Factors Impacting Retention of Mothers in Engineering Careers: Flexibility, Bias, Balance, and Benefits of Social Networking

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Abstract

Social networking allows for interactions among groups and people that have had little opportunity to do so in prior decades. There are many groups on different platforms, serving a variety of different needs for their members. One such group, established on Facebook, consists of engineering working moms, with the membership loosely defined as a mother who is an engineer and employed outside the home. This group was surveyed, with the survey questions including both quantitative and qualitative items, and appropriate data analysis was carried out.

One area in which the social network had significant impacts was in the retention of engineering mothers in the workforce. Data showed that the support provided by the group contributed to the retention of the group's members in the workforce, and assisted in their efforts to balance work and personal life. This paper will address these particular aspects of the group's value to the members, and recommendations will be made for how to leverage the knowledge to better support this particular group in the workforce as they transition throughout their career from recent graduates to seasoned professionals while raising families.

Introduction

Phrases like retention, work-life equilibrium, family, and career are frequently used, yet when combined, they can become perplexing or overlooked. They might appear ambiguous, causing confusion, or too personal to convey a shared understanding. While each person's circumstances differ, creating unique situations for all[1], many individuals seek remedies when confronted with these dilemmas. However, it can be challenging for individuals to identify where to seek assistance, and some may be reluctant to disclose their challenges for fear of appearing inadequate or facing judgment[2]. Online communities have arisen to establish a forum where individuals can exchange experiences and discover solutions with the support of others[3]. This paper delves into the membership and functioning of a successful community of engineer mothers, concentrating on retaining working mom engineering and navigating their corporate experiences.

Participants of a Facebook social networking community named 'Engineering Working Moms' commonly refer to it as their 'exclusive group,' a space to connect with like-minded professionals, among other expressions indicating solidarity with peers in a STEM-driven environment facing similar challenges related to gender biases. As of this and one other study[4], the Facebook group boasted a total membership of 4437, with predominant representation from the United States (92.4%), followed by Canada (2.2%), and Australia (<1%). The camaraderie and encouragement within this community are distinctive and empower numerous members to sustain their engineering careers. Many individuals attribute their continued presence in the engineering community to the support found within this group. They turn to the community for guidance on navigating workplace issues, exploring new job opportunities, coping with layoffs, addressing childcare concerns, managing spousal dynamics, and sharing insights into their daily

lives. The authors, one of whom is an 'engineering mom,' posit that such support networks could play a crucial role in retaining women in the engineering profession.

Literature Review

There are several areas of literature relevant to this work and its specific questions. The key areas to consider are flexibility, bias, and work-life balance. These areas are chosen as the lens through which the results are seen, in order to address the issues that lead to women leaving the engineering workforce after they have children.

Flexibility

Flexibility in one's life and work-life balance refers to the ability to adapt and adjust one's schedule, tasks, and priorities in order to accommodate both personal and professional commitments effectively. It involves having the freedom to make choices that allow individuals to fulfill their responsibilities at work while also addressing their personal needs, family obligations, and pursuing activities that contribute to their overall well-being and fulfillment.

In the context of work-life balance, flexibility encompasses various aspects, including flexible work hours, remote work options, compressed workweeks, job sharing, and the ability to take time off for personal reasons such as childcare, family emergencies, or self-care. It also involves having supportive workplace policies and practices that recognize the diverse needs and priorities of employees and enable them to manage their work and personal lives in a way that promotes satisfaction, productivity, and overall happiness.

Flexibility in work-life balance recognizes that individuals may have different preferences, circumstances, and challenges outside of work that require accommodation. By offering flexibility, employers can foster a positive work environment, enhance employee engagement and retention, and ultimately contribute to the well-being and success of their workforce.

Specifically, flexibility in the workplace can have a positive impact on women engineers' overall well-being[5]. When women engineers are allowed to work flexible hours, they can better manage their work-life balance, leaving them feeling more rested, healthy, and fulfilled. This can lead to improved productivity, creativity, and better job satisfaction[6].

Flexibility in the workplace also helps women engineers who are juggling personal and family responsibilities. They are more likely to be able to take care of their obligations without sacrificing their job performance, thus reducing stress and ultimately leading to better mental and physical health[7].

Furthermore, flexibility in the workplace can also help reduce the gender gap in the engineering field[8]. In the United States, women engineers are often overlooked for promotions and are subjected to higher job insecurity than their male counterparts. They often bargain for time to be with family or attain a work-life balance to obtain needed flexibility. This concept is further supported by Lewis and Humbert[9], who suggest that their findings in France utilizing a

qualitative research method provide insight into established policies. More flexible working policies do not increase gender equity. Instead, they provide evidence that policy alone is insufficient; the practice is most successful in gaining gender parity. Per this study, employers can show that they take women engineers seriously and create an environment where they feel valued by offering flexible working hours.

