International Journal of Gender, Science and Technology
http://genderandset.open.ac.uk

Managing Work-life Balance: A Study of Social Media Network 'Engineering Working Moms'

[1]Isabella Marie Henley, [1]Anne M. Lucietto, [2]Diane L Peters

[1]Purdue University, [2]Kettering University, USA

ABSTRACT

The Engineering Working Moms social networking group is the focus of this study. The group membership is broad, encompassing mothers who are engineers and work outside of the home, but also those who are not currently working, those who work remotely, those between jobs, or those preparing for re-entry. Mainly based in North America, the group is a valuable resource for technical expertise, advice on managing work-life balance and learning the essential skills necessary for navigating life as a technical mother. The researchers conducted a survey of the group to explore their socialization and interactions, specifically their quest for work-life balance. The findings revealed that work-life balance looks different for everyone. Some of the engineers found that limiting their activities was the best option, while others kept a tight schedule on their planners and calendars. Many relied on neighbors, friends, and family to help them schedule activities like carpooling and babysitting. Having a flexible job or a partner with a flexible job also helped significantly. The members of this group all work and care for their families, and they focus on programs and task support that professional organizations and employers can implement to support and retain them in the workforce. The group discusses various issues they face and often delves into the support they receive during pregnancy and childbirth, which is not always clear. This research delved deeper into these issues and highlighted that, while most women felt supported during pregnancy and childbirth, some faced judgmental attitudes from their bosses and co-workers. The issues confronted by the members of this group can inform the development of benefits and programs that employers may consider to attract and retain engineering staff. Additionally, this research provides insight into the interactions and fellowship among women in technical careers, which can help to deepen our understanding of women's socialization.

KEYWORDS: social networks, engineering, motherhood, work-life balance

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INTRODUCTION

Words like retention, work-life balance, family and career are commonly used, but when they are used together, they can be confusing or ignored. They may seem vague, leading to confusion, or too individual to have any common meaning. While individual circumstances vary and create a very different situation for everyone (Fouad et al., 2011), many people seek solutions when faced with these challenges. However, it can be difficult for individuals to know where to turn for help, and some may be hesitant to share their struggles for fear of appearing inferior or being judged (Ruthven, Buchanan, & Jardine, 2018). Online groups have emerged to create a space where people can share their experiences and find solutions through the support of others (Major, 2017). In this paper, we will explore the membership and operation of a successful group of engineers who are mothers focusing on work-life balance and their experience in the corporate environment with respect to pregnancy and childbirth.

Members of a social networking group on Facebook called 'Engineering Working Moms' often refer to it as their 'private group,' a place to find like-minded experts,' as well as many other phrases that indicate comfort with others working in a field requiring a strong STEM background encountering similar situations related to gender bias. The total membership at the time of this study was 4437, and the top contributor countries include the United States (92.4%), Canada (2.2%), and Australia (<1%). The relationships and support in this group are unique and enable many to continue their careers as engineers. Group members have cited the group as a reason why they did not leave engineering. They come to the group to ask about topics from handling workplace issues, finding a new job, what to do when laid off, child-raising issues, spouse issues, and general sharing of their lives. The authors, one of whom is an 'engineering mom,' believe this kind of support may be one way to retain women engineers in the field.

This Facebook group began as an offshoot of the Society of Women Engineers (SWE) (Society of Women Engineers, 2017) and has continued to grow beyond those bounds as others learn about the supportive, easy-to-access group. The research was originally inspired by the group itself. Members of this group asked who was in the group. A member of the group recruited a research team and initiated the research project. The authors did an initial probe and then began to ask questions about their thoughts, how they gained support, and how many children they had. The intent of this was to explore the retention of women engineers further. Other areas of improvement are identified by improving the retention of this unique group of women engineers.

LITERATURE REVIEW

The intent of this paper is to understand the demographic and, ultimately, the retention of women who are mothers within the engineering sector (Ayre, Mills, & Gill, 2013). Thus, this review of literature will cover these topics by focusing on who the participants of this work are, including their work-life balance, the issue of retention of mothers in engineering fields, the support these working mothers receive in their workplace and external to their family life, and the role of online social networks for mothers in engineering professions.

Engineering Working Mothers

For the most part, mothers that are engineers have completed at least one degree in engineering, most often a bachelor's degree. Others may have children first and then pursue further education, choosing engineering as their career goal. In the first of these situations, if a woman waits to complete her bachelor's degree (in the US), before becoming a mother she is likely be 23 years old or older. It is difficult to determine the age of a professional mother that had children before their higher education. Anecdotally and through data found from the National Center for Education Statistics, most engineers fit the first category (National Center for Education Statistics, 2015).

A woman's childbearing years are specified in many sources to age 15-44 years old (Control & Prevention, 2002), with childrearing years extending for up to two decades after that. Members of the 'Engineering Working Moms' (EWM) Facebook group in this study may span any of the ages noted in this range and more senior, considering mothers that are well past childrearing who are there to offer advice and interaction.

Women engineers encounter several obstacles as they navigate their careers. Children and often a spouse/partner, make navigating life's challenges become more complicated. Of those obtaining degrees in STEM fields, approximately 40% of those leave the field, most citing child- and/or family care. (Fouad, Singh, Fitzpatrick, & Liu, 2011; Singh et al., 2013). It is often attributed to confidence (Ayre et al., 2013) and hope (Buse et al., 2013).

As women engineers navigate their careers, they may strive to both advance in those careers and to spend time with family. This balance is impacted by a mother's country and culture, as well as their employer's specific policies. Relevant policies and laws are very different throughout the world, and thus it is important to understand different contexts for mothers' experiences, both to see where differences exist and to identify enduring themes across cultures. As an example, Herman and Lewis (2012) examined decisions to reduce working hours for mothers in four companies in three European countries, revealing circumstances that could allow mothers to combine caregiving with career achievement. Similarly, in Herman, Lewis, & Humbert (2013) interviews were conducted with employees of three European multinational companies, with the goal to understand the experiences specifically of mothers in contrast to the broader experiences of all women in science, engineering and technology careers.

