in the engineering field?**

- 0-5 years
- 6-10 years
- 11-15 years
- 16-20 years
- 21-25 years
- 26-30 years
- 30+ years

13. Thank-You

Thank-you for taking the time to fill out this survey. Your response will help us understand the factors affecting women's careers in the engineering field.

Letha Joye Jepson
jjepson@phd.antioch.edu

Appendix D: Request Letter and Follow-up Letter to SWE

Request Letter:

To: Betty and Marcia:

Subject: Request to run dissertation survey in the May SWE Newsletter

My name is Letha Joye Jepson. I am a Ph.D. student at Antioch University in the Leadership and Change program. My area of interest is Women in Leadership with a focus on women in technical fields. I am an Executive Director in the IT field with 26 years of experience in both the Military and Corporate America. I am a member of Society of Women Engineers (SWE). I would like to thank you Betty for allowing me to run my dissertation survey in your May newsletter. Marcia, Betty gave me your name as my focal to include my request for survey participation.

I am using a survey to capture the data I need to complete my research about successful women engineering leaders in Corporate America. Women Engineers are making an impact in Corporate America, many of them reaching leadership positions in their career yet we don't always know why. The survey and results are through a program called Survey Monkey and the members' anonymity and confidentiality will be protected. This survey for my dissertation is for members of the Society of Women Engineers (SWE) that have worked in the engineering field for 20 – 30 years. Their responses will help me understand factors leading to women's leadership/career success in the engineering field. I will be sharing the aggregate results with SWE and I want to thank-you for your support of this study.

The following is the text I would like to include in your May newsletter:

Survey Poll Request: Women Engineering Leadership in Corporate America. One in four women entering the engineering profession leave after age 30. Why? Women in engineering careers often struggle with being accepted and not being given challenging and/or development opportunities. Your response to this survey will help understand factors affecting women's careers in the engineering field. This survey is for members of the Society of Women Engineers (SWE) that have worked in the engineering field for 20 – 30 years. The survey and results are through a program called Survey Monkey and your anonymity and confidentiality will be protected. ~The aggregate results will be shared with SWE. Thank-you in advance for participating in this survey. You can find the survey at: http://www.surveymonkey.com/s.aspx?sm=oApG4dlRJ7XC_2fD_2blenp3xA_3d_3d_ A response would be appreciated by **June 15, 2009**

Thank-you again for your support for this study. Take care,

Joye Jepson
206-719-5595
jjepson@phd.antioch.edu

Follow-up Letter:

To: Betty and Marcia

Subject: REMINDER: Survey Completion for Women Engineering Leaders in Corporate America.

My name is Letha Joye Jepson. I am a Ph.D. student at Antioch University in the Leadership and Change program. I recently sent a request via the May newsletter to the SWE membership to participate in a study about Women in Leadership with a focus on women in technical fields. Because I did not receive enough responses, would you please re-run my request in the June newsletter.

As a reminder, I sent a survey to capture the data I need to complete my research about successful women engineering leaders in Corporate America. The survey and results are through a program called Survey Monkey and the members' anonymity and confidentiality will be protected. This survey for my dissertation is for members of the Society of Women Engineers (SWE) that have worked in the engineering field for 20 – 30 years. Their responses will help me understand factors leading to women's leadership/career success in the engineering field. I will be sharing the aggregate results with SWE and I want to thank-you again for your continued support.

The following is the text I would like to include in your June newsletter:

Survey Poll Second Request: Women Engineering Leadership in Corporate America. One in four women entering the engineering profession leave after age 30. Why? Women in engineering careers often struggle with being accepted and not being given challenging and/or development opportunities. Your response to this survey will help understand factors affecting women's careers in the engineering field. This survey is for members of the Society of Women Engineers (SWE) that have worked in the engineering field for 20 – 30 years. The survey and results are through a program called Survey Monkey and your anonymity and confidentiality will be protected. ~The aggregate results will be shared with SWE. Thank-you in advance for participating in this survey. You can find the survey at: http://www.surveymonkey.com/s.aspx?sm=oApG4dIRJ7XC_2fD_2bIenp3xA_3d_3d A response would be appreciated by **July 30, 2009**

