

Gender Diversity in STEM – What is the Best Approach?

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[Abstract] Despite 80 years of women in the workforce, lack of gender diversity continues to be an issue. Specifically, STEM corporations are not improving gender diversity as effectively as non-STEM corporations resulting in fewer women initially hired and an underrepresentation of female managers in STEM corporations. This Delphi study was designed to gain a consensus of opinion from a panel of experts from STEM corporations on strategies to improve gender diversity and increase representation of female managers. Hiring managers at STEM corporations can use the findings of this study to improve the gender diversity of their future workforce.

[Keywords] gender equity, women in STEM, retention of women, recruitment of women

Introduction

STEM corporations are not improving their gender diversity as effectively as non-STEM corporations resulting in fewer women initially hired and an underrepresentation of female managers in STEM corporations (Burns et al., 2021; Thomas et al., 2017). The percent of entry level women hired in STEM corporations went from 26% in 2017 (Thomas et al., 2017) up to 33% in 2024 (Thomas et al., 2024). While recent improvement is shown, the current representation does not match the nearly 50% of women in United States workforce (U.S. BLS, 2025). Gender diversity is included as a company goal for most companies (Burns et al., 2021). Additionally, the CEO of Dow, Jim Fitterling, stated companies need to go beyond the goals and take real action (Reiss, 2021). There are many possible factors contributing to the gender diversity problem, among which are gender discrimination in the workplace, lack of support raising a family, and discrimination during the hiring process.

Fewer female employees are hired in STEM corporations than their male counterparts (Burns et al., 2021) and most management roles are filled by hiring from within STEM industries (Ng & Stuart, 2022). The combination of fewer female hires and hiring from within leads to less female participation in management roles (Burns et al., 2021). The disproportionate number of women working in STEM fields impacts both the women looking to be hired and the potential productivity of the corporations (Burns et al., 2021; Safiullah et al., 2022). A more diverse management team leads to greater productivity and less diverse teams have limited productivity (Safiullah et al., 2022). Seierstad et al. (2021) stated Norway understands the importance of women in senior positions and has established regulations to help increase gender diversity in management.

This Delphi study was designed to gain a consensus of opinion from a panel of experts from STEM corporations on strategies to improve their gender diversity and increase representation of female managers (Burns et al., 2021; Thomas et al., 2017). The identified strategies are a steppingstone towards greater representation of women in STEM corporations and may help to increase the number of candidates eligible for internal management promotions (Burns et al., 2021; Thomas et al., 2017). The study was qualitative in nature to allow study participants a greater degree of latitude to share their expert opinions in the area of improved gender diversity

(Taherdoost, 2022). The population was 32 human resource managers and hiring managers involved in the hiring process within several STEM corporations in the United States. The participants took part in iterative questionnaires to gather the consensus of opinion (Mwita, 2022) and the following research question guided this study:

What is the consensus of opinion from a panel of experts on strategies to increase gender diversity in STEM corporations?

Leaders often look for an edge to increase productivity and will investigate the impact of improvement methods ranging from company exercise programs to social media usage in the workplace. While neither exercise programs nor social media usage is proven to increase productivity, Safiullah et al. (2022) learned that employing a gender diverse team does increase overall productivity. One of the contributions from having women on a team is the different perspective they bring which could lead to more innovative results (Safiullah et al., 2022).

The topic of gender diversity best practices of STEM corporations successful with gender diverse recruiting, hiring, and retention was the focus of the study. The results may supplement the numerous studies on the topic of gender diversity including the sectors of health care, financial planning, and law. Robinson and O'Hanlon (2020) found that 16 percent of the United States Military is made up of women and is the highest historical percentage on record. The ratio of several men for each woman is mirrored by STEM corporations where women hold 33 percent of the positions (Thomas et al., 2024).