Ayre et al. (2013) suggest the importance of support – inside the family and outside. Researchers such as Fernando, Cohen, and Duberley (2018) argue that we have little understanding of how women engineers think and subsequently make decisions, or how the support of those around them impacts those decisions.

Work-Life Balance

Finding a balance between work and home can be difficult, especially for women engineers (Brue, 2019; Maji, 2019; Rodríguez-Rivero, Yáñez, Fernández-Aller, & Carrasco-Gallego, 2020). For some women, having the flexibility to control hours, days worked, etc. brings more satisfaction at home and with work (Lewis & Humbert, 2010). While this may be the case, Chung and van der Horst (2020) assert that unpaid overtime hours has become more of a norm. Flexibility in working hours is not always possible, and in this case other arrangements must be made. Without support from the employer, many mothers leave engineering and stop working all together (Buse & Bilimoria, 2014), or move into lesser roles, often referred to as a brain drain of female engineers (Iravani, 2011). One such example is in academia, where women are more likely to take on positions as adjunct or non-tenure-track faculty than men (Wolfinger, Mason, & Goulden, 2009).

The role of a supervisor can also be important. If the supervisor receives training on how to work with employees to establish expectations surrounding work/life balance (Maloni, Gligor, Cheramie, & Boyd, 2019) this could lead to lower numbers of mothers leaving engineering .

Retention

A great deal of research has been completed on the retention of employees in a large variety of fields (Glass, Sassler, Levitte, & Michelmore, 2013; Korte, Brunhaver, & Zehr, 2019). Women in engineering are likely to remain in engineering if they are confident in their abilities and skill set (Ayre et al., 2013) and have a positive outlook to the future (Buse et al., 2013). Others have identified the lack of comradery, support, or feeling a part of a group as a significant challenge for women in engineering (Stone & O'Shea, 2019). Fernando, Cohen, and Duberley (2018) suggest that little is known about how women engineers experience support, suggesting further work in this area will support women engineers' retention. Having a support system of engineers who can give advice and talk about what it means to be an engineer has also been shown to help retention in engineering (Hite, Greenhalgh-Spencer, & Insenga, 2021). This research will take a closer look at a subset of this population, where the women engineers are mothers and have varying familial obligations.

Employees Move into Lesser Roles or Out of Engineering

Some engineers who are mothers turn down promotions, which may or may not include more travel (Fouad, Chang, Wan, & Singh, 2017; Stone, 2007). Some struggle with societal norms of work expectations which date back to the days of a more traditional gender roles in family life with fathers who went out to work, and mothers who stayed home with the children (Meeussen, Veldman, & Van Laar, 2016).

Workplace and External Support

We will now consider how workplaces support or lack thereof impacts engineers who are mothers (Buse, Bilimoria, & Perelli, 2013; Buse & Bilimoria, 2014a, 2014b) First, this document will examine support and then the role of social networks.

Support

Support can come from a company, supervisor, group, friends, and many other places. For engineers who are mothers, having the necessary support system can be crucial to being able to balance the challenges of having a child along with the challenges of being a woman in engineering. We will focus on support from (1) the company, (2) women's networks, and (3) family and friends, including partners.

(1) While many countries worldwide have legislation to support generous maternity leave for employees, this is much more limited in the USA. The Family Medical Leave Act (FMLA) and Fair Labor Standards Act (FLSA), can help enforce companies and organizations in giving women appropriate accommodations when having a child (Murtagh & Moulton, 2011; Steurer, 2017). These laws do not cover all companies or locations in the US, and therefore only somewhat help with family accommodations within a place of work. For example states such as Louisiana (as of 2016) do not have a Sick Leave provision (Raabe & Theall, 2016).

(2) A key support for women engineers can include finding a network of women, such as the Facebook group in this study (Ambrose, Dunkle, Lazarus, Nair, & Ritter, 1997; Hooper, Schweiker, & Kerch, 2023). These groups are important because they provide necessary social and emotional support where they can discuss issues they are facing at work and the challenges of being a women engineer and mother (Schmitt, 2021).

(3) The role of a partner can be valuable for engineers who are mothers when pursuing career goals, by offering equal care of any children along with advice and support (Schmitt, 2021).

Role of Social Networks

Individuals may maintain social connections via social networking (Seabrook, Kern, & Rickard, 2016). Some studies consider the positive and negative aspects of their use. At the same time, this work focuses on staying in touch or developing relationships due to like interests and circumstances (Hurdle, 2001). Thus, providing a means to maintain social networks without travel or inconvenience of time is important.

Online social networking has more than 1 billion individuals interacting and sharing worldwide (Ahmad, Soroya, & Mahmood, 2023). More recent research found that different age groups use diverse social media platforms with teens focused more on YouTube, Instagram, and Snapchat and older age groups Facebook, Instagram, Twitter, and LinkedIn (Anderson & Jiang, 2018). Social networks provide a variety of different values to people, with online networks woven into many aspects of life,

both personal and professional. Personal examples abound, but there are also clear examples of online networking serving for career development, including the career development of women, as discussed in Donelan, Herman, Kear, & Kirkup (2009).

Social networks are available with varying platforms, levels of privacy, and at times sheer providence finding one that suits someone's needs. Considering current events and issues confronting society, there is a great deal of consideration when posting on social media (Spasojevic, Li, Rao, & Bhattacharyya, 2015). It is a pervasive part of modern culture. One of the more important considerations is community trust, essentially determining if a platform or place online is safe (Ayaburi & Treku, 2020; Hatmaker, 2013).

Sense of Community Trust

It takes time to establish trust with others we do not know – specifically those in an online or distant environment. Moser et al (2017) studies online sale groups for mothers. These groups were easy to access, and once members evidenced honesty and safety, they used these platforms to quickly and conveniently sell and buy various merchandise (Moser et al., 2017). According to the authors it took at least a year before that kind of trust was shared amongst members.

A variety of sources converge in their assertion that they found those studied in their project to be more trustworthy in a (1) closed group, when there are (2) administrators watching group discussion and content, and when the (3) group has an identity (Bapna, Gupta, Rice, & Sundararajan, 2017; Dayal, Landesberg, & Zeisser, 1999; Iyer, Cheng, Brown, & Wang, 2020; Moser, Resnick, & Schoenebeck, 2017; Tiidenberg, 2020).