Thank-you again for your support for this study. Take care,

Joye Jepson
206-719-5595
jjepson@phd.antioch.edu

Appendix E: Letter Sent to Pilot Survey Participants

I have a favor to ask of you. As you know, I have been working on my Ph.D. in Leadership and Change for a few years now. I am getting ready to work on my actual dissertation. My area of interest has always been Women in Leadership. I need to pilot a survey to ensure reliability, validity, ease of understanding and ease of use. I am hoping that you will take the survey so that I can look at results to see if the questions are gathering the data I need. The survey and results are through a program called Survey Monkey and your anonymity and confidentiality will be protected. I would also like your feedback on the ease of use and understanding. For that, an email back to me at jjepson@phd.antioch.edu about the experience and any suggestions or questions you have for me would be appreciated.

The actual survey for my dissertation will be given to members of the Society of Women Engineers (SWE) that have worked in the engineering field for 20 – 30 years.

You can find the survey at:
http://www.surveymonkey.com/s.aspx?sm=SoeMKoPuHSWtU7zaJAeSZA_3d_3d

I would appreciate a response back by next week, **March 17, 2008**. Thank-you very much for your time and support in completing my survey and sending me feedback about the survey. Take care,

Joye Jepson
206-719-5595
jjepson@phd.antioch.edu

Appendix F: Crosstab Results

For Satisfaction with Amount of Networking Opportunities:

Satisfaction with Amount of Networking Opportunities * Leadership Training Availability Crosstabulation

			Leadership Training Availability			
			Frequesntly	Occasionally	Not_Available	Total
Satisfaction with Amount of Networking Opportunities	Strongly_Disagree	Count	2	4	4	10
		% within Leadership Training Availability	6.1%	6.7%	22.2%	9.0%
	Disagree	Count	2	8	1	11
		% within Leadership Training Availability	6.1%	13.3%	5.6%	9.9%
	Mildly_Disagree	Count	1	8	8	17
		% within Leadership Training Availability	3.0%	13.3%	44.4%	15.3%
	Neutral	Count	3	7	2	12
		% within Leadership Training Availability	9.1%	11.7%	11.1%	10.8%
	Mildly Agree	Count	10	11	2	23
		% within Leadership Training Availability	30.3%	18.3%	11.1%	20.7%
	Agree	Count	12	19	0	31
		% within Leadership Training Availability	36.4%	31.7%	.0%	27.9%
	Strongly Agree	Count	3	3	1	7
		% within Leadership Training Availability	9.1%	5.0%	5.6%	6.3%
Total		Count	33	60	18	111
		% within Leadership Training Availability	100.0%	100.0%	100.0%	100.0%

Satisfaction with Amount of Networking Opportunities * Management Training Availability Crosstabulation

			Management Training Availability			
			Frequesntly	Occasionally	Not_Available	Total
Satisfaction with Amount of Networking Opportunities	Strongly_Disagree	Count	2	3	5	10
		% within Management Training Availability	8.0%	5.2%	17.9%	9.0%
	Disagree	Count	1	8	2	11
		% within Management Training Availability	4.0%	13.8%	7.1%	9.9%
	Mildly_Disagree	Count	1	7	9	17
		% within Management Training Availability	4.0%	12.1%	32.1%	15.3%
	Neutral	Count	3	4	5	12
		% within Management Training Availability	12.0%	6.9%	17.9%	10.8%
	Mildly Agree	Count	6	11	6	23
		% within Management Training Availability	24.0%	19.0%	21.4%	20.7%
	Agree	Count	9	21	1	31
		% within Management Training Availability	36.0%	36.2%	3.6%	27.9%
	Strongly Agree	Count	3	4	0	7
		% within Management Training Availability	12.0%	6.9%	.0%	6.3%
Total		Count	25	58	28	111
		% within Management Training Availability	100.0%	100.0%	100.0%	100.0%

atisfaction with Amount of Networking Opportunities * Upper Management Mentoring Availability Crosstabulatior

