Computing, Information Systems & Development Informatics Journal
Vol. 13 No.1, 2022 - www.cisdijournal.net

Mentoring and Women's Advancement to Leadership in the Information Technology Field: A Qualitative Case Study

Marcia V. Reid
University of Phoenix
Center for Educational and Instructional Research
Phoenix, Arizona | USA
Email: mvreid60@email.phoenix.edu

ABSTRACT

The advancement of women to leadership positions is an important social concern to address for women who want to break through the obstacles of stereotyping, exclusion from networks, a lack of mentoring, and a shortage of role models. There is a lack of sufficient knowledge about the patterns and types of obstacles women in the IT field experience in the workplace, which may make it more difficult for organizations to address barriers to women's advancement in the workplace. The qualitative case study explored and identified the patterns and types of obstacles women in the information technology (IT) field experience in advancing to leadership positions and explored the mentor-mentee relationship of female organizational leaders in the IT field and its effect on the advancement of women to leadership positions. The sample consisted of two groups of women, one in leadership (10 cases) and the other in nonleadership (10 cases) positions, in the IT field in the eastern United States. Content analysis and NVivo 7 software were used to analyze the interview transcripts and observations for common themes. The findings revealed (a) mentor-mentee relationships play a key role in women's advancement in the IT field, (b) gender discrimination still exists in the IT field, (c) the old boys' network still exists in the IT field, and (d) there is a lack of mentoring programs and services in the IT field. The findings from this study may encourage other women to become mentors and their experiences may help to prepare more women for leadership positions in the IT field.

Keywords: Women, mentoring, IT, advancement, leadership, advancement, representation.

CISDI Journal Reference Format
Marcia V. Reid (2022): Mentoring and Women's Advancement to Leadership in the Information Technology Field: A Qualitative Case Study. Computing, Information Systems, Development Informatics & Allied Research Journal. Vol 13 No 1, Pp 31-42.
Available online at www.isteams.net/cisdijournal
dx.doi.org/1022624/AIMS/CISDI/V13N1P4

1. BACKGROUND TO THE STUDY

Since the early 1990s, women have steadily moved into the information technology (IT) business field giving them some opportunities to advance to leadership positions, driven by the opportunity of a challenging, yet rewarding career (Scott-Dixon, 2004). Although women represent about 50% of the workforce in the US, the female workforce is significantly underrepresented in science, technology, engineering, and math (STEM) with 27% in STEM industries (Martinez & Christnacht, 2021). Women were traditionally perceived as not competent and having no interest in becoming part of the labor force. Women were expected to stay at home, raise the kids, and support the men in any undertaking (Bily & Manoochehri, 1995).

During World War II, women started to become a part of the workforce to fill the void created by the men who had gone to fight in the war (Bily & Manoochehri). After the war, the women returned home to resume their duties as wife, mother, and homemaker. Although the women's time in the workplace was short-lived, the work experience ignited their desire to return to the workplace. Although women represent approximately 50% of the U.S. workforce, only 12% are in top leadership positions, 15.7% are senior executives, and 12.4% are on the board of directors in 500 of the major U.S. organizations (Wilson, 2004). Studies demonstrated women in the IT field may feel apprehensive and discouraged about advancing to leadership positions (Sumner & Niederman, 2003-2004). Studies reported the female labor force is growing at a fast pace (Meyerson & Fletcher, 2000); therefore, women may be afforded increased opportunities to advance to leadership positions, if organizations offer additional mentoring programs and support services to their female employees.

An increase in the number of women in leadership positions may change responsibilities from one particular group to many groups, which will provide both men and women equal opportunities to become leaders (Wilson). The study explored and identified the patterns and types of obstacles women in the IT field experience in advancing to leadership positions. The focused was with two groups of women, one in leadership (10 cases) and the other in nonleadership (10 cases) positions, in the IT field in the eastern United States. The study also explored the mentor-mentee relationship of female IT organizational leaders and its nature on the advancement of women to leadership positions.

