Journal of Information Technology Management

ISSN #1042-1319

A Publication of the Association of Management

THE CAREER DEVELOPMENT OF WOMEN EXECUTIVES IN INFORMATION TECHNOLOGY

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ABSTRACT

The purpose of this study was to develop an in-depth understanding of the career development of women in executive level positions in information technology. This study utilized a qualitative research design. The major research method for this study was in-depth, semi-structured telephone interviews with a group of twenty-five women in executive positions in information technology from across the United States. The study provided an insight into the perception of women executives working in information technology (IT), and their role in this fast-growing technological area. The study examined the educational and career paths that the women took to reach their executive level positions. This study provided a better understanding of why women entered the field of information technology and what their experiences have been. The study examined the barriers that hindered and the factors that assisted the women in achieving executive level positions. Furthermore, this study obtained an in-depth understanding of the challenges and opportunities faced by the women in their educational programs and as they moved up the career ladder to executive level positions.

Keywords: Women, Executive, Career Development, Information Technology

INTRODUCTION

The U.S. Department of Labor projects that by 2014, not only will over 50 percent of all U.S. workers be women, but also 50 percent of the U.S. workforce will be employed by industries that are engaged in producing or using information technology products and services [44]. Despite the impressive increase of women in the workforce, they continue to be underrepresented in managerial positions in the information technology (IT) field. This gender gap is most evident at the senior management and executive levels. Although many women have advanced to the ranks of middle management, as a group, women hold only 10% of upper-level managerial jobs in the computer field [22]. Furthermore, for many women the transition from middle and upper managerial positions to positions of organization leadership (executive-level) is improbable. Currently, only 3% of IT executives are women [2, 36].

The information technology field is male dominated at the executive level position. In addition, it is affected by the shrinking number of women pursuing academic study in computer science and engineering, both at the undergraduate and advanced degree levels. There has been a major concern about the drop of young women entering computer science and engineering degree programs and a drop in the participation of women in these occupations [6, 7, 8]. In all levels of educational institu-

tions across the nation, girls and women remain underrepresented in computer and information science studies and subsequently, the technological workforce [2, 8]. The recent sharp decline in the number of women pursuing undergraduate degrees in computer-related fields and the attrition of women in advance-degree programs affect the number of women at levels higher in the pipeline in IT [8, 22].

Research on the career development of women managers in general often refers to the glass ceiling that restricts advancement to top executive positions [17, 23, 35, 45]. The literature confirms the presence of such a barrier in IT [7, 27, 29]. However, a few exceptional women have broken the glass ceiling and have obtained executive level positions, such as chief information officer (CIO) or chief knowledge officer (CKO). Although the literature has also discussed broader issues concerning the opportunities and problems faced by women in IT occupations, systematic research on the educational background, work experiences, motivation, persistence, aspirations, and overall career development of women in executive level positions in information technology positions is lacking [21, 22, 42]. Given that there is a shortage of women employed in IT related jobs and even fewer women in executive positions, it is important to address this concern and gap in the IT literature [28].

The study of career development of women has become increasingly important, as the percentage of the labor force that is female has increased [19]. As more women enter the labor market, the focus has shifted from "women oriented toward homemaking versus careers" to "traditional versus nontraditional careers and identifying career patterns of women" [19, pp. 178]. This shift reflects the changing career expectations of women in information technology. Women have entered the labor market in larger number and are more likely to remain in the workforce for significant parts of their lives. This trend results in more women pursuing lifelong careers in their chosen occupations, which should result in more women reaching top-level positions [35, 43].

The relative failure of women to move into top rank positions in the IT field is an important topic of concern given that an increasing number of women are in the workforce. The significance of the absence of women in the highest and most visible positions in IT should not be ignored. By studying and understanding the career development and aspirations, as well as, the barriers that exist and the factors that assist women in executive level positions in IT, we can learn how to break down the barriers and how to facilitate the development and achievement of more women to IT positions.

CONCEPTUAL FRAMEWORK

Many new theories have been developed during the last two decades, which incorporate variables that have been shown to influence women's career development [34]. Five career development theories/models were used as the conceptual framework for this study. These five conceptual theories/models that are of specific relevance to women include: Hackett and Betz's [20] Self-efficacy Approach; Farmer's [12] Model of Career and Achievement Motivation; Astin's [1] Sociopsychology Model; Gottfredson's [16] Theory of Career Aspirations; and Brook's [4] Expectancy Valence Theory. These theories/models were used to develop a conceptual framework for the study that was used to expand our understanding of the barriers and factors contributing to the women executives' career choices, aspirations and overall advancement.

These five theories/models attempt to understand the phenomena of women's career development, but they can generally be summarized into two main categories: external and internal factors. Some of the external factors noted by Astin, Brooks, Farmer, Gottfredson, and Hackett and Betz include: sexual discrimination and harassment, mentoring, gender, gender-role socialization, work-family constraints, role models, and opportunities for advancement. Some internal factors noted by Astin, Brooks, Farmer, Gottfredson, and Hackett and Betz include: age, sex, race, personality traits, academic achievement, self-efficacy, persistence, and motivation. Farmer [13] suggested that internal and external factors have different values for different women. For some women, internal factors are more influential and for others external factors are. Either way, there appears to be an interaction between internal and external factors, which results in an individual's career path.

This study utilized a qualitative interview approach to extend research in this area and to shed further light on the dynamics underlying women's career development. This qualitative study attempted to analyze the sequence of events leading to the women's career choice, adjustment, and progress and to recognize patterns as they occur across their career progression. This study may also lead to the development of a hierarchy of factors that assist and barriers that hinder women's career development, which will increase our understanding of not only what is involved, but the relative importance of each component.