This study brings a unique perspective in understanding the best practices used by corporations to promote gender diversity in the United States. This study contributes to the body of knowledge of gender diversity by providing an understanding of what actions are necessary to achieve an improved level of gender diversity. The study results coupled with other studies in the field (Burns et al., 2021) provide managers with best practices needed to make changes to the hiring, retention, and promotion of women resulting in an increased percentage of women employed at STEM corporations. Follow-on studies could explore best practices used by STEM corporation in large technology centers such as New York City, San Francisco, or Chicago.

Literature Review

Gender diversity has historically meant having representation from both men and women in a group. The gender diversity definition has departed from the binary categories and has shifted to include people who are transgender, non-binary, and other gender classifications not falling into the cisgender norms. For the purposes of this study, the focus was on the gender diversity specifically found between men and women.

Women have historically, and continue to be, underrepresented in jobs within the STEM sector (Jiang, 2021). The cause of the underrepresentation is a debated topic, but some claim the small percentage of women in STEM majors is partly to blame (Jiang, 2021). One of the factors limiting the number of female STEM majors is the gender of a woman's school advisor (Koch et al., 2022). Women with a male advisor are less likely to select a STEM major. Koch et al. (2022) discovered that women in STEM majors were treated less favorably by peers and professors. The unfavorable treatment led to more women experiencing burnout and resulted in a larger percentage of women changing to a non-STEM major than their male classmates (Koch et al., 2022). Compounding the issue of fewer women graduating with degrees in STEM majors, women are less likely to pursue an occupation in a STEM career than men (Jiang, 2021).

Women encounter numerous barriers as they progress through academia and move into STEM careers. While some of the barriers might only be perceived by women, most barriers are present at every step of the journey (O'Connell & McKinnon, 2021). One of the barriers found in some STEM organizations is the existence of different expectations of a woman's performance versus a man's performance of the same job (Salin, 2021). O'Connell and McKinnon (2021) stated women in STEM feel like they must work twice as hard as their male coworkers to be perceived as doing the same quality work.

Another barrier faced by women is a lack of confidence which is often based on the influences of gender stereotypes perpetuated throughout their academic and professional lives. The self-limiting behavior caused by the lack of confidence is part of the glass ceiling theory (Salin, 2021). In addition to the glass ceiling theory, women face the combination of being outnumbered by their male colleagues and stereotypically not belonging within a STEM field (Stewart-Williams & Halsey, 2021). In the minority of situations where women withstand the barriers against them, they are still paid less than men for doing the same job as described by the gender wage gap.

Imposter phenomenon, or imposter syndrome, is most often experienced by highly trained individuals who doubt their own abilities (Huecker et al., 2023). Women tend to experience imposter phenomenon more often than men, but it can impact anyone who feels they are not qualified for the job they are filling or assignment they are given (Huecker et al., 2023; Shanafelt et al., 2022). Those who experience imposter phenomenon tend to exhibit similar symptoms and use similar coping mechanisms to deal with the situation (Shanafelt et al., 2022).

The theories that framed this study were role congruity theory, Herzberg's two-factor theory, Bem's gender schema theory, and Bandura's social cognition theory. Role congruity theory can impact the way a hiring manager perceives female applicants which puts women at a disadvantage during the hiring process (Eagly & Karau, 2002). Herzberg's two-factor theory describes how different factors of an employee's job can lead to satisfaction or dissatisfaction in the workplace (Silbernagel-Krohne & Moser, 2023). Key elements of dissatisfaction could lead to women leaving the STEM industry. Gender schema theory explains how individuals learn gender traits at a young age (Bem, 1981). The traits women learn as children could deter them from entering a STEM field. Social cognitive theory describes how individuals learn by watching others (Bandura, 1977). Watching failed attempts by women to enter the STEM field could lead to other women avoiding the STEM field in hopes of finding better success.