The primary research question was:
(1) What factors might contribute to or hinder the advancement of women to leadership positions in the IT field?
(2) How do the female leaders who are in leadership positions and the female leaders who are prepared for leadership positions in terms of education and experience but have not yet attained those positions perceive how mentoring programs and services affect the advancement of female organizational leaders in the IT field?

2. STATEMENT OF PROBLEM

Historically, research showed women have not advanced as rapidly as men into top leadership positions (Lyness & Thompson, 2000). In the United States, "the technology sector is the fastest-growing industry . . . and the [IT] field has been the biggest driver of economic expansion in recent years. . . . [M]en have traditionally dominated this industry" (Book, 2001, p. 7).

The gender gap in the workplace is even more prevalent in the IT field, where there is a predominance of male employees in both management and nonmanagement positions (Kaminski & Reilly, 2004). The disparity of career advancement and salary between men and women is even greater for women who work in the IT field, throughout all levels in the organization (Kaminski & Reilly). The specific problem for the qualitative case study was a lack of sufficient knowledge about the patterns and types of obstacles women in the IT field experience in the workplace, which made it more difficult for organizations to address barriers to women's advancement in the workplace. A richer and more detailed understanding of women's experiences may help organizations build support systems and guidance programs for women to use and advance steadily through the management ranks.

An understanding of the nature of the mentor-mentee relationship and how this relationship influences the advancement of women to leadership positions gave organizational leaders in the IT field guidance on the actions they should take to advance women to leadership positions. By examining and exploring patterns associated with women in the IT field, the study findings may provide information to help women IT and non-IT leaders and nonleaders, as well as women in other organizational fields become mentors for new and existing employees in the workplace.

The study results may be transferable to women in leadership positions outside of the IT field because the women had experiences similar to women in the IT field. More female leaders in the IT field may give rise both to more female mentors and mentees and to increased leadership opportunities leading to top management positions.

3. OBJECTIVE

The main purpose of this research is to explore and identify the patterns and types of obstacles women in the IT field experience in advancing to leadership positions and the mentor-mentee relationship of female organizational leaders in the IT field.

4. RELATED LITERATURE

The research literature on women in the workforce does not address the obstacles women in the IT field experience in advancing to leadership positions. Exploration and identification of the patterns and types of obstacles women in the IT field encounter in advancing to leadership positions is important because organizational leaders in the IT field may use this information to show women how to overcome obstacles in the workplace.

Despite an extensive search for more recent literature on the topics of mentoring and women's advancement in the IT field, few studies after 2001 were found (Kaminski & Reilly, 2004; Scott-Dixon, 2004). The current literature is prevalent "with research exploring various alleged differences between men and women in management" (Robinson & Lipman-Blumen, 2003, p. 28). Although the current research literature includes studies around mentoring and women's advancement, the current literature is limited in terms of research studies on mentoring and women's advancement in the IT field (Casto et al., 2005; Rhode, 2003; Roemer, 2002; Robinson & Lipman-Blumen; Tharenou, 2005).

Women continue to be notably underrepresented in the senior leadership ranks of many industries in the United States (Jandeska & Kraimer, 2005). The low number of women in leadership positions affects the nature of mentoring studies (O'Neill & Blake-Beard, 2002), which are restricted because a shortage of women in leadership positions led to limited female mentoring relationships (Ragins & Scandura 1994).

Comparative literature from Castillo, Grazzi and Tacsir (2014) shows that many EU member countries "have implemented policies related to women and science, committing to gender mainstreaming, creating National Committees on Women and Science, publishing sex-disaggregated statistics, and promoting gender studies and research" (p. 14). Review of the literature also revealed that in recent decades, mentoring programs in Germany and Norway have utilized search committees to identify experienced women candidates who can fill leadership positions (Castillo et al., 2014). Meiksins, Layne and Nguyen's (2021) literature assessment of important social science research from 2020 referenced that, Charles et al. (2020) found that a group of men in France who were in their first year of a prestigious engineering program scored higher on tests of their visual-spatial ability, compared to women who were in the same distinctly selective engineering program.