When studying the participation of individuals in a particular occupation, career development theory provides a basic understanding of how and why individuals made their career choices. Career development theory translates the different experiences and expectations of women into operationally how they manage and progress in their careers. This area of study provided a framework for research and analysis of the study.

RESEARCH QUESTIONS

The following research questions guided this study:

1. What is the educational background of women in executive positions in information technology?
2. What is the work history and development of women in executive positions in information technology?
3. What life experiences have impacted the career development/progression of women in executive positions in information technology?
4. What are the barriers and obstacles that hindered the career development of women in executive positions in information technology?
5. What factors have assisted the career development/progression of women in executive positions in information technology?

METHODOLOGY

This study utilized a qualitative design, which provided a comprehensive understanding of the career development of women in executive level positions in information technology. This study used semi-structured interviews. Interviewing is the most common qualitative method practiced in organizational research [32]. The major research method for this study was in-depth, semi-structured telephone interviews with a group of twenty-five women in executive level positions in information technology from across the United States. An interview guide was developed to obtain detailed information in order to produce an in-depth understanding of the career development of the women executives. This strategy was utilized because it allows for rich data, thorough responses, probing, and clarification of meanings [33]. The random sample of 25 women in executive level positions in information technology was selected from the National Center for Supercomputing Applications (NCSA) Fortune 500 Industrial Partners list. Data was analyzed using basic descriptive statistics and a multi-step content analysis methodology.

To increase the validity of the findings, an interview transcription and summary was prepared and sent to five of the participants, who confirmed that the transcription and interpretation of the data was accurate. This member checking strategy was utilized as an additional step to ensure the validity of the data collected. Both researchers independently analyzed the data to check for validity and reliability in the emergent themes, categories, and frequency rankings. The researchers also utilized the peer examination strategy in which a research associate with expertise in qualitative data analysis was asked for comments as items were coded, categories were defined, and findings were developed [15]. The research associate independently reviewed the overarching content themes in addition to the statements taken from the individual interview transcripts to determine the appropriate categorical placement for each. The analyses and ratings from all the researchers matched principally well.

PROFILES OF STUDY PARTICIPANTS

Twenty-five women executives in information technology (IT) at twenty-five Fortune 500 companies were interviewed. The women executives worked in industrial corporations whose annual revenues and assets ranged from $5.727 billion to $246.525 billion and $3.328 billion to $370.782 billion, respectively. The number of employees in the twenty-five companies ranged from 17,611 to 1,300,000, with an average of 145,751 employees. The types of industries in which the study participants are employed included: computer, office equipment, 4 (16%); pharmaceuticals, 4 (16%); household and personal products, 3 (12%); aerospace and defense, 2 (8%); chemicals, 2 (8%); general merchandisers, 2 (8%); wholesalers: healthcare, 2 (8%); and others 6 (24%).

The study participants are employed in a variety of industries. The companies in which the study participants are employed are located throughout the United States and included: Illinois, 4 (16%); New York, 4 (16%); Arkansas, 2 (8%); Minnesota, 2 (8%); California, 2 (8%); New Jersey, 2 (8%); Texas, 1 (4%); Ohio, 1 (4%); Pennsylvania, 1 (4%); Washington, 1 (4%); North Carolina, 1 (4%); Tennessee, 1 (4%); Missouri, 1 (4%); Michigan, 1 (4%); Massachusetts, 1 (4%).

The study participants range in age from 38 to 55 years, with an average of 48.3 years. Eighteen (72%) of the study participants are married, and 7 (28%) are single. The ethnic origin of all the study participants includes 23 (92%), White; and 2 (8%), African-American. Sixteen (64%) of the study participants have children, and 9 (36%) do not have children. Of those participants having

children, there children's ages range from 6 to 29 years, with an average age of 14.8 years. The participants who do have children have small families, with the average of 1.8 children.

RESULTS

The results of this study are summarized in five sections that parallel the research questions: (a) Educational Background of Study Participants, (b) Work History and Development of Study Participants, (c) Life Experiences Impacting Study Participants' Career Development, (d) Barriers that have Hindered the Study Participants' Career Development, and (e) Factors that have Assisted the Study Participants' Career Development.

Research Question One: Educational Background of Study Participants

Research question number one addressed the educational background of the women in executive positions in information technology. To address this area the study participants were asked questions related to their educational background, such as degrees attained, factors in school, additional education and training, and subjects needing more emphasis in their education.

Degrees Attained. All the participants have earned a Bachelor degree. The participants' Bachelor degrees major fields of study included: Computer Science, 6 (24%); Engineering, 6 (24%); Mathematics, 5 (20%); Business (e.g., Management, Business Administration, Economics), 5 (20%); Music 2 (8%); Psychology 1 (4%); Science 1 (4%); Dance 1 (4%); and Political Science 1 (4%). Of the 25 study participants, 17 (68%) have also earned a Master's degree. The study participants' Master degrees major field of study included: MBA, 11 (65%); Computer Science, 7 (41%); and Public administration, 1 (6%). Of the twenty-five study participants, 1 (4%) had earned a Ph.D. in Computer Science.

Factors in School. Eleven (44%) of the study participants identified factors in school that assisted them in becoming interested in the information technology field, and fourteen (56%) of the study participants did not identify any factors. The following factors were identified by the study participants as having assisted them in becoming interested in the information technology field: took computer programming classes in high school or college, 5 (45%); participated in internships/co-operative education programs in college, 4 (36%); exposed to computer science through high school math classes, 2 (18%); high school teacher encouraged and inspired them to do well in math, 2 (18%); high school teacher provided work experience for them in computer programming after school, 1 (9%); worked after school as a computer programmer, while in high school and then later worked as a computer programmer, during the summer, while in college, 1 (9%); minored in computer science while in college, 1 (9%); worked as a research assistant in graduate school, 1 (9%); position as editor-in-chief of the school magazine, 1 (9%); and did master's thesis related to computers in public organizations, 1 (9%).