			Upper Management Mentoring Availability			
			Frequesntly	Occasionally	Not_Available	Total
Satisfaction with Amount of Networking Opportunities	Strongly_Disagree	Count	1	2	7	10
		% within Upper Management Mentoring Availability	4.8%	3.8%	18.4%	9.0%
	Disagree	Count	1	4	6	11
		% within Upper Management Mentoring Availability	4.8%	7.7%	15.8%	9.9%
	Mildly_Disagree	Count	1	9	7	17
		% within Upper Management Mentoring Availability	4.8%	17.3%	18.4%	15.3%
	Neutral	Count	1	6	5	12
		% within Upper Management Mentoring Availability	4.8%	11.5%	13.2%	10.8%
	Mildly Agree	Count	2	14	7	23
		% within Upper Management Mentoring Availability	9.5%	26.9%	18.4%	20.7%
	Agree	Count	11	14	6	31
		% within Upper Management Mentoring Availability	52.4%	26.9%	15.8%	27.9%
	Strongly Agree	Count	4	3	0	7
		% within Upper Management Mentoring Availability	19.0%	5.8%	.0%	6.3%
Total		Count	21	52	38	111
		% within Upper Management Mentoring Availability	100.0%	100.0%	100.0%	100.0%

Satisfaction with Amount of Networking Opportunities * Peer Mentoring Availability Crosstabulation

			Peer Mentoring Availability			
			Frequesntly	Occasionally	Not_Available	Total
Satisfaction with Amount of Networking Opportunities	Strongly_Disagree	Count	0	4	6	10
		% within Peer Mentoring Availability	.0%	7.4%	25.0%	9.0%
	Disagree	Count	2	7	2	11
		% within Peer Mentoring Availability	6.1%	13.0%	8.3%	9.9%
	Mildly_Disagree	Count	2	9	6	17
		% within Peer Mentoring Availability	6.1%	16.7%	25.0%	15.3%
	Neutral	Count	4	5	3	12
		% within Peer Mentoring Availability	12.1%	9.3%	12.5%	10.8%
	Mildly Agree	Count	4	13	6	23
		% within Peer Mentoring Availability	12.1%	24.1%	25.0%	20.7%
	Agree	Count	14	16	1	31
		% within Peer Mentoring Availability	42.4%	29.6%	4.2%	27.9%
	Strongly Agree	Count	7	0	0	7
		% within Peer Mentoring Availability	21.2%	.0%	.0%	6.3%
Total		Count	33	54	24	111
		% within Peer Mentoring Availability	100.0%	100.0%	100.0%	100.0%

Satisfaction with Amount of Networking Opportunities * Networking Opportunities Availability Crosstabulation

			Networking Opportunities Availability			
			Frequesntly	Occasionally	Not_Available	Total
Satisfaction with Amount of Networking Opportunities	Strongly_Disagree	Count	1	4	5	10
		% within Networking Opportunities Availability	2.1%	7.5%	45.5%	9.0%
	Disagree	Count	2	6	3	11
		% within Networking Opportunities Availability	4.3%	11.3%	27.3%	9.9%
	Mildly_Disagree	Count	3	12	2	17
		% within Networking Opportunities Availability	6.4%	22.6%	18.2%	15.3%
	Neutral	Count	4	8	0	12
		% within Networking Opportunities Availability	8.5%	15.1%	.0%	10.8%
	Mildly Agree	Count	7	15	1	23
		% within Networking Opportunities Availability	14.9%	28.3%	9.1%	20.7%
	Agree	Count	23	8	0	31
		% within Networking Opportunities Availability	48.9%	15.1%	.0%	27.9%
	Strongly Agree	Count	7	0	0	7
		% within Networking Opportunities Availability	14.9%	.0%	.0%	6.3%
Total		Count	47	53	11	111
		% within Networking Opportunities Availability	100.0%	100.0%	100.0%	100.0%