A review of the literature about mentoring revealed mentoring was an important way for leaders to increase their mental, technical, and communication skills (Kram, 1983). Sosik and Lee (2002) espoused mentoring was a course of action that matched a person who was established within a particular field (mentor) with a person who was relatively new to the business (protégé) to provide support and guidance in advancing the career of the protégé. Similarly, Tharenou's (2005) study on female and male mentoring relationships revealed women needed guidance to help them advance to the next level in their careers. Additional review of the literature revealed ease of access to a mentor was one of the reasons women became successful managers (Headlam-Wells, 2004).

Additional research is necessary to address the literature gap in terms of mentoring and the advancement of women to leadership positions in the IT field.

5. METHODOLOGY

The study adopted a qualitative research method. The focus was about two groups of women, one in leadership (10 cases) and the other in nonleadership (10 cases) positions in the IT field in the eastern United States. The design was appropriate because the researcher had access to and was able to report on the real-life experiences of women in the IT field. The case study design included in-depth interviews that brought forth new ideas and identified or discovered new opportunities and challenges women face in the IT field that were not previously found in the literature (Blum & Muirhead, 2005; Dubé & Paré, 2003).

The population was women in the IT field in the eastern United States. The sample consisted of 20 women employed in the IT field: 10 women who, at the time of the study, were employed in leadership positions and 10 women who were prepared for leadership positions in the IT field in terms of education and experience but had not yet attained those positions in the IT field. The participants, 20 women who worked in the IT field in leadership (n = 10) and nonleadership (n = 10) positions, were contacted via e-mail, telephone, or face-to-face communication methods and asked to participate in a structured in-depth interview. A subsample of 5 women in leadership positions in the IT field were selected from the 10 leaders to also participate in semistructured in-depth interviews and observations. The subsample of 5 leaders was selected based on the following criteria: (a) the participant with the most years working in the IT field, (b) the participant with the most years in a leadership position, and (c) the participant with the highest position in a leadership field.

The 20 women were recruited for the study using the snowball sampling technique (Browne, 2005; Mertens, 2005; Rea & Parker, 2005; Simon, 2006). Recruitment for participants to volunteer for the qualitative case study included the following: (a) use of personal networks to request the contact information for 10 female participants from colleagues, peers, and acquaintances of the researcher employed in the IT field for a minimum of 2 years in leadership and nonleadership positions in the eastern United States and (b) recommendations for the other 10 female participants came from the women who had already volunteered for the study or from women who had heard about the study and wanted to become a participant. The study was limited in terms of small sample size. The small sample size may have impeded generalization of the study findings beyond the sample.

Table 1 presents the distribution of the years working in the IT field across the leadership and nonleadership categories. Table 2 presents the distribution of the years working in the IT field by the leadership and nonleadership groups. At the time of the study, 9 (45%) of the participants had been working in the IT field between 10 and 19 years (see Table 1). Five (50%) of the participants in nonleadership positions fell into the 10-19 years category, and 5 (50%) of the participants in leadership positions had been working in the IT field between 20 and 29 years (see Table 2). As illustrated in Table 1, only 1 (5%) of the participants was within the 30-39 years category. None of the participants in each of the categories had been working in the IT field for more than 40 years or less than 2 years.

Table 1: Distribution of Sample by Years in IT Field (n = 20)

Years in IT field	*n*	%
2-4	2	10
5-9	3	15
10-19	9	45
20-29	5	25
30-39	1	5
40+	0	0

Table 2: Distribution of Leaders and Nonleaders by Years in IT Field (n = 20)

Years in IT field	Leaders		Nonleaders	
	n	%	*n*	%
2-4	0	0	2	20
5-9	0	0	3	30
10-19	4	40	5	50
20-29	5	50	0	0
30-39	1	10	0	0
40+	0	0	0	0