(1) In the case of the EWM Facebook group, all these conditions are met. The participants and members of the group are part of a closed, private group. This means that no one can access discussions and lists of members outside of that group. In this case, these group members may discuss any number of topics and share solutions, ideas, and ways to approach dilemmas they would not otherwise share. While most studies have focused on trust within an economic situation (Bapna et al., 2017), the requirements of trust in a private space are similar where discussions are not shared outside of the group.

(2) There are specific guidelines that those joining the EWM Facebook group must agree to uphold or risk being muted or banned from the group. There are a team of members acting as administrators, ensuring that the guidelines are followed. Research shows that when guidelines are created, monitored, and adhered to, a level of trust is established between members and those in these groups (Tiidenberg, 2020).

(3) Members of the EWM group are mothers that work as engineers. This group identity assures that all the individuals who are members of this group are mothers and engineers, and thus it is assumed many of the life

experiences are similar (Iyer et al., 2020). This provides group members a means to trust the group and each other.

The sense of community in the social networking environment provides what can be missing for women and underrepresented minorities in the engineering workplace. If they do not feel part of the community, they are more inclined to search for alternative careers, move to another employer, or leave engineering altogether (Scott, 2020).

RESEARCH QUESTIONS

This study examines the effects of a social network platform on a specific group of members. The platform examined is Facebook's 'Engineering Working Moms,' (EWM) which consists of mothers who are engineers. The intention is to further our understanding of this group and perform a high-level review of this demographic and their needs, explicitly asking the following questions:

- *How are engineers who are also mothers finding a work-life balance?*
  - *Do engineers who are mothers have to limit activities because of their careers?*
  - *Does having a support system improve the happiness of engineers who are mothers?*
- *Are companies giving women engineers appropriate support throughout pregnancy and childbirth?*

METHODOLOGY

This study population includes anyone from the closed group on Facebook entitled 'Engineering Working Moms.' The members of this group are mothers that are engineers at any stage of life.

The Survey

The survey was based on questions asked by the group participants, the researchers, and in a variety of anecdotal situations. The final survey was written by the researcher team, who synthesized these sources into one final instrument for the research project. The survey questions can be found in Appendix A. These questions in various forms such as yes/no, Likert scale, and open-ended response were loaded into Qualtrics and a survey link created.

Administration of the Survey

The survey link was posted three times in the Facebook group over a period of two weeks. It was recognized that this group would have significant work-life balance constraints so posting it three times increased the opportunity to participate in the research.

Data Analysis

The research team's student member cleaned the data by removing incomplete responses, and then gathered demographic data. The quantitative data was analyzed using basic descriptive statistics, with the student member working under

the guidance of senior members of the team. The final question asked the participants what advice they would give about being an 'engineering Mom'. The responses were compiled to extract information about community and retention using a high-level examination, following the principles of Content Analysis methodology (Bernard, 1952; Krippendorff, 2012).

FINDINGS AND RESULTS

Demographics

The following data was collected and examined to understand these engineers and their families' general demographic. The age distribution, educational level, time gaps, and types of degrees earned are presented in this section.

The average age of the participants in this group was 39.4 years. Figure 1 shows the age distribution of the study participants.

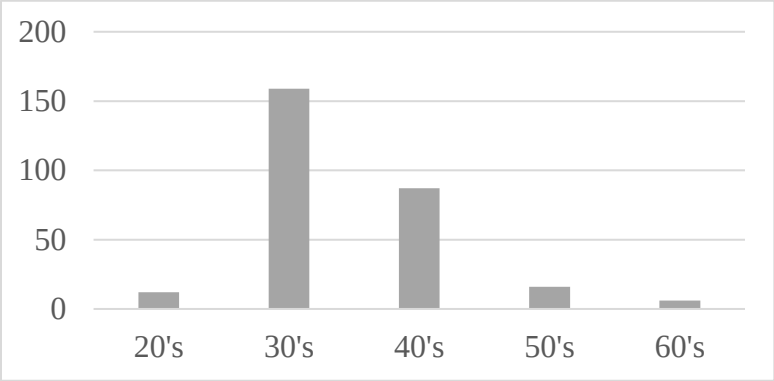

Figure 1. Study Participants – Age Distribution (n=280)

The survey also asked about their first degree to learn more about the study participants. Most survey participants pursued engineering degrees, while a few that pursued advanced engineering degrees did not list their first degree as engineering. As the data was cleaned for tabulation, 46 participants did not complete the information, leaving the total number of respondents for this question at 280. A few participants indicated their first degrees were masters or Ph.D.; those were not included in this table.

First Degree	
Associate of Arts	1
Associate of Science	1
Bachelor of Arts	4
Bachelor of Engineering	1
Bachelor of Science Engineering only	256
Bachelor of Science ALL	271

Table 1. Study Participants - First Degree Distribution (n=280)

Of the people who responded with their first degree, 157 of the 280 complete responses indicated a second degree. Figure 2 shows a summary of what was found.

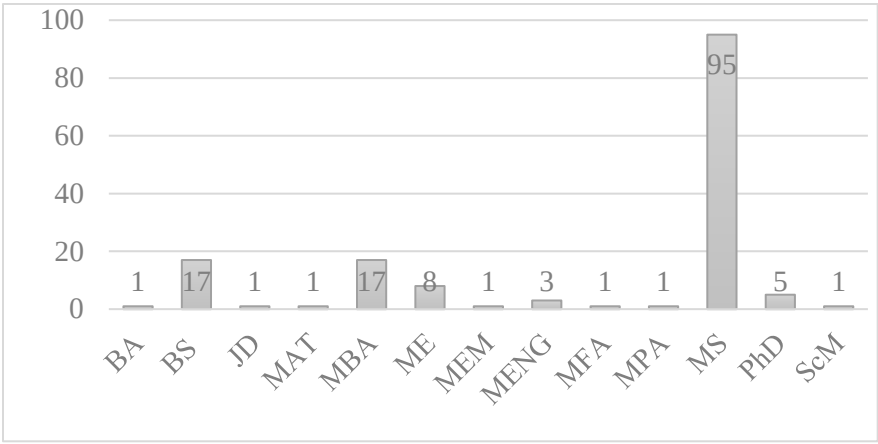

Figure 2. Study Participants – Second Degree Distribution (n=157)

The data shown in this table indicates that some of the respondents earned a second bachelor's degree. Most respondents indicated that they earned a master's degree, with most a Master of Science followed at a distance by those earning a Master of Business Administration.