The study participants became interested in the IT field through their math classes and computer programming classes. They felt that they had positive computer learning experiences in these classes, which positively impacted their attitude toward the IT field. Another factor in school that assisted the participants in becoming interested in the IT field included high school teachers that encouraged and inspired them to do well in math. This encouragement and inspiration assisted in building their confidence in math and influenced them to take more math classes, such as calculus and engineering concepts courses.

Additional Education and Training. In addition to their college degree(s), all of the study participants had obtained additional education and training to further their knowledge. The five subject areas most frequently pursued for additional knowledge included: leadership/executive development, 18 (72%); technical skills (e.g., computer programming, systems engineering, artificial intelligence, emerging technologies), 17 (68%); management development, 13 (52%); project management, 8 (32%); and finance, 8 (32%). The findings reveal that the additional education and training obtained by the participants related mostly to leadership, business, technical skills, and interpersonal skills. The education and training mostly took place through the participants' companies, educational institutions, professional organizations, conferences, and vendors.

Subject Areas Needing More Emphasis in Education. Although the majority of the study participants indicated that their education prepared them adequately for their careers, they all mentioned subject areas they would have liked to have emphasized more in their education. The six subject areas most frequently mentioned by the study participants as needing more emphasis in their education included: business management, 9 (36%); interpersonal management (e.g., communication,

human relations, presentation skills), 8 (32%); finance, 8 (32%); computers, 6 (24%); negotiation, 5 (20%); emerging technologies, 5 (20%). The majority of the subject areas identified by the participants are related to business, interpersonal, and technical skills.

In addition, 2 (8%) of the participants indicated that they would have liked to obtain an MBA, so that they would have had a stronger business background. They felt that having a strong understanding of business would have assisted them in applying information technology to the organization in a more knowledgeable way. The majority of the participants also felt that because the information technology field changes so rapidly, to be successful you need to continue learning throughout your career. Two (8%) of the study participants indicated that they would have like to have had internships available to them during their education.

Research Question Two: Work History and Development of Study Participants

Research question number two addressed the work history and the development of the women in executive positions in information technology. First, the findings related to the work history of the women in executive positions in information technology are presented, and then the findings related to the development of the women in executive positions in information technology are presented.

Work History of Study Participants.

To address the area of work history the study participants were asked questions related to positions held; acquisition of current position; and job responsibilities.

Job Positions Held. Study participants were asked to identify the positions they have held throughout their professional careers, starting with their current position title. The current position titles of the study participants included: Chief Information Officer (CIO), 15 (60%) and Directors or Vice-Presidents of IT, 10 (40%). Fifteen (60%) of the study participants first positions held were in the IT area (e.g., Programmer, Analyst, Hardware Design Engineer, Computer Programmer), and 10 (40%) of the participants first positions held were not in the IT area (e.g., Instructor of Music, Research Associate of Behavioral Medicine, Secretary, and Clerical Officer).

Fourteen (56%) of the study participants have changed positions an average of every two years; 9 (36%) have changed positions an average of every three years; and 2 (8%) have changed positions an average of every four years. The major reason for changing positions was because of a promotion. Other reasons included: relocated, returned to school, company divested the division, company was bought by another company, better opportunity in another company, medical issues, moved into a different business unit, and moved into a different field.

Acquisition of Current Position. Twenty-two (88%) of the study participants acquired their current positions due to being approached by others (e.g., supervisor, CEO, vice-president, director, recruiting firm). One participant obtained her current position due to a corporate merger, and another obtained her current position after being elected by the board of directors. Finally, two participants obtained their current positions due to self-initiated applications. The participants who acquired their current positions by being approached by others indicated that in order to advance, support and recognition from management is needed.

Job Responsibilities. According to the study participants, through their work, they continuously develop, design, and implement IT strategies and products to improve the effectiveness, cost-efficiency, and profitability of their corporations. In addition to the participants IT responsibilities, all of them have direct supervision over employees, which range from systems analysts to project managers. All study participants also have direct control over large budgets.

The number of hours that the participants worked in an average workweek ranged from 45 to 90 hours, with an average of 60.8 hours. The majority (72%) of the participants worked 50-60 hours a week. All of the study participants' work required out-of-town travel. The number of days that participants spent out-of-town on business in the last twelve months range from 10 to 230 days, with an average of 62.4 days. The majority (84%) of the participants traveled 10 to 70 days in the last twelve months.

Development of Study Participants.

To address the area of development, the study participants were asked questions related to age when deciding to pursue a career; factors influencing career choice; career plans; and areas needing improvement.

Age Related To Pursuing Career. The age study participants were when they first decided to pursue a career ranged from 5 to 35 years, with an average of 13.6 years. The majority (77%) of the participants decided to pursue a career when they were 16 years or younger. The age that participants decided to pursue a career in IT ranged from 16 to 44 years, with an average of 25.5 years. Over half (56%) of the study participants did not decide to pursue a career in IT until they were in

their early twenties. Three (12%) of the participants decided to pursue a career in IT when they were of high school age (16 and 18 years of age).

Factors Influencing Career Choice. The study participants were asked what were the major factors that influenced their choice to enter a career in the IT field. The five most frequent factors given by the participants that influenced their choice to enter a career in the IT field included: many different job opportunities, 14 (56%); challenging field, 11 (44%); interesting and fun field, 11 (44%); good job market, 10 (40%); and high salary field, 10 (40%). One study participant was influenced to enter a career in the IT field in the following way,

"I had some friends, who were engineers, and at the time, I was a social worker in a burnout job that didn't pay very well, and I saw that my engineer friends were doing really fun, interesting and challenging things in their jobs and making really good money. So, essentially I decided to pursue a degree in engineering when I was 23 years old."