The primary data collection methods used structured and semistructured telephone and face-to-face in-depth interviews and observations of the behaviours and interactions of the women during face-to-face interviews (Creswell, 2002; Marschan-Piekkari & Welch, 2004). Audio tape recording captured the participants' responses to the interview questions; observations were written on a notepad during the interviews. Transcription of interviews and analysis of narrative text revealed the participants' experiences in the IT field.. At the start of the audio-recorded interview, the participants were reassured that their identity, demographic information, and other personal information would be kept confidential and would not be included in the research study report. Also, the purpose and nature of the study was explained. The participants were reminded their past and current company and employers' name would not be disclosed and all records containing the participants' information would be kept for 3 years, after which the records would be destroyed. The participants were told an identifier would be created and assigned to each participant (Neuman, 2003) and the identifier would be used during data collection and data analysis. The participant identifier was used to maintain participant anonymity and confidentiality. The identifier included a two-digit number representing the order in which the participant was interviewed, the participant's level within the organization, and the date of the interview. Notes taken during the telephone interviews were used to identify common themes.

The data analysis methods used were content analysis and NVivo 7 software to analyze the data from the interviews and observations of the participants for common themes in the experiences of female leaders in IT organizations and the nature of their mentoring relationships. The data analysis began with transcribing the data collected from the interview sessions, typing up the observational notes, and sorting the information based on the data source (Creswell, 2003). Transcription of the audiotapes occurred shortly after the completion of the structured and semistructured audio-recorded interviews. Each transcript was read to acquire a general sense of the information collected and its meaning and to identify common themes (Creswell). The written notes and interview transcripts were reviewed several times to help identify themes and patterns. The interview tapes were transcribed verbatim, except for the removal of text that would violate the participant's privacy and anonymity. The transcribed interviews were sent to each of the participants to review for accuracy and validation.

Transcripts of the interviews were reviewed for themes and patterns using content analysis and analyzed further using NVivo 7, a qualitative data analysis software instrument (Creswell, 2002; Walsh, 2003). NVivo 7 was used to analyze and interpret the research data collected from the interview and from documented data sources. The participants' interviews and the observations were integrated to triangulate the data and sources. The findings from the in-depth interviews and face-to-face observations were triangulated to strengthen the study and ensure the findings were more reliable and accurate (Blum & Muirhead, 2005; Creswell, 2003; Leedy & Ormrod, 2001).

6. DISCUSSION OF FINDINGS

The study revealed six themes: (a) experience, (b) support and guidance, (c) opportunity, (d) discrimination, (e) old boys' network, and (f) mentoring programs. The six themes were derived from the participants' responses to prepared questions and the themes from the data answered the primary research questions. The participants identified experience almost unanimously as the key factor in women advancing to leadership positions. Of the 20 participants, 12 participants reported they never had a mentor, and 8 participants stated they had a mentor. Two (20%) of the nonleaders and 6 (60%) of the leaders reported they had had a mentor in the past. The other 8 (80%) of the nonleaders and 4 (40%) of the leaders stated they never had a mentor and wished one were available to provide them with support and guidance during their working experiences. Most of the women reported mentoring programs or services were available in their organizations. They noted although there was a slight increase over the past several years in the number of women in the IT field, opportunities were still limited for women in the workplace. All 10 leaders noted women had to work twice as hard as men to advance to any position in the IT field. Nonleader 3, a senior analyst working in the IT field for 4 years, stated, "Men are prone to get the promotions to move forward or to move ahead in the position, as opposed to women."

Many of the participants reported one of the main obstacles to women advancing to leadership positions in the IT field was that the IT industry was still a male-dominated field and the good old boys' network still existed in many organizations. Several women said being a woman was itself an obstacle, because women must choose between personal and professional life when making decisions between family life and career opportunities. Leader 4, a project manager working in the IT field for 23 years, stated, "I made some personal choices that I knew would [pause], you know [pause], would stop me from being in certain positions or even being considered [for certain positions]." Leader 1, a vice president working in the IT field for 26 years, summed up many of the participants' experiences in the IT field by stating, "I think in this [IT] industry, in general, that there is a sense that the company and your job should come before everything else. And I think it's very hard for women, especially women with children, to give up everything to do the kind of job you have to do for advancement. [pause] I think that what's interesting to me is that a lot of men are taking what I think are lesser track positions to kind of get the same kind of freedoms that women have. The group, the pool of people that are willing to give everything up is smaller, but that is still the pool from which the most advanced will always come."