Satisfaction with Amount of Networking Opportunities * Special Assignments Availability Crosstabulation

			Special Assignments Availability			
			Frequesntly	Occasionally	Not_Available	Total
Satisfaction with Amount of Networking Opportunities	Strongly_Disagree	Count	0	4	6	10
		% within Special Assignments Availability	.0%	6.6%	33.3%	9.0%
	Disagree	Count	2	6	3	11
		% within Special Assignments Availability	6.3%	9.8%	16.7%	9.9%
	Mildly_Disagree	Count	1	10	6	17
		% within Special Assignments Availability	3.1%	16.4%	33.3%	15.3%
	Neutral	Count	2	10	0	12
		% within Special Assignments Availability	6.3%	16.4%	.0%	10.8%
	Mildly Agree	Count	8	12	3	23
		% within Special Assignments Availability	25.0%	19.7%	16.7%	20.7%
	Agree	Count	13	18	0	31
		% within Special Assignments Availability	40.6%	29.5%	.0%	27.9%
	Strongly Agree	Count	6	1	0	7
		% within Special Assignments Availability	18.8%	1.6%	.0%	6.3%
Total		Count	32	61	18	111
		% within Special Assignments Availability	100.0%	100.0%	100.0%	100.0%

atisfaction with Amount of Networking Opportunities * Participation on Special Projects Availability Crosstabulatio

			Participation on Special Projects Availability			
			Frequesntly	Occasionally	Not_Available	Total
Satisfaction with Amount of Networking Opportunities	Strongly_Disagree	Count	2	5	3	10
		% within Participation on Special Projects Availability	5.4%	8.8%	17.6%	9.0%
	Disagree	Count	0	7	4	11
		% within Participation on Special Projects Availability	.0%	12.3%	23.5%	9.9%
	Mildly_Disagree	Count	2	9	6	17
		% within Participation on Special Projects Availability	5.4%	15.8%	35.3%	15.3%
	Neutral	Count	4	7	1	12
		% within Participation on Special Projects Availability	10.8%	12.3%	5.9%	10.8%
	Mildly Agree	Count	8	13	2	23
		% within Participation on Special Projects Availability	21.6%	22.8%	11.8%	20.7%
	Agree	Count	15	16	0	31
		% within Participation on Special Projects Availability	40.5%	28.1%	.0%	27.9%
	Strongly Agree	Count	6	0	1	7
		% within Participation on Special Projects Availability	16.2%	.0%	5.9%	6.3%
Total		Count	37	57	17	111
		% within Participation on Special Projects Availability	100.0%	100.0%	100.0%	100.0%

For Satisfaction with Amount of Mentoring Opportunities:

Satisfaction with Amount of Mentoring Opportunities * Leadership Training Availability Crosstabulation

			Leadership Training Availability			
			Frequesntly	Occasionally	Not_Available	Total
Satisfaction with Amount of Mentoring Opportunities	Strongly_Disagree	Count	2	4	4	10
		% within Leadership Training Availability	6.1%	6.7%	22.2%	9.0%
	Disagree	Count	3	10	6	19
		% within Leadership Training Availability	9.1%	16.7%	33.3%	17.1%
	Mildly_Disagree	Count	3	14	4	21
		% within Leadership Training Availability	9.1%	23.3%	22.2%	18.9%
	Neutral	Count	4	5	0	9
		% within Leadership Training Availability	12.1%	8.3%	.0%	8.1%
	Mildly Agree	Count	8	14	3	25
		% within Leadership Training Availability	24.2%	23.3%	16.7%	22.5%
	Agree	Count	8	11	0	19
		% within Leadership Training Availability	24.2%	18.3%	.0%	17.1%
	Strongly Agree	Count	5	2	1	8
		% within Leadership Training Availability	15.2%	3.3%	5.6%	7.2%
Total		Count	33	60	18	111
		% within Leadership Training Availability	100.0%	100.0%	100.0%	100.0%