The survey also inquired if those responding had earned a third-degree, and the results of those responses are shown in Figure 3 below.

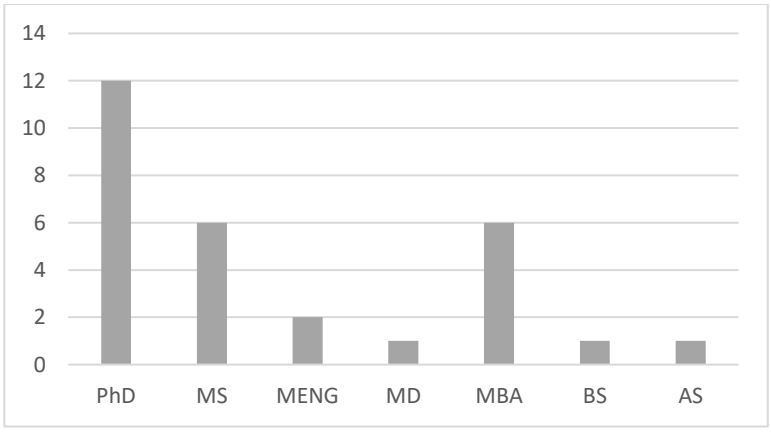

Figure 3. Study Participants – Third Degree Distribution (n=29)

The responses indicated that most third-degree earners completed a Ph.D., closely followed by Master of Science and Master of Business Administration degrees. One respondent earned an associate in a different field, others a bachelor’s degree in a different discipline, and one medical doctor's degree. Of the 280 original respondents, only 29 individuals (slightly over 10%) of these respondents completed the third degree.

Participants were additionally asked when they earned their degrees, and the time between degrees was reviewed. It was found that the average time between first and second degrees was six years, with 11 responses indicating the exact graduation date for first and second degrees. The average time between second and third degrees is 5.8 years, with two responses indicating a delay in obtaining the third degree after a second degree. It should be noted that the data indicates a rather large gap for 5 of the respondents between the second and third degrees. Four of the responses indicated between 10 and 15 years and one at 21 years. Other questions asked of the participants include the number of children they have. All 280 respondents with complete responses indicated the number of children they have. The average number of children is slightly more than 2. The frequency of distribution is shown below in Figure 4.

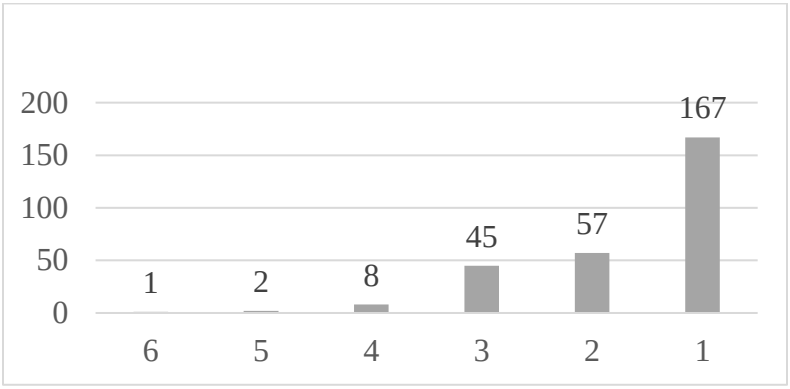

Figure 4. Study Participants – Number of Children (n=280)

In the case of the participant reporting six children, they note the ages of two children and, in other places, indicate they were counting a blended family, where two of the children were their biological children. In the participants reporting five children, they were ages 12-16 and 11-16 years. This indicates that they were born in quick succession with no other data provided. Respondents with four children included two sets of twins and one set of triplets, with no other information provided that could provide insight into that participant's situation.

Identified Issues

This section provides an insight into the issues that engineers who are mothers deal with and what they need to continue in their current employment as engineers. Further defining what these engineers need may be retained in their current positions or the long-term field.

Support Groups

The mothers were asked if they struggled to find a support group of other engineers who are mothers. These results show that of the 236 respondents to this question, 55% of the mothers struggle with finding support from other mothers. An additional 20% of mothers also indicated that they *might* struggle with finding a support group. Only 26% reported that they did not struggle to find a support group.

During Pregnancy
One question asked the mothers if their workplace was accommodating if they worked while pregnant. 242 women responded to this question. Most of the respondents (80%) indicated that they felt they had proper accommodations while pregnant in their workplace. About 5% of the respondents indicated that they felt they did not receive the proper support.

The participants were also asked what the climate was like among coworkers in the office while they were pregnant. Responses ranged from having a very supportive atmosphere and no issues to having judgmental coworkers. When sorting the responses, some of them were placed into multiple categories if there was mention of both supportive and judgmental coworkers. 9 of the responses mentioned that their coworkers also had families. Some of these responses can be seen below:

- 'Supportive - most of my team leaders have children, and many coworkers did as well, so everyone was understanding and happy for me'
- 'All men and most were parents and they were a bit patronizing and expected me to stay home'
- 'All supportive. Most of the men have children, so they at least were familiar with the concept.'

Additionally, 198 of the responses indicated in some way that their coworkers were supportive through their pregnancy. Some of these responses simply left it at 'Supportive' and did not elaborate. A few responses where they elaborated can be seen below:

- 'Supportive. Being pregnant didn't seem to alter the working relationship at all.'
- 'Mostly supportive. I was first pregnancy in our group for a long time and first for my manager. A male coworker had baby at same time and group was mostly young. They were supportive but we weren't close. No negative comments or reactions though.'
- 'My coworkers were very supportive! Only some have children and there hadn't been a pregnancy in the group for some time. They even threw me a shower!'