Table 3 presents the distribution of the ages of the sample by age group. Table 4 presents the distribution of the ages of the participants by the leadership and nonleadership categories by age group. Overall, more than half (55%) of the participants were in their 40s (see Table 3), with a somewhat greater proportion of nonleaders than leaders (60%) in the 40-49 age group (see Table 4). As Table 4 illustrates, 5 (50%) of the female leaders were in their 40s, whereas 6 (60%) of the female nonleaders were in their 40s. Four (20%) of the participants fell within the 50-59 age range; all 4 of these participants were in a leadership position (see Table 4). None of the participants was younger than age 30 or older than age 60.

Table 3: Distribution of Sample by Age Category (n = 20)

Age category	*n*	%
18-29	—	—
30-39	5	25
40-49	11	55
50-59	4	20
60+	—	—

Table 4: Distribution of Leaders and Nonleaders by Age Category (n = 10)

Age category	Leadership		Nonleadership	
	n	%	*n*	%
18-29	—	—	—	—
30-39	1	10	4	40
40-49	5	50	6	60
50-59	4	40	—	—
60+	—	—	—	—

Table 5 illustrates the descriptive statistics for the ages of leaders, nonleaders, and the entire sample. The descriptive statistics include measures of central tendency (mean, mode and median) and measures of variation (range and standard deviation). The mean age across the entire sample was 43.50. The smallest range of 15 was in the nonleaders category. The nonleaders category had the lowest values across the sample, in terms of mean, median, mode, range, and standard deviation.

Table 5: Measures of Central Tendency for Age by Leader and Nonleader Categories

Category	Mean	Median	Mode	Range	*SD*
Leaders (*n* = 10)	46.80	46.50	56.00	21.00	7.58
Nonleaders (*n* = 10)	40.20	41.00	46.00	15.00	5.61
Total sample (*n* = 20)	43.50	43.50	46.00	25.00	7.32

Results of the study suggests the advancement of women to leadership positions is an important social concern that must be addressed for women who want to break through the obstacles and hindrances of stereotyping, exclusion from networks, lack of mentoring, and shortage of role models. Women just entering the workforce should understand barriers to advancing to leadership positions and to equality with men in the workplace still exist (Gregory, 2003). An increase in the number of women in leadership positions may give rise to new strategies for existing organizations to use in preparing women to advance to leadership positions.

There was consensus among the participants that there are too few women in leadership positions in the IT field, which may be one reason there is a lack of mentors. Many of the leaders and nonleaders perceived that because there are so few women in the IT field, women must work twice as hard as men to move through the leadership ranks. Both the leaders and the nonleaders felt female leaders can help to create new opportunities for other women, encourage women to set high standards for themselves, and show women how to improve their network connections.

According to Williams (2015), "If organizations are truly interested in retaining and advancing women, they will approach the issue of gender bias the same way they do other business issues: develop objective metrics and hold themselves to meeting them". Data from the study can help organizations gain a richer and more detailed understanding of women's experiences and help to build support systems and guidance programs for women to use and advance steadily through the management ranks. More female leaders in the IT field may give rise both to more female mentors and mentees and to increased leadership opportunities leading to top management positions.

7. RECOMMENDATIONS

The perceptions of women within the qualitative case study led to the conclusion that more women are needed in the IT field to help increase the number of female leaders and mentors who can provide guidance and support and create opportunities for other women. Female mentor-mentee relationships should be encouraged to help women improve network connections and plan and prepare for career advancement. Women still face many obstacles in advancing to leadership positions, which makes working in the IT field a challenge. If the number of women working in the IT field is to be increased further, then the real cause of the problems of barriers to advancement, lack of mentoring, and shortage of female role models in the IT field must be examined further and action taken.

The shortage of women in the IT field may be one of the reasons for few or no mentoring programs and services in the IT field. Organizations may find it beneficial to develop and implement some type of mentoring program and services to provide support and guidance to (a) women who want to get into IT and non-IT fields, (b) women who are prepared for leadership positions in IT and non-IT fields in terms of education and experience, but have not yet attained the positions, and (c) women who are in leadership positions. Women who want to enter IT and non-IT fields may find it useful to work in organizations that offer mentoring program and services that may provide them with female mentors who can share their own workplace experiences.