Another participant had this to say,

"I found the field of IT intellectually challenging because I like to solve very complex problems. I also like to continuously learn new things, so I like the fact that IT is a dynamic changing field and you have to stay on top of things and everyday you have the opportunity to make a difference."

Career Plans. The study participants were asked if they had a career plan when they started their careers. Nineteen (76%) of the participants did not have a career plan when they started their career, and 6 (24%) did have a career plan. The five most frequent reasons given by the participants for not having a career plan when they started their careers included: not aware of my career options, 13 (68%); did not have a future career focus, 9 (47%); did not know career planning was important, 7 (37%); lack of role models, 5 (26%); and had no context for career planning in the business world, 4 (21%). One study participant who did not have a career plan stated,

"When I started school, I knew I wanted to be an engineer, but I didn't have a career plan beyond obtaining my engineering degree. I knew that a career in engineering would be interesting and challenging and I could make good money. Most likely I never dreamed beyond that because I didn't have any women role models in engineering and wasn't aware of any women in top-level positions in engineering. I do think maybe that kept me from developing a career plan and dreaming further."

Furthermore, another participant who did not have a career plan explained,

"I did not have a career plan or role models. I did not know or was aware of any women in top-level positions in organizations. As I reached new levels in my career, which was sort of step by step, that I realized my potential and where I could go in my career."

The six study participants who did have a career plan when they started their career indicated that it was self-generated with help and assistance from a parent(s) and/or from managers who took an interest in their career progression. These individuals provided encouragement, support, and advice on how to move forward in their career.

Areas Needing Improvement to Continue To Progress in Career. The study participants were asked to identify the areas they think they need to improve in order to continue to progress in their careers. The six areas most frequently mentioned by the participants as needing to improve in order to continue to progress in their careers included: interpersonal/social/communication skills, 10 (40%); business skills (non IT skills) (e.g., production, sales, marketing), 9 (36%); financial planning/management/investment, 8 (32%); dealing with company politics, 6 (24%); strategic planning, 5 (20%); and risk taking, 5 (20%).

The one area most frequently mentioned by study participants as needing to improve in order to continue to progress in their careers was interpersonal/social/communication skills. The study participants indicated that they needed to learn to communicate their thoughts and opinions to their executive groups in a more confident and effective way. Other participants needed to work on being more social within their companies and interacting and having conversations with certain influential people in the organization. Still other participants needed to communicate and work more effectively with people from different cultures and mindsets.

Research Question Three: Life Experiences That Have Impacted the Career Development of Study Participants

Research question number three addressed the life experiences that have impacted the career development of the study participants. The study participants were asked to identify events that they have encountered in their personal/family life that have hindered their career development and events that they have encountered in their personal/family lives that have been helpful to their

career development. The study participants were also asked to identify personal sacrifices they had made for their career.

Life Events That Have Hindered Career Development. Thirteen (52%) of the study participants could not identify events in their personal/family life that hindered their career development, and twelve (48%) of the study participants identified events in their personal/family life that hindered their career development. The three most frequent personal/family life events reported by the study participants included the following: difficult balancing work and family, 9 (75%); slowed down career progression to have children, 3 (25%); and marriage difficulties, 3 (25%).

The participants who identified having difficulties balancing work and family indicated that they had too many work and family responsibilities and sometimes they did not have time to accomplish everything effectively. To them, time management was the biggest challenge and trying to do everything well and not feeling guilty if something did not get done.

Three (25%) of the study participants indicated that their careers were slowed down in order to try and have children. They deliberately turned down promotions so that they could reduce their travel schedule, reduce the stress at work, and concentrate on trying to start a family. They stated that this slowed their career advancement, but they also indicated this was a conscious choice that they made, without regret.

Having marriage difficulties created conflict between work and family for three of the study participants. These marriage difficulties sometime resulted because of working tremendous amount of hours, having to relocate, or not having time to socialize. Having to manage the effects of marriage difficulties and the demanding requirements of work made it extremely hard for these participants to continue to progress in their careers.

Life Events That Have Assisted Career Development. All of the study participants identified events in their personal/family life that helped in their career development. The five most frequent personal/family life events reported by the study participants included the following: supportive and encouraging parents, 15 (60%); supportive and encouraging spouse, 10 (40%); learning the value of hard work and good work ethics from parents, 8 (32); parenting and raising children, 8 (32%); and supportive children, 6 (24%). Over half of the participants reported that having supportive and encouraging parents has had a positive impact on their career development. Having supportive family/parents in one case meant having parents who assisted her in developing good work ethics by involving her as a child to work on projects around the house. This is what this participant had to say,

"My parents got me involved in doing projects around the house. For example one time I assisted them in remodeling a room and I had to learn how to tear the plaster off the wall, measure and saw the paneling, and then put the paneling up. My parents taught me how to organize projects, follow directions, and make things happen by being a good worker. When I was a project manager I drew on what I learned from my parents when I was a child, as far as concentration, focus, and the many things you need to consider when pulling a big project together."

In other cases having supportive family/parents meant having parents who encouraged them to do well in school, helped them address personal barriers that they encountered in their lives, encouraged them to take advantage of opportunities that were presented to them, and encouraged them to take risks. This is what a study participant had to say about having supportive parents,

"My parents were key influences in my career. They always told me that I could do anything I wanted to do if I set my mind to it. They provided a really good and supportive environment for me. My parents were both school teachers and they provided me with a lot of encouragement to do well in school and in everything else I did. They also provided me with a lot of discipline and told me to work hard and do well, and that good things would happen to me."