Methodology

This qualitative Delphi study was structured to gain a consensus of opinion from a panel of experts from STEM corporations on strategies to increase gender diversity in STEM corporations. The exploratory nature of the Delphi technique aligned well with a qualitative research method (Taherdoost, 2022). The data collection method was an initial, open-ended questionnaire followed by a series of several questionnaires to gain a consensus of opinion (Mwita, 2022). The Delphi technique employs three rounds of questionnaires building upon the answers from the previous round (Mwita, 2022). The iterative approach of the Delphi technique helps to reach a consensus of opinion from the participants.

Digital questionnaires were employed with a snowball sampling method which allowed the pool of potential participants to expand beyond those individuals initially contacted (Beiderbeck et al., 2021). Caution was taken to ensure all participants meet the sampling criteria and were within the defined population. The study questionnaires were collected via email and saved in a secure location to maintain participant's anonymity. After the first round of questionnaire results were received, the next round of questionnaires was created based on the initial input. Following

the implementation of the iterative questionnaires, the results were compiled to determine the consensus of opinion from the experts to answer the research question.

The defined population for this study was human resource managers and hiring managers at STEM corporations in the United States. Individuals in these two roles are experts in the company's hiring practices with knowledge of the efforts taken to specifically recruit and hire women. Within the stated population, the sample size used was a group of 32 selected human resource managers and hiring managers who have been employed for at least one year at STEM corporations. The sample size of 32 individuals was sufficient to ensure data saturation for this study. Mwita (2022) suggested sample size is a significant factor influencing data saturation. Eligibility criteria for participation in the study included minimally one year employment within the company and experience with the company's hiring policy and procedures.

Instrumentation

This study used the qualitative Delphi technique to collect the data required. The Delphi technique consisted of multiple rounds of questionnaires to gain a consensus of opinion from a panel of experts (Beiderbeck et al., 2021). Prior to the three rounds, a field test was conducted to ensure the research problem and research question were aligned and unbiased. The first round consisted of open-ended questions and was provided for the participants via SurveyMonkey. The questions used in the Round 1 questionnaire were aligned with this study's research question as shown in Table 1. After the receipt of the Round 1 questionnaire answers, the Round 2 questions were created based on Round 1 response analysis.

Table 1

Research Question and Round 1 Question Alignment

Research Question	Round 1 Questions
RQ: What is the consensus of opinion from a panel of experts on strategies to increase gender diversity in STEM corporations?	Q1: Do you see a lack of gender diversity in your STEM corporation? If so, are there goals in place to increase gender diversity? Q2: What are the best strategies to increase gender diversity in STEM corporations? Q3: What barriers have you observed that have limited gender diversity in STEM corporations? Q4: What successful strategies has your corporation implemented to increase gender diversity. Q5: What successful strategies have you observed which would increase gender diversity in STEM corporations? Q6: Have there been any strategies you have observed that have not been successful in attempting to increase gender diversity in STEM corporations? If so, please explain. Q7: What can hiring managers do to increase the gender diversity in STEM corporations?

Round 2 was provided to the participants as an online questionnaire using a five-point Likert scale via SurveyMonkey (Table 2). The participants were also given the opportunity to share their thoughts about the rated opinions through open-ended questions. Rounds 2 and 3 were based on the previous round's responses and each round continued to refine the understanding of the consensus of opinion. Round 3 was conducted using a five-point Likert scale and the SurveyMonkey online survey platform (Table 3). Once a consensus of opinion was established, the iterative rounds were ended, and final data analysis commenced.

Table 2

Round 2 Questions

Round 2 Questions
For the following set of questions, please rate how much you agree with the identified approach for increasing gender diversity in STEM corporations. The rating scale has options of strongly agree, agree, neutral, disagree, and strongly disagree. 1. Educate hiring teams on the existence of gender bias and how to avoid it. 2. Implement gender diversity training for all employees. 3. Maintain fair compensation practices. 4. Introduce equitable policies for all genders. 5. Investigate recruitment process. 6. Learn from exit interviews. 7. Provide flexible workspace. 8. Implement mentorship programs. 9. Make job postings more inclusive to attract a gender diverse applicant pool. 10. Maintain transparency regarding diversity initiatives. 11. Follow fair promotion practices. 12. Submit to equality audits by an outside service to ensure equality. 13. Encourage a diverse corporate culture. 14. Advertise job opportunities in more equitable locations.