Women who are prepared for leadership positions in IT and non-IT fields in terms of education and experience but have not yet attained the positions may find mentoring programs and services helpful by networking with women in leadership positions who can provide guidance on how to overcome obstacles to advance to leadership positions. Female leaders and nonleaders in IT and non-IT fields may benefit by increasing their personal networks and helping to make decisions in the organization that have a positive effect on other women.

The findings may be used to expand the body of research and be compared with findings from past research on mentoring and women's advancement to leadership positions in the IT field. Further research in the area may contribute to the body of research that would inspire women to advance further in IT and non-IT fields by providing a richer and more detailed understanding of the obstacles or hindrances women encounter in advancing to leadership positions. Additional research might be conducted to review the introduction of mentoring programs and services as early as high school to prepare women who want to enter the IT field, which may help to (a) increase the number of women in the IT field, (b) increase the number of women in leaderships positions, and (c) increase the number of available female mentors in leadership positions who may be available to form mentor-mentee relationships.

Further research may also be conducted on whether the experiences of the women in the study are representative of the larger group of women in IT, such as through a quantitative descriptive study using a survey based on the findings of the qualitative case study. Since the study did not include representation of women in the 20-29 age groups, further research may be conducted on young women working in the IT field to explore and understand their particular experiences. Further research on whether work or family life commitments influence decisions organizational leaders make in advancing women to leadership positions in the IT field may help increase the number of women working in the IT field.

Although women in the IT field face obstacles such as the old boys' network, additional research may be conducted on men and their perspective on women breaking into the old boys' network in the IT field. Additional research may also be conducted on whether mentor-mentee relationships are more beneficial to women than men working in the IT field. Because the current literature is limited in terms of research studies on whether women's education and experience play a role in advancement to leadership positions, further research may be able to explain more clearly the significance of education and experience in women's advancement to any type of leadership position in IT and non-IT fields.

8. CONCLUSION

Overall, women have made some progress in organizations and have populated the workforce in about the same numbers as men, but women in senior positions are still rare (Burnford, 2021). Mentoring programs and services should be started as early as high school, which would serve to attract more women to work in the IT field. The number of women in leadership positions in the IT field may increase, but only with the help of other women who are already in the IT field and who are committed and have the desire to see women in leadership positions make decisions that benefit other women in the workplace. Greater numbers of female leaders in senior positions may encourage other women to become mentors, build better mentoring relationships with mentees, support other women in leadership positions, share their experiences with other women, and prepare women for leadership positions in the IT field. The lack of women in leadership positions might contribute to so few women being available to form mentor-mentee relationships.

While women continue to face many obstacles in advancing to leadership positions in the IT field, more research should be done in this field to determine and highlight barriers that women face to advance to leadership positions. The greatest challenge of this study was the relatively small sample size located in the eastern United States which may not have been a representative sampling of female leaders in the IT field. Future studies could expand the sample size to include women located outside the eastern United States to other regions, cultures, continents, and other countries. Further studies could determine the types of mentoring programs or whether mentor-mentee relationships are beneficial in helping women advance to leadership positions in the IT field and other industries.

Since the current literature is limited in terms of research studies on whether women's education and experience play a role in advancement to leadership positions, further research may be able to explain more clearly the significance of education and experience in women's advancement to any type of leadership position in IT and non-IT fields.

The fundamental conclusion of the study is (a) the obstacles women face in advancing to leadership positions still exist, for instance, the old boys' network; (b) the proportion of women working in the IT field should be increased; (c) more female mentors in the IT field may lead to a larger pool of available female mentors; and (d) more women in the IT field might lead to more women in leadership positions and more mentoring programs and services in IT organizations. This study will go a long way to help increase in the number of women in leadership positions and more mentoring programs and services in IT organizations.