Although many indicated support from their coworkers, 47 of the responses also indicated that there was judgment from their coworkers. Of these responses, some simply said 'Judgmental' with no explanation. Of the elaborated comments, some responses indicated both good and bad experiences, whereas others only mentioned bad experiences. A few responses can be seen below:

- 'My male colleagues were assholes, one PM told me that there was still time to miscarry or abort because I told him early due to budget impacts. Another was super creepy and kept wanting to touch my stomach'

- ‘I experienced supportive and judgmental coworkers. I also had managers who voiced their assumption that i would not return to work after having my baby.’
- ‘mostly judgmental - they were all men with stay at home wives’

Planned Childbearing
One of the survey questions asked if their childbearing was planned if so, why. About 35% of the respondents provided an answer to this question. Some said there was no plan, others were concerned with maternal age, some waited for career to become established, and others were advising that career should have no impact on when to choose to have a child.

Another survey question asked how women having multiple children planned to space them out. Most of the responses seemed to relate more to personal reasons. A few cited waiting to take an exam or get past a milestone in work.

Maternity Leave
This question resulted in a wide variety of responses. Some left their job; others had some leave, little to no leave, and a generous leave plan. That appears to align with the size of the organization where the respondent works, i.e. Larger organizations generally have more leave than smaller organizations. However, smaller organizations appear to have more flexibility in time worked.

Lactation Room
The survey asked respondents if their company had lactations rooms. Of the 280 respondents, 257 answered this question. 69% of the population indicated that they did have access to such facilities, and 18% said no. An additional 13% said maybe.

Availability of Childcare
Respondents indicated that generally, childcare is not available at their company. Outside of the survey and in the additional response question at the end of the survey, participants indicated that having childcare at their or their spouse/partner's place of work would be a significant benefit. A few indicated that they would consider this to be a factor encouraging to them in staying with a company or moving to a new one.

Other ‘Engineering Moms’ in the Workplace
Respondents indicated that it would be helpful if there were other mothers (engineers and non-engineers) in the workplace. Some indicated that there were plenty, but they did not feel like they could relate to them. Others suggested that the online venue was safer because they can keep their thoughts and comments away from their workplace.

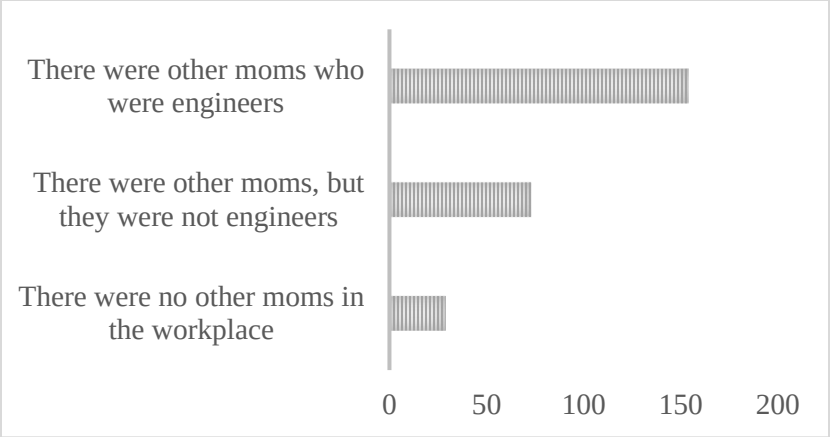

Figure 9. Other Engineering Mothers in Workplace (n=280)

Childbearing and Influence of Career on those Decisions
After sorting the responses and using a Content Analysis methodology (Neuendorf, 2016), most older respondents said their career impacted their childbearing decisions. Overall, regardless of age, respondents indicated whether they were or were not planning to have children; based on the information shared in the survey, there was no correlation to anything other than personal preference. Also, regardless of age, degree attainment and pursuing other goals have been impacted by the timing of childbearing and the demands of raising a family.

Return to Work After Having a Child
Of those responding to this question, few said they did not return to work. Those that said no had powerful statements about why they did. One stated that she wanted to be a stay-at-home mom, another indicated her ex-husband pushed her to stay home, another did not trust her childcare options. In a remarkably candid response to the question, she said, '… I decided not to return to a crappy manager who devalued me because I had children. I was also burnt out. I did try to negotiate a unpaid leave of absence but HR denied my request so I resigned.' This sentiment was shared outside of the survey as well as in other responses to this question.

Children Involvement in Activities Outside of School
After having a child, many women decided to put their child/ children into activities outside of school. Of the 195 participant respondents, 134 said that they put their children in activities while 61 said their children did not participate in after-school activities.

Mother Involvement in Activities Outside of Work
Respondents were also asked if they participated in any activities outside of work including volunteering. 232 participants responded to the question. Almost half of the respondents stated that they participate in volunteering activities while another 21 percent participate in another activity outside of work. The remaining 32 percent of the women do not participate in any additional activities.

Management of Commitments Outside of Work
The survey takers were asked how they manage their commitments outside of work with their careers in response to the questions about their activities and their children's activities. Many of the responses indicated that they used some sort of calendar or schedule to make sure that they stayed on track. Other responses indicated having a more flexible work schedule as seen below:

- 'Flexible work arrangements. I work from home on days that my commute would keep me from children activities. I might take off early and make up the time at some point later in the week.'
- 'Communication with my boss on needing to leave at a certain time. Making up working time as needed by either working through lunch or after hours'
- 'I've reduced hours to 32hrs per week so I can be present for the activities. Plus my job is very flexible with when you work, some days I work 10 hrs so that other days I can work 5-6 hrs.'

Other responses indicated that to manage commitments they had to limit their own activities or limit those of their children as seen by these responses:

- 'It is tough, but my work is flexible. We try to keep the schedules simple, 1 activity per child at a time.'
- 'I schedule the kid's activities after daycare is closed so I'm already picking them up anyway. We do one activity per kid.'
- 'Limit to 1 activity for me & 1 per season for children'

Additionally, some of the respondents have found that they do not manage their commitments with work well. Some of these responses can be seen below:

- 'Not well. Always scrambling to find out what can be flexed or who can be where.'
- 'I sacrifice sleep and sanity.'
- 'Sometimes I feel like I'm struggling in my career, sometimes I struggle at being a fabulous mother! It never feels like everything is on a high!'
- 'Stressed, rushing, eating on the go. Juggling between cars and parents'
- 'I feel like we do so much less than other families because we just don't have time'

Advice to Other 'Engineering Working Moms'
Respondents were asked to give any advice they want to share with other 'engineering working moms'. Answers included the need to be flexible, be willing to ask for help, build support from other women engineers. Some of the quotes captured from the survey follow:

- 'Communication is key. Whether it's with your partner, your boss, or other families that you can build a village with, keeping communication going makes a world of difference.'
- 'Be flexible and give yourself grace. Don't be afraid to ask for help.'