Having a supportive and encouraging spouse was also mentioned by the participants as having a positive impact on their career development. These participants indicated that their spouses were extremely influential in their careers and without them it would have been difficult to succeed. One participant explained it this way,

"Early in my career when I started to advance my husband told me that I was going to go higher and was going to start to make more money than him and that he was okay with it. He has been incredibly supportive and has taken more and more responsibilities at home, as my travel schedule has increased. There is no way I could be doing what I am doing without this kind of support."

Thirty-two percent of the participants identified parenting and raising children as having a positive impact on their career development. The participants who saw

parenting and raising children as a positive to their career development indicated that being a parent made them a more balanced person. In addition, the lessons they learned from parenting in their personal life many times extended to their professional life. For example, one participant had this to say,

"I have two teenagers and I have learned not to put them on the defensive, because as soon as they are on the defensive, everything shuts down and everything is over. Clearly that's the same in the workplace, if there is a problem you need to approach it with respect and allow the other person to talk and take ownership of the problem without making them defensive. "

Personal Sacrifices Made for Career. The study participants were asked to identify personal sacrifices they had made for their career. The five most frequent personal sacrifices made by the participants included the following: time spent with family (spouse, children), 12 (52%); personal/free time, 9 (39%); relocating, 9 (39%); social time/friendships, 8 (35%); and travel too much related to work, 6 (26%). Participants stated that the majority of the personal sacrifices made for their careers were made by choice, without regret. One participant summed it up best by saying,

"I would call them choices [instead of sacrifices] because in all things in life, you make choices. We each make choices and for every fork in the road you take, you sacrifice the other fork in the road and both could be equally interesting."

Research Question Four: Factors That Have Hindered the Career Development of Study Participants

Research question number four addressed the factors that have hindered the career development of the study participants. The study participants were asked questions related to the major challenges they have encountered in their careers and major mistakes they have made in their careers.

Major Challenges Encountered in Career. Study participants were asked to identify the major challenges they have encountered in their careers. The six most frequent major challenges reported by the study participants included the following: work/life balance, 11 (44%); extremely difficult/challenging job assignments, 9 (36%); dealing with interpersonal/people issues, 8 (32%); dealing with company politics, 8 (32%); gender discrimination, 8 (32%); and male dominance in IT, 8 (32%).

Forty-four percent of the participants indicated that balancing work/life responsibilities has been a major challenge in their careers. These study participants indicated that it was difficult to achieve balance in work/life when having to put so many hours at work to succeed in their positions.

Thirty-six percent of the participants mentioned extremely difficult and challenging job assignments as a major challenge they encountered in their career. Many times these participants were given some very tough assignments where the people before them had failed. Some of the participants were assigned to assist in leading major corporate mergers or given international assignments in countries that had cultures that did not view or accept women as leaders. One of the participants was given a complex project assignment related to a new technology that required her to travel frequently and for long periods of time. She had to live out of her suitcase for two years, and she only came home once a month to turn in her expense report, pay her mortgage and then went back on the road again. This was a long strategic project that was put into place by the participant over a period of two years.

Thirty-two percent of the participants identified dealing with interpersonal/people skills as a major challenge they encountered in their career. The study participants many times encountered difficulties in dealing and relating to people at different levels of the organization, understanding how others feel, motivating employees toward superior performance, and establishing networks. The participants discussed challenges such as personality conflicts and team members who were difficult to manage. These participants commented that it was important to understand that some personalities are difficult to get along with, but it was important to find a way to work together for project completion.

Thirty-two percent of the participants noted that dealing with politics in the organization was a major challenge encountered in their career. In many instances, the study participants believed they had difficulty conforming to company norms, fitting in, adapting to the organization's culture, and knowing whom to approach for support. Several of the participants encountered problems in determining the organization's informal power structure, primarily because established political systems and networks were composed of men and were therefore sometimes not available to women.

Thirty-two percent to the study participants also indicated that gender discrimination was a major challenge in their careers. Several of the participants believed

that because they were women, they had advanced more slowly, were not given promotions that they deserved, had to work harder to prove themselves, were not taken seriously or were treated with less respect, and were banned from international job assignments.

Several of the participants indicated working for bosses who had difficulties dealing with women, or they did not believe in the development or advancement of women. The participants indicated that the gender discrimination was often very subtle in form. For example, they were often excluded from meetings in which all male peers were invited, or they [participants] were not invited to play golf. These participants were often unable to participate in valuable informal business discussions. Being excluded and not having access to valuable inside information many times hindered these participants' advancement opportunities. One study participant shared her experience by stating,

"I didn't take legal action, but I would describe it as a hostile work environment. I had a large group of colleagues, all men, the majority of them based outside of the United States. They had a favorite successor to this gentleman that I replaced, someone who worked on my staff and they were very loyal to him, he was one of the good old boys. Most of them had wanted him to take the job and I don't think that I was welcome from the very beginning. They would do all kinds of awful things to me. They were very unhappy that the company had decided to go outside, first of all, much less go outside to bring a woman. And they didn't make it very pleasant for me while I was there. "

In addition, the study participants indicated that male dominance in IT was a major challenge in their careers. They indicated that female role models and mentors were difficult to find in the IT field because it is mostly male dominated. They felt that having female role models to look up to and having the opportunity to talk and share your experiences with a female mentor was important for building self-confidence. These participants were many times made to feel like outsiders or were intimidated by male colleagues, which created challenges to their career development. This is what one study participant had to say,

"There have been several times when I have had male colleagues come up to me and say in a spiteful way that they want my job or that they are going to take my project away from me. This type of thing has happened to me throughout my entire career and I know that other women have had similar experiences. Most of the time I don't let it bother me, but sometimes it bothers me and I feel very uncomfortable and it can be very hurtful. "

Major Mistakes. Study participants were asked to identify the major mistakes they have made in their careers. All the study participants indicated that making mistakes has been their primary learning path. The five most frequent major mistakes reported by the study participants included the following: not communicating my ideas more effectively, 10 (40%); underestimated the importance of human relation types skills, 8 (32%); setting the wrong priorities at work, 7 (28%); not succeeding at a major job assignment, 6 (24%); and taking on too many job related responsibilities at one time, 6 (24%).