Acknowledgments
I wish to acknowledge the support of the University of Phoenix Center for Educational and Instructional Research, its director Dr. Mansureh Kebritchi and reviewer Dr. Karen Johnson for their support in developing this manuscript.

REFERENCES

1. Bily, S., & Manoochehri, G. (1995). Breaking the glass ceiling. *American Business Review*, 13(2), 33-40. Retrieved December 15, 2005, from EBSCOhost database.
2. Blum, K. D., & Muirhead, B. (2005, February). The right horse and harness to pull the carriage: Teaching online doctorate students about literature reviews, qualitative, and quantitative methods that drive the problem. *International Journal of Instructional Technology and Distance Learning*, 2(2). Retrieved July 20, 2006, from http://www.itdl.org/Journal/Feb_05/article03.htm
3. Book, E. W. (2001). Why the best man for the job is a woman. *New York: HarperCollins*.
4. Browne, K. (2005). Snowball sampling: Using social networks to research non-heterosexual women. *International Journal of Social Research Methodology*, 8, 47-60. Retrieved July 4, 2006, from EBSCOhost database.
5. Burnford, J. (2021). Removing Rocks From The Rucksack: How To Lighten The Load For Women In Leadership. *Forbes*, 11, 20-34. Retrieved February 17, 2022, from https://www.forbes.com/sites/joyburnford/2021/10/28/removing-rocks-from-the-rucksack-how-to-lighten-the-load-for-women-in-leadership/?sh=706d9de82744
6. Castillo, R., Grazzi, M., & Tacsir, E. (2014). Women in Science and Technology What Does the Literature Say? *Inter-American Development Bank*, IDB-TN-637. Retrieved May 7, 2022, from https://publications.iadb.org/publications/english/document/Women-in-Science-and-Technology-What-Does-the-Literature-Say.pdf
7. Casto, C., Caldwell, C., & Salazar, C. F. (2005). Creating mentoring relationships between female faculty and students in counselor education: Guidelines for potential mentees and mentors. *Journal of Counseling & Development*, 83, 331-336. Retrieved November 28, 2005, from EBSCOhost database.
8. Charles, S., Jaillet, A., Peyret, N., Jeannin, L., and Riviere, A. (2020). Exploring the Relationship Between Spatial Ability, Individual Characteristics and Academic Performance of First-Year Students in a French Engineering School. *47th SEFI Annual Conference 2019 – Varietas Delectat: Complexity Is the New Normality*, Sept. 16–19, 2019: 235–248.
9. Creswell, J. W. (2002). Educational research: Planning, conducting, and evaluating quantitative and qualitative research. *Upper Saddle River, NJ: Pearson*.
10. Creswell, J. W. (2003). Research design: Qualitative, quantitative, and mixed methods approaches. *Thousand Oaks, CA: Sage*.