- 'Find your village and support system - this will help you in finding balance in your life.'
- 'The attrition rate of female engineers out of engineering is high. It can be a challenging field that is male dominated. Women offer a unique perspective to the engineering community. Find somewhere that appreciates the perspective you bring then embrace it!'

Others suggested that a good network of mentors and others influential in their lives, such as supervisors and spouses, is critical to success as a working mother in engineering. More quotes from the survey follow:

- 'Having a supportive supervisor, or competent HR, is very important. Knowing the laws on what you should be provided with (lactation room/breaks) is important. Know that you are never alone and that there are other women (moms) in engineering that are facing the same obstacles as you.'
- 'Have good mentors, a variety to give you perspectives and good sponsors.'
- 'Advocate for yourself. Support other women. Attend any women's organization meetings at your company and create a network. The mothers I met in the mothers room at work are some of my best friends now almost 4 years later.'

Furthermore, many of the respondents also emphasized the importance of finding a work-life balance that works for them. The following quotes are responses from the survey:

- 'Everyone is replaceable in the workplace but we can't go back and relive our baby's childhood. Set clear boundaries, establish realistic deadline goals within your working hours, and make a focused effort to create a work/life balance. When work gets demanding, find an opportunity to swing the pendulum back towards family for a few weeks to even it all out.'
- 'Think about how you want to prioritize. You may decide that you want to put your career on cruise control while your children are young. My desire to advance at work was reduced, and now I am happy making sure I have time for my family, but not chasing the next promotion. Be aware that your priorities may shift over time and that is okay.'
- 'You can have it all-you just need to lower your standards a little of what that means and accept that sometimes you will be killing it at work but not as a wife, or being the most present parent but not exercising as much as you want to. If you adjust the intensity levels a little bit you can be happier overall. Do what you need to do to balance out your life, don't worry what society thinks you should do.'

– 'You've got this. It is ok to be smart and a momma!!'

DISCUSSION

It is evident from this study that supporting mothers who are engineers is crucial for their happiness, work-life balance, and retention in the engineering profession.

Improving Work-Life Balance

Improving work-life balance is a crucial issue that affects everyone, but it has been a major topic of discussion when it comes to gender equality in the workplace. This is mainly because it is often viewed as a women's issue due to women's role in childbirth and childcare. In light of the increasing number of women engineers in the workforce, companies must offer the necessary support for pregnant engineers and those who have recently given birth. This support should include a range of services such as flexible working hours, extra time off, maternity leave, and the option to work from home.

It is unfortunate that many companies fail to provide the required support to women engineers throughout their pregnancy and childbirth, as indicated by the findings of this study. This lack of support needs to be addressed to ensure that women engineers have equal opportunities as their male counterparts. The question arises as to why such support is not provided. Companies may not provide the necessary support due to various reasons, including a lack of awareness about the needs of pregnant women, a lack of understanding of the legal requirements, and a lack of resources to provide the necessary support.

Ensuring that companies provide necessary support for pregnant women engineers can be achieved by taking several steps. Firstly, companies should have a comprehensive maternity leave policy in place that complies with legal requirements. Many countries outside the US, especially in Europe, have well-developed legal entitlements for maternity leave, which means that companies are obliged to offer much more extensive support. Secondly, managers should be trained to support pregnant engineers and those who have recently given birth. Finally, companies should ensure that resources are available to provide necessary support, such as flexible working hours, extra time off, and the ability to work from home. Engineers who are mothers can often work remotely, allowing them to balance their work and childcare more effectively.

Engineers who freelance have the advantage of flexibility in terms of when and where they work. This allows them to manage their work and family life with ease. As previously noted, Lewis & Humbert (2010) discovered that flexibility leads to higher job satisfaction, highlighting the significance of this aspect. By taking the necessary measures to provide this type of support, companies can ensure that they are creating an inclusive and supportive work environment for all engineers.

Are They Limiting Activities?

Do engineers who are mothers have to limit activities because of their careers? The findings of this study show that only a small number of mothers will limit their activities. Others will work hard to establish a support network, often called "a village." These villages may be broad, including neighbors, teachers, and friends in the neighbourhood, while others are more narrowly limited to family members who live nearby.

The support system that these engineers develop appears to improve their happiness. They often satisfy both their personal and technical professional goals. The statements that support this assertion include their ability to get more done and do fulfilling things.

Company Support Throughout Pregnancy and Childbirth
The participants indicated that some companies have programs and policies supporting mothers in ways they could not imagine. At the same time, others cut maternal leave to the shortest amount, which is only sometimes adequate if birth is complex or the child has medical or emotional issues. Many participants changed jobs or re-evaluated their situation and became stay-at-home parents. Based on these responses, it is clear that the varying policies have influenced the decisions made regarding the career paths of these study participants.

Balancing the needs of a career, family, and themselves is challenging. Some women in this group struggle to find this balance, especially with such demanding careers.

Flexibility within a company was one factor that assisted in this balance. Many women who work for companies willing to alter their work schedule seemed to find balancing activities outside of work with their careers easier. Some had decided to reduce their hours to have more time at home, work from home a few times a week, or alter their hours so they would go to work earlier but leave in time to pick up their children from school or daycare. Some would also leave work early to support their family activities, knowing they would have to work after their child went to bed to catch up. Having support from their company to have untraditional hours can be a huge advantage to these mothers who struggle to find time for themselves, their children, and their careers. Even with the flexibility of hours, some of the respondents found that they had to limit their or their children's activities outside of work and school to balance all their responsibilities.