The participants indicated that not communicating their ideas more effectively had been a major mistake in their careers. These study participants indicated that in the past they had had difficulties communicating their ideas effectively. They felt that they had to be more vocal and assertive in communicating their ideas, especially to top management. However, they indicated that they had to be careful not to come across as overly aggressive when communicating their ideas. This is what one of the study participants had to say,

"I learned that I had to stand up for my ideas more strongly, but in a careful way. I had to do it in a way that was perceived positively. I couldn't do it the same way men do it, I couldn't emulate their behavior and get away with it, because that's not acceptable and that's okay. I just had to figure out what was acceptable for me and make it work to my advantage."

Thirty-two percent of the study participants reported that underestimating the importance of human relation type skills was a major mistake they made in their careers. These study participants indicated that at the beginning of their careers they only focused on getting the job done (the technical part) and really didn't bother getting to know people. They soon realized that having good-working relationships with people was essential to getting their work done. At first, they felt awkward and uncomfortable dealing with people, but after a while they learned how to establish rapport, trust, and good working relationships with the people in their workplaces. One study participant had this to say,

"At first I had to learn just very simple people skills, such as saying good morning, how are you, and ask them (co-workers) something about their lives, before bring up work issues. "

The other study participant further stated,

"In my undergraduate degree program there were technical course requirements, foreign language require-

ments, English requirements, and many other types of requirements, but there was never any sort of interpersonal skills requirements. I never learned the interpersonal basics in school. I learned them later, at work, the hard way. I wish I had learned them much earlier."

These participants pointed out that they had to learn to maintain good working relationships with the people they worked with, and not just their peers and the people above them, but the people at all the work levels. They felt that establishing respectful and trusting relationships with the people they work with was essential to their work success.

Setting the wrong priorities at work was reported by 28% of the participants as a major mistake they made in their careers. These participants indicated that they would sometimes get their priorities wrong at work, by working and spending too much time on the wrong work assignments and not making progress on the more important work assignments. They also felt that as technical people and because of their great interest in the IT field they had a tendency to share too much information that was interesting to them, but not completely relevant to the core work assignment, which could greatly distract from the major focus and getting the work completed on time.

Not succeeding at a major job assignment was reported by 24% of the participants as a major mistake they made in their careers. These participants indicated that they had been involved in some projects that were not successful or were not able to deliver the projected results. Sometimes these projects did not succeed because of people issues, ineffective project planning, not having all parts of the company aligned, ineffective work teams, leadership issues, technology issues, or unforeseen reasons. A study participant had this to say about an unsuccessful project,

"There was one major career disaster that happened six months before they were to promote me. I was working on a major company project and we had a catastrophic systems failure and lost two days of information from the business, so we had to recreate the business manually by hand. It was a series of events that led to it, no particular person or event caused it."

Taking on too many job-related responsibilities at one time was reported by 24% of the participants as a major mistake they made in their careers. These study participants indicated that they took on too many job responsibilities and eventually had to learn to set priorities, pace themselves, delegate, and apply their strengths and expertise to the job areas that were of most importance.

Research Question Five: Factors That Have Assisted the Career Development of Study Participants

Research question number five addressed the factors that have assisted the career development of the study participants. Study participants were asked questions related to role models; mentors; functions performed by companies; and factors most important to career development.

Role Models. The study participants were asked if they had role models during the time they chose their careers. Twelve (48%) of the participants indicated that they did have role models during the time they chose their careers and 13 (52%) indicated they did not have role models. The three most frequent role models mentioned by the participants included: senior level executive (director and above), 7 (35%); father, 5 (25%), and manager, 2 (10%). Of the 20 mentors identified by the 12 study participants, 17 (85%) were male and 3 (15%) were female.

The five most frequent ways in which role models influenced their career choice included the following: shared their expertise with them, 7 (58%); gave them useful career advice, 6 (50%); encouraged them to meet high performance standards, 6 (50%); oriented them to job/career opportunities, 5 (42%); and believed in their potential, 4 (33%). One of the study participants who identified her father as a role model had this to say,

"My father was my role model when I chose my career. He was an executive in a Fortune 500 company. I saw what he did over the course of his career. I saw the kinds of jobs and career paths that he took. I also saw how much he enjoyed his job and the satisfaction he got from it. He always encouraged me to pursue whatever I was interested in and not to impose any artificial boundaries on myself in terms of what I thought I could and couldn't do. Since I was five or six years of age or for as long as I can remember I was expected to have a career, as were my siblings. I knew when I grew up that I was expected to be able to support myself and pursue a career that was meaningful."

Another study participant had this to say about her role models,

"It just happened that I became friends with two (male) engineers and I was very curious about what they did on their jobs. What they shared about their jobs seemed to be so fun, challenging, and interesting that I

thought this is what I would like to be doing. I think it was just luck that I happened to meet and become friends with these engineers and had the opportunity to learn from them what engineering was all about."

Mentors. All of the study participants indicated having mentors during their professional careers. The number of mentors that the participants have had during their professional careers ranged from 1 to 10 mentors, with an average of 4.12 mentors. The study participants combined had 103 mentors during their professional careers. The largest group of mentors was represented by senior level executive (director and above), 66 (64%); manager, 15 (14%); boss/supervisor, 7 (7%); and professor, 4 (4%). Of the 103 mentors identified by the 25 study participants, 78 (75%) were male and 26 (25%) were female.