In conclusion, flexibility in the workplace can have a positive impact on women engineers' overall well-being. It can help them better manage their work-life balance, reduce stress, and improve job satisfaction and productivity. Furthermore, it can also help reduce the gender gap in the engineering field, creating a more inclusive and equitable work environment, and more research is needed to determine what methods and techniques are most successful in attaining gender parity.

Bias

Bias in one's work or personal environment as a woman engineer refers to the unfair treatment, prejudice, or discrimination that a woman may encounter based on her gender within engineering-related contexts. This bias can manifest in various forms and may include gender stereotyping, unequal opportunities, microaggression, unequal pay, and lack of representation in the workplace and home by virtue of their education, experience, and personal interactions. :

Overall, bias in the work or personal environment of a woman engineer can create barriers to professional growth, diminish job satisfaction, and contribute to feelings of exclusion or marginalization within the engineering profession. Recognizing and addressing bias is crucial for creating inclusive and equitable work environments where all individuals, regardless of gender, can thrive and succeed based on their skills, contributions, and merit.

Bias in the workplace can have a significant impact on women engineers and their career decisions. Women engineers face challenges that male engineers do not, including gender-based discrimination and bias[10]. This can include exclusion from professional networks, lack of recognition for their work, and being passed over for promotions and leadership positions, resulting in lower pay, fewer opportunities for advancement, and fewer chances to gain the skills and experience necessary for future success[11,12].

Moreover, bias in the workplace can lead to an environment where women engineers feel unwelcome, undervalued, and discriminated against. This can lead to self-doubt, anxiety, and frustration, making it harder for them to stay in their field and progress in their careers[13,14].

In addition, bias in the workplace can lead to the perception that women engineers are incapable of doing their job as well as their male counterparts. Ultimately leading to women engineers being given fewer challenging tasks or overlooked for critical assignments. This can limit their ability to develop their skills and experience, making it more difficult to gain meaningful professional recognition[15].

Finally, bias in the workplace can lead to women engineers feeling like they need to prove themselves more than their male counterparts. This can harm their mental health, well-being, and ability to pursue the career path they desire[16].

In conclusion, bias in the workplace can have a significant impact on women engineers and their career decisions. It can lead to feelings of exclusion and undervaluation, limit their ability to develop their skills and experience, and lead to a need to prove their capability continually, with severe implications for their career success and overall well-being.

Work-Life Balance

Work-life balance is crucial for women engineers, as it pertains to finding a balance between their professional responsibilities as engineers and personal commitments outside of work. It involves effectively managing their time, energy, and priorities to ensure they find fulfillment both in their careers and personal lives. To achieve this balance, they need to be able to pursue their career aspirations, meet job demands, and engage in meaningful projects while also fulfilling their family responsibilities, personal interests, and self-care routines.

The ability to achieve work-life balance enables women engineers to thrive in their careers while maintaining overall well-being and satisfaction in their personal lives. They can achieve this by employing strategies such as flexible work arrangements, boundary-setting, effective time management, and seeking support networks to navigate the unique challenges and opportunities they face in the engineering profession.

The workplace environment can have a significant impact on the work-life balance for women engineers [17]. An environment that supports their career goals and acknowledges their unique needs can help them make informed career decisions. However, a hostile environment towards women engineers can make maintaining a healthy work-life balance challenging[18].

In a supportive environment, women engineers can access resources such as mentorship and networking opportunities to help them succeed. This can also give them access to additional career opportunities and help them achieve career advancement. Additionally, supportive environments can give women engineers flexibility in their work schedules, allowing them to manage their work-life balance better[19].

On the other hand, a hostile environment can lead to a lack of resources, leaving women engineers needing more support to succeed. Additionally, hostile environments can make it difficult for women engineers to feel comfortable in their work environment, leading to stress, anxiety, and a lack of motivation. Maintaining a healthy work-life balance can make it challenging, as women engineers may need help prioritizing their personal lives[13].

Ultimately, the workplace environment can have a significant impact on the work-life balance for women engineers[20]. Employers must create an environment that supports women engineers and their unique needs to ensure they can make informed career decisions and achieve a healthy work-life balance.

Previous Work With this Group

As part of a broader study, a survey was conducted on the Engineering Moms Facebook group to gather information about their experiences. In a previous publication, the researchers focused on the group's individual attributes and their emphasis on personal and family needs. However, they felt that the collected data had more to offer. Therefore, they developed research questions to extract additional data, with the goal of sharing the richness of this group's interactions and composition with a wider audience.

Research Questions

In this paper, the following research questions were addressed:
1. What role do flexible employer policies have in retaining members of the group in the engineering workforce?
2. What experiences with bias did group members report?
3. How can work-life balance be enhanced for engineers who are also mothers?