Satisfaction with Amount of Mentoring Opportunities * Management Training Availability Crosstabulation

			Management Training Availability			
			Frequesntly	Occasionally	Not_Available	Total
Satisfaction with Amount of Mentoring Opportunities	Strongly_Disagree	Count	2	3	5	10
		% within Management Training Availability	8.0%	5.2%	17.9%	9.0%
	Disagree	Count	2	10	7	19
		% within Management Training Availability	8.0%	17.2%	25.0%	17.1%
	Mildly_Disagree	Count	2	11	8	21
		% within Management Training Availability	8.0%	19.0%	28.6%	18.9%
	Neutral	Count	4	4	1	9
		% within Management Training Availability	16.0%	6.9%	3.6%	8.1%
	Mildly Agree	Count	4	15	6	25
		% within Management Training Availability	16.0%	25.9%	21.4%	22.5%
	Agree	Count	7	11	1	19
		% within Management Training Availability	28.0%	19.0%	3.6%	17.1%
	Strongly Agree	Count	4	4	0	8
		% within Management Training Availability	16.0%	6.9%	.0%	7.2%
Total		Count	25	58	28	111
		% within Management Training Availability	100.0%	100.0%	100.0%	100.0%

Satisfaction with Amount of Mentoring Opportunities * Upper Management Mentoring Availability Crosstabulation

			Upper Management Mentoring Availability			
			Frequesntly	Occasionally	Not_Available	Total
Satisfaction with Amount of Mentoring Opportunities	Strongly_Disagree	Count	0	2	8	10
		% within Upper Management Mentoring Availability	.0%	3.8%	21.1%	9.0%
	Disagree	Count	1	8	10	19
		% within Upper Management Mentoring Availability	4.8%	15.4%	26.3%	17.1%
	Mildly_Disagree	Count	1	12	8	21
		% within Upper Management Mentoring Availability	4.8%	23.1%	21.1%	18.9%
	Neutral	Count	0	6	3	9
		% within Upper Management Mentoring Availability	.0%	11.5%	7.9%	8.1%
	Mildly Agree	Count	4	15	6	25
		% within Upper Management Mentoring Availability	19.0%	28.8%	15.8%	22.5%
	Agree	Count	8	8	3	19
		% within Upper Management Mentoring Availability	38.1%	15.4%	7.9%	17.1%
	Strongly Agree	Count	7	1	0	8
		% within Upper Management Mentoring Availability	33.3%	1.9%	.0%	7.2%
Total		Count	21	52	38	111
		% within Upper Management Mentoring Availability	100.0%	100.0%	100.0%	100.0%

Satisfaction with Amount of Mentoring Opportunities * Peer Mentoring Availability Crosstabulation

			Peer Mentoring Availability			
			Frequesntly	Occasionally	Not_Available	Total
Satisfaction with Amount of Mentoring Opportunities	Strongly_Disagree	Count	1	2	7	10
		% within Peer Mentoring Availability	3.0%	3.7%	29.2%	9.0%
	Disagree	Count	2	10	7	19
		% within Peer Mentoring Availability	6.1%	18.5%	29.2%	17.1%
	Mildly_Disagree	Count	3	13	5	21
		% within Peer Mentoring Availability	9.1%	24.1%	20.8%	18.9%
	Neutral	Count	3	6	0	9
		% within Peer Mentoring Availability	9.1%	11.1%	.0%	8.1%
	Mildly Agree	Count	6	15	4	25
		% within Peer Mentoring Availability	18.2%	27.8%	16.7%	22.5%
	Agree	Count	10	8	1	19
		% within Peer Mentoring Availability	30.3%	14.8%	4.2%	17.1%
	Strongly Agree	Count	8	0	0	8
		% within Peer Mentoring Availability	24.2%	.0%	.0%	7.2%
Total		Count	33	54	24	111
		% within Peer Mentoring Availability	100.0%	100.0%	100.0%	100.0%