Table 3*Round 3 Questions*

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Trustworthiness within a qualitative study is measured by the credibility and transferability of the study. Inherent bias within a study can minimize the credibility of the conclusions resulting from the study. The answers received for each round of this study were provided to each panelist to verify the interpretation of the answers by the researcher. Credibility was reinforced by ensuring each of the panelists aligned with the inclusion criteria.

Transferability within a qualitative study is how well a study can be replicated by another researcher in a similar study. To increase transferability, the researcher described each aspect of the research process and the setting within which this study was performed. Singh et al. (2021) described how focus should be placed on the features of the study which can be commonly replicated for future researchers. Having a detailed description of the population and sample for this study also assists future researchers understand what attributes differ and which attributes are transferable. Increased transferability and credibility within this study will lead to better trustworthiness.

Data Collection and Analysis

Data collection using the Delphi technique was comprised of three rounds of iterative questionnaires which are answered by each of the qualified participants. This study started with a recruitment process to engage enough participants for the study. Each of the participants was given a series of open-ended questions during Round 1. Round 1 also included demographic questions for the purpose of classification of participants. Based on the answers to the Round 1 questions, subsequent rounds were conducted to come to a consensus of opinion from the combined knowledge and experience of the participants.

The first round of this study was initiated by sending an informed consent form along with a SurveyMonkey link to the Round 1 questionnaire. The Round 1 questionnaire consisted of demographic questions as well as a series of open-ended questions. Participants were encouraged to share their expertise while answering the questions since the Round 1 answers were the basis of information used for subsequent rounds. The participants were asked to answer the questionnaire within a one-week period so that the time between rounds was not stretched to the point that participants lost interest. Attrition of participants was one of the risks associated with the multiple rounds in a Delphi study.

Starting with the answers from Round 1, the researcher created a series of questions for Round 2. The intent of Round 2 was to gather the thoughts of the experts and move closer to a consensus (Mwita, 2022). The questions for Round 2 were presented in a five-point Likert scale format to gain an understanding of each participant's agreement with each question. The ratings for the Likert scale included strongly agree, agree, neutral, disagree, and strongly disagree. Based on the ratings from the Round 2 questions, the third round of questions were created. The questions in Round 3 consisted of a series of five-point Likert scale ratings for the participants to answer. Once the results from Round 3 were received, it was determined that a consensus of opinion from the experts had been achieved. Data was analyzed using NVivo coding software to identify the themes which were most mentioned by the participants.

This Delphi study was limited by participation response time during the first round. The initial plan for each round of this Delphi study was to provide one week for participation responses. Following the first week of Round 1 responses, only 12 participants had expressed interest in the study, which was not sufficient for the purposes of this study. Due to the lack of participants, the questionnaire window was extended for the first round to be a total of two weeks. Following the second week, an additional 25 participants responded to the Round 1 questionnaire and the round was closed. Rounds two and three of this Delphi study were kept open for a one-week period because adequate participation was received with minimal attrition.

Results

The initial round of this Delphi study began with a series of open-ended questions for the participants to share their experience, thoughts, and opinions. Table 4 shows the main ideas and their frequency for the Round 1 interview questions related to the Research Question. Out of the 14 main ideas coded, educating hiring teams, implementing mentoring programs, and following fair promotion practices were found to be mentioned most frequently by the participants. The number of participants included in each round decreased slightly due to no response given for either Round 2 or 3. A total of 37 participants provided input for Round 1. For Round 2, four participants did not provide any input, so the remaining 33 participants were included. One more participant was non-responsive during Round 3 which resulted in the 32 participants incorporated in the overall study.