A variety of functions were performed by the mentors that assisted the participants' career development. The six most frequent functions performed by mentors included the following: provided them with job opportunities/challenges to demonstrate my skills and abilities, 20 (80%); suggested strategies for advancing in their career, 18 (72%); believed in their potential, 15 (60%); encouraged them to take risks, 13 (52%); shared his/her expertise with them, 12 (48%); and gave them useful career advice, 11 (44%). The study participants' mentors helped them to stay focused and not to get distracted from their career goals and what they were trying to accomplish. A study participant had this to say about one of her mentors,

"He told me to ask myself everyday if I was doing what I needed to accomplish my career goals and if I wasn't, then I needed to change things. He told me not to let events drive me, but that I should drive the events."

Another participant had this to say about one of her mentors,

"He was the general manager in charge of the division I was in and he was considerably higher in the organization than I was, but he took the time and interest in me. He discussed career choices with me and the kinds of experiences that I needed to have to be competitive in the job market. He also assisted me in selecting the positions that would give me the best balance of experiences and help my career the most."

The study participants' mentors also assisted them in handling difficult situations on the job. Here is what a participant had to say about one of her mentors,

"I had a formal mentor as part of my company's development program. He was a vice-president and a male. We met once a month to discuss what I was accomplishing and specific issues I was struggling with in my position. He gave useful advice on how to handle difficult situations that I was facing in my position. He would actually talk through with me how to handle these situations, he was extremely helpful."

The study participants also observed and learned from their mentors' successes. A study participant had this to say about one of her mentors,

"She was the first female executive I had ever worked with closely. I observed and learned that she had her own style of how to get things done that was different from the men around us, but just as effective. So I learned that you can have different styles and you don't have to emulate the ones you see around you. You can be yourself and have your own style and still be very effective. "

The study participants were also asked to think back over their careers and to consider those people who have significantly helped and influenced their career development. They were asked to select the people who have provided them with substantial help, and without them their career progress may have been hindered or made considerably more difficult. All of the study participants indicated that their mentors were the individuals who most helped and influenced their career development.

Functions Performed by Companies That Have Assisted in Career Development. Study participants were asked to indicate what the companies they have worked for have done to help them succeed in their careers. The five most frequent functions performed by the companies to help the participants succeed included the following: job/career opportunities/challenges (e.g., promoted, challenging assignments), 20 (80%); training and development opportunities (e.g., internal and external programs), 15 (60%); acknowledged/recognized skills and talents, 12 (48%); provided supportive/collaborative work environment, 10 (40%); and provided mentors (e.g., support, encouragement, and guidance), 9 (36%).

The majority of the study participants indicated that the companies they had worked for had help them succeed in their careers by giving them challenging job opportunities, opportunities to develop different skills, and advancement/promotional opportunities. In addition, the participants cited training and development opportunities as being helpful to their career development. They cited opportunities such as leadership programs and other related courses, exposure to professional development

conferences, seminars, and women professional organizations as being helpful.

The participants specified that their companies acknowledged and recognized their skills and talents. They indicated that this type of recognition increased their self-confidence and provided them greater visibility in and outside the company. The participants indicated that their companies provided them with a supportive/collaborative work environment. They indicated that their work environments relied on open, honest communication and the sharing of knowledge and information in all directions. They further specified that the interactions among employees were based on honesty, mutual respect and integrity. Participants also specified that their companies provided them with mentors, who gave them support, encouragement and guidance in their career development.

Factors Most Important to Career Advancement. The study participants were asked to identify six factors that they considered to have been the most important to their career advancement and success in the IT field. The findings reveal that all the study participants considered demonstrated competency on the job (produced high quality work), hard work, willingness to take risks, mentors, educational credentials, and continuous learning/training/development as the factors most important to their career advancement and success. In addition, other factors that were frequently mentioned as important to their career advancement and success in the IT field included: being flexible/adaptable to change, 12 (48%); interpersonal/people skills, 12 (48%), focused on success/delivery of results, 11, (44%); and depth and breadth of knowledge about IT/business, 10 (40%).

Demonstrating competency on the job, producing high quality work, getting results, being accountable, knowing their job/field, willing to take risk, and being consistently outstanding were mentioned by the majority of the participants as prerequisites for a successful IT career. The participants indicated that they had made job changes that were regarded as exceptionally risky. For example, a move into an unfamiliar area of business, taking on new assignments, a huge leap in responsibility, a transfer into a lower-level job that afforded a better shot at advancement, or relocating (sometimes to another country). They reported having a high level of motivation to be successful and to make the companies they work for successful. They felt that their high level of energy and enthusiasm was related to their high level of motivation, which was then related to working hard. One participant had this to say, "you are not going to work hard and put in a 60 plus hour week, if you are not focused and really motivated".

CONCLUSIONS AND DISCUSSION

The shortage of women in information technology is widely reported [3, 8, 18, 37, 40], and the statistics on the status of women who earn undergraduate degrees in computer science and engineering is fewer than their representation in the U.S. population. According to the Information Technology Association of America (ITAA) [25], the IT sector, by and large, is a field of highly technical expertise and requires education and background in mathematics, science, and technology before candidates can even become eligible for many IT positions. Therefore, women who enter IT positions and aspire long-term, successful careers in IT most likely need to attain adequate technical skills and knowledge through education and training. The findings of this study show that educational credentials were one of the most important factors to the career development/progression of the study participants. All of the study participants had earned a bachelor degree, and over half have earned a master degree. Sixty-eight percent of the participants have earned a bachelor and/or master degree in a technical area (e.g., computer science, engineering). Forty-eight percent of the participants earned a bachelor or master degree in business. The study participants emphasized that having a technical degree or business related degree was valuable for understanding the IT field and how it relates to the business functions of the organization.