Satisfaction with Amount of Mentoring Opportunities * Networking Opportunities Availability Crosstabulation

			Networking Opportunities Availability			
			Frequesntly	Occasionally	Not_Available	Total
Satisfaction with Amount of Mentoring Opportunities	Strongly_Disagree	Count	2	3	5	10
		% within Networking Opportunities Availability	4.3%	5.7%	45.5%	9.0%
	Disagree	Count	2	15	2	19
		% within Networking Opportunities Availability	4.3%	28.3%	18.2%	17.1%
	Mildly_Disagree	Count	7	13	1	21
		% within Networking Opportunities Availability	14.9%	24.5%	9.1%	18.9%
	Neutral	Count	4	4	1	9
		% within Networking Opportunities Availability	8.5%	7.5%	9.1%	8.1%
	Mildly Agree	Count	10	13	2	25
		% within Networking Opportunities Availability	21.3%	24.5%	18.2%	22.5%
	Agree	Count	14	5	0	19
		% within Networking Opportunities Availability	29.8%	9.4%	.0%	17.1%
	Strongly Agree	Count	8	0	0	8
		% within Networking Opportunities Availability	17.0%	.0%	.0%	7.2%
Total		Count	47	53	11	111
		% within Networking Opportunities Availability	100.0%	100.0%	100.0%	100.0%

Satisfaction with Amount of Mentoring Opportunities * Special Assignments Availability Crosstabulation

			Special Assignments Availability			Total
			Frequesntly	Occasionally	Not_Available	
Satisfaction with Amount of Mentoring Opportunities	Strongly_Disagree	Count	1	5	4	10
		% within Special Assignments Availability	3.1%	8.2%	22.2%	9.0%
	Disagree	Count	0	13	6	19
		% within Special Assignments Availability	.0%	21.3%	33.3%	17.1%
	Mildly_Disagree	Count	4	13	4	21
		% within Special Assignments Availability	12.5%	21.3%	22.2%	18.9%
	Neutral	Count	2	7	0	9
		% within Special Assignments Availability	6.3%	11.5%	.0%	8.1%
	Mildly Agree	Count	8	13	4	25
		% within Special Assignments Availability	25.0%	21.3%	22.2%	22.5%
	Agree	Count	12	7	0	19
		% within Special Assignments Availability	37.5%	11.5%	.0%	17.1%
	Strongly Agree	Count	5	3	0	8
		% within Special Assignments Availability	15.6%	4.9%	.0%	7.2%
Total		Count	32	61	18	111
		% within Special Assignments Availability	100.0%	100.0%	100.0%	100.0%

atisfaction with Amount of Mentoring Opportunities * Participation on Special Projects Availability Crosstabulatio

			Participation on Special Projects Availability			
			Frequesntly	Occasionally	Not_Available	Total
Satisfaction with Amount of Mentoring Opportunities	Strongly_Disagree	Count	2	4	4	10
		% within Participation on Special Projects Availability	5.4%	7.0%	23.5%	9.0%
	Disagree	Count	2	12	5	19
		% within Participation on Special Projects Availability	5.4%	21.1%	29.4%	17.1%
	Mildly_Disagree	Count	5	13	3	21
		% within Participation on Special Projects Availability	13.5%	22.8%	17.6%	18.9%
	Neutral	Count	1	7	1	9
		% within Participation on Special Projects Availability	2.7%	12.3%	5.9%	8.1%
	Mildly Agree	Count	9	13	3	25
		% within Participation on Special Projects Availability	24.3%	22.8%	17.6%	22.5%
	Agree	Count	13	6	0	19
		% within Participation on Special Projects Availability	35.1%	10.5%	.0%	17.1%
	Strongly Agree	Count	5	2	1	8
		% within Participation on Special Projects Availability	13.5%	3.5%	5.9%	7.2%
Total		Count	37	57	17	111
		% within Participation on Special Projects Availability	100.0%	100.0%	100.0%	100.0%

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