11. Dubé, L., & Paré, G. (2003). Rigor in information systems positivist case research: Current practices, trends, and recommendations. *MIS Quarterly*, 27, 597-636. Retrieved July 18, 2006, from EBSCOhost database.
12. Gregory, R. F. (2003). Women and workplace discrimination: Overcoming barriers to gender equality. *New Brunswick, NJ: Rutgers University Press*.
13. Headlam-Wells, J. (2004). E-mentoring for aspiring women managers. *Women in Management Review*, 19, 212-218. Retrieved November 12, 2005, from ProQuest database.
14. Jandeska, K. E., & Kraimer, M. L. (2005). Women's perceptions of organizational culture, work attitudes, and role-modeling behaviors. *Journal of Managerial Issues*, 17, 461-478.
15. Kaminski, J. A., & Reilly, A. H. (2004). Career development of women in information technology. *Advanced Management Journal*, 69(4), 20-30. Retrieved March 14, 2005, from EBSCOhost database.
16. Kram, K. E. (1983). Phases of the mentor relationship. *Academy of Management Journal*, 26, 608-625. Retrieved December 20, 2005, from ProQuest database.
17. Leedy, P. D., & Ormrod, J. E. (2001). Practical research: Planning and design (7th ed.). *Chicago: University of Chicago Press*.
18. Lyness, K. S., & Thompson, D. E. (2000). Climbing the corporate ladder: Do female and male executives follow the same route? *Journal of Applied Psychology*, 85, 86-101. Retrieved September 12, 2005, from EBSCOhost database.
19. Marschan-Piekkari, R., & Welch, C. (2004). Handbook of qualitative research methods for international business. *Northampton, MA: Edward Elgar*.
20. Martinez, A., & Christnacht, C. (2021). Women Are Nearly Half of U.S. Workforce but Only 27% of STEM Workers. *United States Census Bureau*. Retrieved February 17, 2022, from https://www.census.gov/library/stories/2021/01/women-making-gains-in-stem-occupations-but-still-underrepresented.html
21. Meiksins, P., Layne, P., & Nguyen, U. (2021). Women in Engineering: A Review of the 2020 Literature. *Magazine of the Society of Women Engineers, 68(2)*. Retrieved May 7, 2022, from https://magazine.swe.org/women-in-engineering-a-review-of-the-2020-literature/
22. Mertens, D. M. (2005). Research and evaluation in education and psychology: Integrating diversity with quantitative, qualitative, and mixed methods. *Thousand Oaks, CA: Sage*.
23. Meyerson, D. E., & Fletcher, J. K. (2000). A modest manifesto for shattering the glass ceiling. *Harvard Business Review*, 78, 127-136.
24. Neuman, W. L. (2003). Social research methods (5th ed.). *Upper Saddle River, NJ: Prentice Hall*.
25. O'Neill, R. M., & Blake-Beard, S. D. (2002). Gender barriers to the female mentor-male protege relationship. *Journal of Business Ethics*, 37, 51-63.
26. Ragins, B. R., & Scandura, T. A. (1994). Gender differences in expected outcomes of mentoring relationships. *Academy of Management Journal*, 37, 957-971. Retrieved December 18, 2005, from ProQuest database.
27. Rea, L. M., & Parker, R. A. (2005). Designing and conducting survey research: A comprehensive guide. *San Francisco: Wiley*.
28. Rhode, D. L. (2003). The difference "difference" makes. *Stanford, CA: Stanford University Press*.
29. Robinson, J. L., & Lipman-Blumen, J. (2003). Leadership behavior of male and female managers, 1984-2002. *Journal of Education for Business*, 79, 28-33. Retrieved February 19, 2006, from EBSCOhost database.
30. Roemer, L. (2002). Women CEOs in health care: Did they have mentors? Health Care Management Review, 27(4), 57-67. Retrieved November 21, 2005, from EBSCOhost database.
31. Scott-Dixon, K. (2004). *Doing IT: Women working in information technology*. Toronto, Canada: Sumach Press.
32. Simon, M. (2006). Dissertation and scholarly research: Recipes for success. *Dubuque, IA: Kendall Hunt*.

33. Sosik, J. J., & Lee, D. L. (2002). Mentoring in organizations: A social judgment perspective for developing tomorrow's leaders. *Journal of Leadership & Organizational Studies*, 8(4), 17-32. Retrieved December 20, 2005, from ProQuest database.
34. Sumner, M., & Niederman, F. (2003-2004). The impact of gender differences on job satisfaction, job turnover, and career experiences of information systems professionals. *Journal of Computer Information Systems*, 44(2), 29-39.
35. Tharenou, P. (2005). Does mentor support increase women's career advancement more than men's? The differential effects of career and psychosocial support. *Australian Journal of Management*, 30, 77-109. Retrieved November 24, 2005, from ProQuest database.
36. Walsh, M. (2003). Teaching qualitative analysis using QSR NVivo. *The Quality Report Journal. TQR*. Retrieved July 9, 2006, from http://www.nova.edu/ssss/QR/QR8-2/walsh.pdf
37. Williams, J. C. (2015). The 5 Biases Pushing Women Out of STEM. *Harvard Busines Review Digital Article*. Retrieved March 9, 2022. https://hbr.org/2015/03/the-5-biases-pushing-women-out-of-stem
38. Wilson, M. C. (2004). Closing the leadership gap: Why women can and must help run the world. *New York: Penguin Group*.