For many mothers, finding a good balance includes limiting the activities they involve themselves in or involving their children outside of work and school. A few cited only allowing their children to be involved in one activity at a time to help ease some of the worries of time constraints. Additionally, many of the respondents enjoy volunteering and have the activities they participate in, and some explained that they find themselves limiting what they do or altogether stopping their activities. The best technique for a few was limiting the activities they involved themselves and their families in and keeping a calendar or planner to help organize the hectic schedules they had to keep.

Throughout all the responses to many different questions relating to organization or management of time, the use of some calendar or planner seemed to be what most women use to keep track of their family schedules. The consensus of most of the women was that having the system in place to keep track of everything helped them feel organized and have a better handle on everything they had to do. For the individuals, this small step could make the difference between feeling overwhelmed about all the tasks that need to get accomplished and feeling like they have a grasp

on what they must do and when. Although keeping a calendar seemed to help many, sometimes extra support is needed by others within their 'village' of people. Some women explained that they could not have the balance they do without the support of those within their circle. They thought it was interesting how many people referred to using their family to balance their work with their child's school or activities schedule. Many also included the need to set up a carpool with neighbors or friends who could help transport their children to and from school or activities. Other said that having a stay-at-home spouse or a spouse with a more flexible job immensely helped them juggle all the school, work, and personal tasks they needed to do, especially relating to the activities everyone needed to go to after school. In the end, everyone had a different way of gaining support from those around them, and few had similar means of achieving similar goals. It is hard to rely on family if none live nearby or friends if none of them have children. Furthermore, if both the parents' schedules are not flexible enough to accommodate different times, the mothers may have found they did not have the balance they desired. In the end, finding a community that can help support you is essential for balancing work and life.

Composition of Family Unit

The participants themselves drive this question. They wondered who was in the group, where they fit into the group, how many children each participant has, and what age. For the sake of developing trust and delving into questions that are more in-depth and understanding the needs of engineers in this group, learning more about the demographics supports the development of programs and available resources that support these women in the workplace.

In general, this population's average age is in the late 30s; children vary in age and indicate that most had or adopted their children after graduating with their last degree. Some engineers graduated with advanced degrees, some children born/adopted during degrees, and most after (Argys & Averett, 2022). However, a few fit the non-traditional definition of returning student (Dill & Henley, 1998) for advanced degrees when children were grown and generally out of college.

Support For Engineering Mothers from Within A Company

There are many ways a company can support mom engineers while pregnant, immediately after having a child, or when caring for their child (Andersen, Momsen, Pedersen, & Damkjær Maimburg, 2022). The needs of the women in a company will depend on their situation. Some of these include offering paid leave after the birth of a child, having a lactation room at work, and ensuring the people in management positions have a supportive attitude towards these women and their children' needs. As the children get older, the company can also show support by having child-care options, being flexible with scheduling, and creating an inclusive environment for those with children. For the pregnant engineers while working, some mentioned an environment where they felt judged by their team members, while others said they felt supported. This went along with the environment companies created. For some women, the lack of support would only be from their manager or boss, whereas for some women, it would be with their co-workers too. Creating an environment of acceptance can be important not only for the mental

well-being of the mom engineers but also for the retention of them within that company. It is essential to continue to support the mom engineers after they have had a child too.
One way of supporting mothers is to provide adequate time off to be at home with their children when they are new parents. FMLA does not cover every situation and can leave some women without guaranteed time off. Other women also complained that the time off given by FMLA was not enough. Adding to maternity leave can improve the mental well-being of the mom engineers because they can return when they are ready and have bonded more with their child. Not all women surveyed were also offered a lactation room after returning to work. A lactation room can help support women who need to pump by meeting their needs after childbirth. Beyond the maternity leave and lactation rooms, companies can support mom engineers by being flexible with their schedules.

Of this group of women, many conveyed the flexibility of the company they worked for to balance their family life with their work life. Some would talk about the advantage of setting their schedules. This could look like going in to work earlier and ending in time to be able to pick their children up from school and drive them to their activities. Others cited being able to leave work early and work more after their children went to bed. Some of them even opted to take fewer hours during the week and pay less so that they could do more with their children. Having the flexibility to make the best timing decision for their family dynamic is an excellent way to help the mom engineers balance the home and work life.

Professional Networks
One way to increase career satisfaction is to develop a robust professional network. This can include attending professional events and conferences, joining professional organizations, and leveraging online networking tools. A solid professional network can provide mentorship, support, and advice opportunities. Additionally, networking can give women engineers access to job and career advancement opportunities. Another way to increase career satisfaction is to focus on personal growth and development by taking on additional responsibilities, gaining new skills, and setting ambitious but realistic goals. Regularly assessing progress and reflecting on accomplishments can also be beneficial.

The social media platform provides such a venue and aids in further developing camaraderie between these women.The EWM Facebook group is perceived as a safe place where engineers who are mothers can ask questions and interact without bias or ridicule. This is different in other social forums, as illustrated by the comments from the survey respondents.

As previously stated, group membership is restricted to women that have children. There is no restriction on how they got the children, and this group identified various relationships – birth, stepparent, adopted, and foster. When examining the group members' demographics, the researchers found that the average age of ~39 years old and usually toddler age and old children align with the childbearing practices of women who have obtained a college degree. However, it is intersting that most group members have one child, some have two children, and few have

more than three children. While a few participants had more than three children, the study population had mixed families, and data indicated the potential for multiple births. The significance is that more children make dealing with a technical career and advancing one's education a more significant issue for a healthy work-life balance.

Some respondents stressed the need for a "village," indicating the reliance on family, friends, and others to maintain a successful work experience while parenting. Others stated that the social media platform where they felt safe was critical to their mental health. Examination of postings and responses to the survey questions found that the group members often begin a post with 'hello smart mama's,' or 'I need to ask a question,' or they jump into the discussion as if it had never left off.

All participants indicated the need for moral support on every level. They find the online network easy to access, safe, and a place to 'chat' with like-minded individuals. The older mothers' support, the younger ones, and the importance of others' support cannot be stressed enough. The online venue has one attribute that no other group has – it is a mixed group of like-minded individuals that are not co-workers, not family, neighbors, or others from various places in their lives. They perceive that the like-minded group is supportive, and they think alike and experience many of the same situations and personal encounters. The research questions ask how this group finds a work-life balance and if the companies they work for provide enough resources and support throughout their child-giving process.