Furthermore, as the survey itself was conducted through a Facebook social networking group, some understanding of the importance of social networking can be evaluated to determine how it is valuable to the members of the group.

Methods

This document is a review of existing data and research done by others. Its purpose is to provide a summary of the current understanding of the use of social media to support the retention of engineers in the workplace. The full analysis of the larger study, which includes both quantitative and qualitative data, was published by Henley, Lucietto, and Peters[4]. Therefore, this document will not replicate the full analysis, but will instead focus on key findings and references to answer the research questions presented here.

The researchers utilized an abbreviated Content Analysis of data that supports responding to the research questions. Further analysis found that the data reflected 4 areas that supported the response to the questions and provided a greater understanding of what the collective respondents were sharing with them.

Findings

The research questions in this paper are answered in accordance with the available data on each relevant topic. The data analyzed in this paper is qualitative, and the focus is not on the quantitative data collected or analyzed. The quantitative data can be found in a previously submitted paper[4].

The data set consisted of 280 respondents with an average age of 39.4 years. Out of these respondents, 256 held a Bachelor of Science degree in engineering. Additionally, 157 of them had a second degree, which included an MS in engineering and an M in engineering. Furthermore, 29 respondents reported having a third degree, most of which were a PhD in engineering, MS in engineering, or MBA. The data set is discussed in more detail in Henley, Lucietto, and Peters[4].

Flexibility

Many of the qualitative responses referenced flexibility, either when speaking of how the respondents' balanced commitments with their career or when stating what advice they would give to others. Multiple responses to different questions reflected the importance of flexibility, either on one's own part or of their employer. Overall, 70 specific references to flexibility were present in the answers to various questions. Questions that this data was found included the following:

11. Was your workplace accommodating while you were pregnant of you were working while you were pregnant?
18. What advice would you give other STEM women who are pregnant in the workplace?
29. How do you manage the demands of parenting while working as an engineer? Are there systems you use?
41. Is there anything you wish to share with the researchers that wasn't covered in the questions above?

The research study collected 70 responses from individuals who shared their thoughts and experiences on parenting and work-life balance. The researchers found that most responses highlighted the importance of flexibility, whether it be from the mother or the family as a whole. One respondent noted that when faced with a parenting problem, they employed the principles of design theory to think of multiple solutions. This approach allowed them to remain flexible and adaptable in their parenting techniques. Another respondent advised being open to the curveballs that life throws and recommended being flexible in response to changing circumstances.

In a recent survey, several respondents provided their thoughts on the role of employers in enabling flexibility in the workplace. One respondent suggested that their employer was more willing to allow flexibility in how their work was done because they were good at their job. This indicates that good performance and productivity may be important factors in convincing employers to provide more flexible work arrangements.

Other respondents expressed a strong desire for more flexibility in their work schedule to spend more time with their family. They wished for a job with more flexible hours or the option to work part-time. These respondents recognized the importance of balancing work and family commitments and identified flexibility as a key factor in achieving this balance.

Despite these desires for more flexibility, all respondents acknowledged the importance of flexibility in making things work for both mothers and companies. A flexible work schedule can help mothers balance their work and family commitments, while employers can benefit from increased employee satisfaction, motivation, and productivity.

Overall, the responses consistently underscored the value of flexibility in achieving work-life balance. Whether it be from the mother, the family, or the employer, flexibility was seen as a crucial factor in enabling individuals to effectively navigate the demands of both work and parenting.

Bias

The survey responses revealed a recurring theme of bias, though not always explicitly stated as such. Several questions received answers that showed indications of bias, and almost all survey questions contained a form of bias.

The survey results highlighted an interesting trend where a considerable number of respondents expressed their apprehension about being perceived as responsible mothers, especially when it comes to taking time off for family responsibilities. It was fascinating to note that many participants opened up about the impact of gender bias on their parenting approach and how it influenced their decision-making process. The insights offered by the respondents were candid and thought-provoking, shedding light on the complex interplay between societal expectations, gender roles, and parenting responsibilities.

During a recent online discussion, a group of mothers shared their experiences with gender bias and how they are working to combat it in their personal and professional lives. One participant expressed her mindfulness of gender biases in her career, which has made her extremely intentional about how she speaks to her children and when to point out gender biases to them. She believes that raising awareness about gender bias at a young age will help her children become more conscious of the issue and work to combat it as they grow older.

Another mother highlighted the importance of building her daughter's confidence and shielding her from the biases that society imposes on women. She explained that she has seen firsthand how societal biases can affect a young girl's self-esteem, and she is determined to help her daughter develop a strong sense of self-worth. She believes that building her daughter's confidence will help her to stand up to gender bias and inequality in all aspects of life.