All of the women executives in this study have continued to pursue additional education and training to assist them in their career development and advancement. According to Burke and McKeen [5], managerial women who participate in greater number of education and training activities are more organizationally committed, job satisfied and involved, and have higher career prospects. Therefore, education and training seems to be of great importance to the career development of women executives. Constantly learning new things was a major reason given by the study participants for being satisfied with their careers and being flexible/adaptable to change was mentioned as a factor most important to their career development. Education and training was a major way that the study participants learned new things, stayed current in their fields, and remained adaptable to change. The con-

tinued investment in education and training ensured that the women executives obtained the knowledge required to continue to progress in their careers.

Although the women executives in this study are undoubtedly highly skilled in their area of technical expertise, many of these women indicated a lack of knowledge in business subjects (e.g., finance, negotiation, and business management) and interpersonal skills (human relations, social, and communication). Solely having a technical field background does not seem to be satisfactory for advancing in the IT field in business companies. The literature supports this finding by specifying that companies are looking for professionals with a broader background and range of skills, including not only technical knowledge, but also communication and other interpersonal skills [24, 30, 38]. Similarly, Freeman and Aspray [14] and Lee and Lee [31] stated that IT workers in addition to their technical expertise need communication and organizational skills. They also emphasized the importance of teamwork skills, such as the ability to work with others who have diverse educational backgrounds, aptitudes, values, ethnic backgrounds, and cultures; to understand the function of each team member; and to respect the strengths and limitations of others. This shift from requiring workers to possess solely sound technical knowledge emphasizes IT workers who can handle many different job responsibilities and work effectively with many different types of people.

The women participants of this study indicated that continuous, life-long learning and continuously striving for success was a major factor in their career development. While life-long learning and striving for success were seen as important factors for these women, there were challenges/obstacles that they encountered that attributed to unforeseen barriers in their career paths. The feeling of being excluded (being an outsider) was seen as having a negative impact on career development. In addition to exclusion, there were also obstacles such as work/life balance, company politics, and non-supportive bosses. For many women in executive positions in IT, the existence of the "glass ceiling" negatively impacts their career development. Igbaria and Baroudi [21] suggested that women encounter a "glass ceiling" that prevents them from reaching the top levels of management. Participants' from this study recognized, identified, and verbalized that the glass ceiling does in fact exist in their work organizations.

Organizations have the opportunity to play a key role in the career development of women in executive positions in IT. Organizations can create environments where women have the opportunity to advance, receive equal treatment and access to information and opportunities, remove barriers such as the glass ceiling that might hinder their development, and provide support through role models/mentors. Additionally, the challenge of balancing work and family produces barriers for women in executive positions in IT. The demands of work coupled with the demands of family can become problematic for some women in executive positions as they seek creative ways to continue maintaining their family structure and the increasing demands and pressures arising from their work.

Along with the difficulties that come with balancing work/family life and the other barriers previously mentioned, some of the participants of this study acknowledge that being a woman in an executive position in IT often means having to make personal sacrifices (e.g., time with family/spouse/children, personal time, relocation, social time with friends, and long work hours) for their career. Although the researchers posed the question of "what personal sacrifices have you had to make for your career" to the participants, the majority of them replied to us that they did not view them as personal sacrifices, rather they saw them more as "choices without regret". These choices were seen as necessary in order to progress in their careers and reach executive level positions in IT.

All of the women executives indicated having mentors during their professional careers. Most often it was a senior level executive, manager, or boss/supervisor who served as a mentor for these women, and the majority (75%) were men. By definition, a mentor is someone who is already highly placed within an organization in a position of influence. A mentor is someone who has already gained the prerequisite experience and status needed to support and promote the career of the less experienced individual. For this reason, mentors are most often men rather than women [9, 41].

The study participants had an average of four mentors throughout the course of their career. Mentors were viewed as helpful in that they: Provided participants with job opportunities/challenges to demonstrate skills and abilities, suggested strategies for advancing participants careers, believed in their potential, encouraged participants to take risks, shared his/her expertise with the participants, and gave participants useful career advice. The women executives of this study indicated that their mentors were the people they considered to have most significantly influenced their career development. They reported that their mentors had provided them with substantial help, and without them their career progress may have been hindered or made considerably more difficult. Research shows that people who have mentors secure

more promotions, have greater job mobility, recognition, satisfaction, and easier access to powerful individuals in the organization [11, 26, 35, 39]. In addition, according to DeVoe [10] to recruit and retain more women into the IT field, industry and academia have to convince young women that IT is open to them and encourage them to pursue IT degrees and jobs; and providing role models and mentors is an essential way to do this.

Due to the current skill shortage that the IT industry is facing along with the diversification of IT occupations, there are excellent opportunities for women to enter the IT sector. However, if organizations want to attract and retain talented women into their IT workforce, they must have an understanding of the personal and work environment factors that affect women's career development in IT. The acceptance of women in IT as permanent and valuable additions to the executive ranks is a necessary first step to the unlocking of their full potential. Once organizations recognize that women are in the workforce to stay, the value of investing in their development will be self-evident. It will then be only a question of how quickly the obstacles to their growth can be removed in order to further their upward mobility and increase productivity.

A small number of women, such as the ones in this study have already achieved a high enough level to demonstrate the contribution women can make. Now it is time to identify and understand their needs and concerns, to address the problems they are facing, and to initiate an honest and straightforward analysis of how these problems can be resolved. Organizations have it in their power to profit from women's motivations and aspirations; they can create a climate where men and women can communicate freely and with ease, and they can reward the aggressiveness and competitiveness in women and men equally. Ultimately they will find that the time spent on this effort will be a worthwhile cost—one that is much better in comparison with the alternative of stifling women's career growth or losing their talents, contributions, and potential entirely.

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