Improving Retention

What can be done to improve the retention of women engineers that are also mothers? Our survey indicated that these women want support at work to make their home life easier or better. Some want daycare on-site or nearby; others want that and a means to pay for these services. Others indicate that home support may help; some have indicated that the employer's negotiation for preferred rates with Care.com, a platform that connects families with local caregivers who have been through a screening process including background checks, or the like would be most helpful. Each person is unique, as are their needs and the aides or help that will make their lives easier. This study shows that retention may be increased through these additional support modes. Referring to Schmidt (2021) suggests that these measures may help women move into leadership roles by providing the social support that allows them to do so.

CONCLUSION

The researchers set out to understand more about engineers who are mothers, their work-life balance, and the support they receive from the companies they work for. To do this, they analyzed the results of a survey sent to the Facebook group 'Engineering Working Moms.' This survey included questions related to their degrees, family dynamic, and work-life balance. From these responses, it was found that the average age of the respondents was 40 and that they averaged slightly above two children. Most of the women felt supported throughout their pregnancy

and childbirth, although some commented on judgmental attitudes from their bosses and co-workers. The amount of time off they received aligns with the company's size. After having the child, most women were not offered childcare by their place of employment. Some women commented on limiting the number of activities they involved themselves and their children in outside of working hours. There were also comments about their job's flexibility, allowing them to take their children to their activities and spend more time with their families. Some women felt like they had a good balance between their families and work, while others felt they had no balance and needed more help. Many women had support outside of their work, such as local friends and family members, to help them get everything done.

Good work-life balance looks different for every person. Some of the engineers found that limiting the activities involved for themselves and their children was their best option. Others kept a tight schedule in their planner and calendar to fit everything in. Many of them also had to use friends, family, and neighbors to help each other schedule activities such as carpooling and babysitting their children when they needed additional help. Additionally, having a flexible job or a spouse who had a flexible job helped significantly in their efforts to get everything done.

Company flexibility could increase the overall balance between their work life and family life for women engineers who are mothers. Offering more flexible hours, such as starting earlier and ending earlier, allowing people to leave work early to take care of their children and work later into the night, and offering reduced hours can all be options that support the careers of women engineers. Furthermore, giving guaranteed maternity leave and offering more maternity leave than statutory entitlement gives mothers adequate time to return to work when ready and more time to bond with their child. Also, working to improve the environment and attitude within the company helps not only with the mental well-being of the mothers but also with the retention of these engineers within the company.

FUTURE WORK

From a research perspective, further studies could look at the role of other social media platforms to understand their potential for supporting women engineers who are mothers. Engaging employers with social media campaigns could also support ongoing efforts to attract and further retain experienced female and minority engineers in the workforce.

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APPENDIX A: Engineering Working Moms Survey

1. Age

2. Degree
    a. First Degree Type
    b. Year Degree was Earned
    c. Second Degree Type
    d. Year Second Degree Earned
    e. Third Degree Type
    f. Year Third Degree Earned

3. Number of children and their ages
    a. Number of Children
    b. Age (Oldest, if applicable)
    c. Age (Second oldest, if applicable)
    d. Age (Third oldest, if applicable)
    e. Age (Fourth oldest, if applicable)
    f. Age (Fifth oldest, if applicable)
    g. Age (Sixth oldest, if applicable)

4. Is your children's father(s) also an engineer or other STEM major? (If more than one father – indicate if at least one is an engineer or other STEM major.)

5. Did you work while you were pregnant?

6. Is your workplace male-dominated?

7. What is your role in your workplace? How long have you been in this role?

8. Is your role in your workplace a leadership role?

9. What role were you in while you were pregnant?

10. If you planned the timing of your child, how did your career influence your decision? When is the best time to have a child?

11. Was your workplace accommodating while you were pregnant if you were working while you were pregnant?

12. What sorts of maternity/paternity leave does your company offer?

13. Does your company offer a lactation room and breaks for lactation?

14. Does your company offer childcare on-site?

15. What was the climate like among your coworkers while you were pregnant? Were they judgmental? Supportive?

16. Were there other moms in the workplace? Were these other moms' engineers?

17. Are there dads in your workplace? What is their attitude towards parenting?

18. What advice would you give other STEM women who are pregnant in the workplace?

19. Did you always plan to have children? Did engineering influence your decision to have children?

20. Did you return to work after having your child?

21. If not, what were your reasons for not returning?

22. If you have multiple children, how did you plan to space them out?

23. What kinds of games/toys do you offer your children?

24. Do you feel engineering influences how you parent? If so, how does it?

25. Do you plan to encourage your child(ren) to pursue a career in STEM? Engineering specifically?

26. Do you plan to, or did you, enroll your children in preschool?

27. How much of the childcare process does their father participate in? If more than one father – include information in responses at the end of the survey.

28. Is it hard to find other moms who are engineers to form support groups with?

29. How do you manage the demands of parenting while working as an engineer? Are there systems you use?

30. Does your children's father(s) work? Does he/they work at the same company as you?

31. Explain if your children have multiple fathers - do they work. If your children have the same father ignore this question.

32. If your children's father(s) works at the same company as you, has this created any problems?

33. Explain if your children have multiple fathers - do they work at the same company? If your children have the same father ignore this question.

34. How do you manage childcare if you are working? Who watches the children while you're at work? How do you manage childcare if you are working? Who watches the children while you're at work? How much does childcare cost you monthly?

35. Do you participate in any activities outside of work? Do you volunteer?

36. If you have school-age children, do your children participate in any after-school activities?

37. How do you balance those commitments with your career?

38. Please share any advice you have for other women in engineering. Especially advice directed at those who are, or may wish to become, moms.

39. Do you have any regrets related to engineering or parenting? Please share.

40. Did you face any adversities in your workplace, from your family and friends, or from elsewhere while you were pregnant? Did you feel pressured to have a child?

41. Is there anything you wish to share with the researchers that wasn't covered in the questions above?