Yet another participant shared how she works to treat both her son and daughter equally, providing them with the same opportunities, including tools for building. She explained that she despises gender bias at work and won't tolerate it at home. She believes that treating her children equally and giving them the same opportunities will help them develop a sense of fairness and equality, which will help them to combat gender bias as they grow older.

Overall, the participants acknowledged experiencing bias, but they were determined to take active steps to combat it and champion equality. They believe that by raising awareness, building confidence, and treating their children equally, they can help to create a more equitable and just society for everyone.

Work-Life Balance

The importance of work-life balance was also a pervasive theme in the responses, with its importance being repeatedly stressed, whether using those specific words or similar terms. Survey respondents commented on its importance often, spoke of how they addressed it, and commented on how employers promoted it; often this was tied in with the need for flexibility, as

that was seen as one means of promoting and helping to achieve work-life balance. The questions that elicited discussion regarding work-life balance follow:

14. Does your company offer childcare on-site?
19. Did you always plan to have children? Did engineering influence your decision to have children?
29. How do you manage the demands of parenting while working as an engineer? Are there systems you use?
34. How do you manage childcare if you are working? Who watches the children while you're at work? Ho do you manage childcare if you are working? Who watches the children while you're at work? How much does childcare cost you monthly?

In a recent survey, several respondents shared their thoughts on the importance of work-life balance. Many of them expressed that they wished they had considered it more or earlier in their career. It was evident from their responses that work-life balance had largely influenced their career decisions.

One respondent aptly advised, "Protect the work-life balance! Stand up/advocate for what you need, and don't feel bad about it." This emphasizes the need for individuals to prioritize their personal and professional lives equally and not feel guilty about it.

Another respondent shared their experience of staying in a comfortable job for too long because of the good work-life balance it offered. They commented, "I probably stayed in one comfortable role for too long when my kids were little, because I knew I had a good thing going with work-life balance and was afraid of moving to an unknown."

Overall, it was clear from the respondents' free responses that work-life balance was a major concern for them, and they valued employers who took this into consideration. The importance of work-life balance cannot be overstated, and it is crucial that individuals and organizations alike prioritize it to maintain a healthy and productive work environment.

Social Networking

Social networking is especially important for women who are mothers and engineers in the workplace. In today's professional world, social networking platforms are invaluable for networking, mentorship, and knowledge sharing [21]. Every open response in this survey provided at least one or two responses that either explicitly or implicitly that social networking is of a significant value to them, and their quality of life.

For mothers trying to balance work and family life, social networking provides a vital support system where they can connect with other professionals facing similar challenges. In the engineering field, where women are underrepresented, social networking enables female engineers to access resources, find mentorship opportunities, and build professional relationships that can help advance their careers [22]. Moreover, social networking platforms promote the exchange of ideas and experiences, creating a sense of community and empowerment among female engineers and working mothers. By leveraging the power of social networking, women in

these dual roles can navigate career advancement, overcome obstacles, and make meaningful contributions to their fields while maintaining a healthy work-life balance [23].

The social networking community of Engineering Working Moms on Facebook has had a significant impact on retaining mothers in engineering careers. The support provided by the group has helped its members balance work and personal life, leading to their continued presence in the engineering community. By providing a forum where individuals can exchange experiences and discover solutions with the support of others, this community of like-minded professionals has empowered numerous members to sustain their engineering careers. This support network has the potential to play a crucial role in retaining women in the engineering profession.

Discussion/Conclusion

After examining the survey results, it is evident that work-life balance and flexibility are closely related. The participants highly valued the flexibility they received from their employer, as well as their own ability to be flexible, because it helped them achieve a better work-life balance. Therefore, it is important for employers to consider the types of flexibility they can offer in order to retain women engineers, particularly those who are also mothers.

Furthermore, while many women engineers had experienced bias, they did not view it as a permanent aspect of the work environment. Instead, they believed they could actively fight against it in their own lives and families. This optimistic attitude suggests that while bias is a concern, they are willing to take action to combat it.

Moreover, the advent of the social media revolution has transformed the way individuals connect with others who share similar experiences and situations. Through platforms like Facebook, people can easily exchange information while preserving their anonymity. Social media platforms have provided a way for individuals who may feel isolated or alone in their personal situations to become part of a larger community. Prior to the rise of these platforms, few organizations existed to support engineering mothers in the midst of parenthood. While some found solace in the Society of Women Engineers, others were unable to attend social events and conferences. However, Facebook groups, like the one studied for this paper, provide the necessary community and networking opportunities for nearly any subject one may encounter in their lives. This interconnectedness has facilitated support networks and resource sharing among women engineers, particularly those navigating the complexities of balancing career and family responsibilities.

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