Table 4

Round 1 Alignment and Frequency

Research Question	Main Idea	Frequency
What is the consensus of opinion from a panel of experts on strategies to increase gender diversity in STEM corporations?	- Implement mentorship programs	24
	- Educate hiring teams on the existence of gender bias and how to avoid it	20
	- Follow fair promotion practices	20
	- Encourage a diverse corporate culture	17
	- Maintain fair compensation practices	11
	- Learn from exit interviews	10

- Implement gender diversity training for all employees	8
- Investigate recruitment process	8
- Maintain transparency regarding diversity initiatives	8
- Make job postings more inclusive to attract a gender diverse applicant pool	6
- Submit to equality audits by an outside service to ensure equality	6
- Advertise job opportunities in more equitable locations	4
- Provide flexible workspace	3
- Introduce equitable policies for all genders	2

The results from Round 1 were used to create the Round 2 questionnaire. For the purposes of this study, consensus was defined as greater than 70% of the participants agreeing with a given statement. Using the Likert scale, each optional response was assigned a corresponding number. Strongly agree (5), agree (4), neutral (3), disagree (2), and strongly disagree (1) were used for the consensus determination. Table 5 shows the degree of consensus for each of the Round 2 questionnaire main ideas. The most consensus was found on the topics of educating a hiring team and encouraging a diverse corporate culture.

Table 5
Round 2 Consensus Results

Main Idea	Consensus
- Encourage a diverse corporate culture	86%
- Educate hiring teams on the existence of gender bias and how to avoid it	82%
- Follow fair promotion practices	77%
- Implement mentorship programs	76%
- Investigate recruitment process	71%
- Maintain transparency regarding diversity initiatives	71%
- Submit to equality audits by an outside service to ensure equality	70%
- Learn from exit interviews	64%
- Maintain fair compensation practices	57%
- Provide flexible workspace	55%
- Implement gender diversity training for all employees	53%
- Make job postings more inclusive to attract a gender diverse applicant pool	49%
- Advertise job opportunities in more equitable locations	40%
- Introduce equitable policies for all genders	38%

Taking the consensus results from Round 2, the Round 3 questionnaire was created to determine the consensus of opinion. Table 6 shows the main ideas which showed the largest

consensus in Round 2 and the degree of consensus found during Round 3. Based on the results, implementing mentorship programs and encouraging a diverse corporate culture were shown to have the highest level of consensus and were chosen as two of the main themes of this study.

Table 6

Round 3 Consensus Results

Main Idea	Consensus
- Implement mentorship programs	88%
- Encourage a diverse corporate culture	86%
- Educate hiring teams on the existence of gender bias and how to avoid it	81%
- Follow fair promotion practices	77%
- Submit to equality audits by an outside service to ensure equality	74%
- Investigate recruitment process	73%
- Maintain transparency regarding diversity initiatives	71%

With a consensus of 88% associated with the Research Question, the first theme identified from the data analysis of this Delphi study was implementing mentorship programs with a focus on gender-diverse mentors. Participants expressed that having someone to talk to is an important aspect of retention for women working in STEM organizations. P7 shared, “Having someone like you to look up to makes success seem possible.” Participants shared how female mentors can guide female new hires to navigate unique situations which men might not face. P23 said, “Mentors can help work through the politics of corporate employment” and P9 suggested, “Mentorship programs help retain talented individuals who might otherwise quit from burnout.” Mentors are especially important when women often find themselves working in a group with all men. Participants agreed that implementing a mentorship program is an important strategy to increase gender diversity in STEM corporations. P24 added, “Networking is an added benefit of a mentorship program.” Implementing a mentorship program had an 88% consensus with 13 participants strongly agreeing and 19 participants agreeing with the strategy. According to all participants of this Delphi study, implementing a mentorship program is a good strategy to help increase gender diversity in STEM corporations.

With a consensus of 86% associated with the Research Question, the second theme identified from the data analysis of this Delphi study was encouraging a diverse corporate culture within STEM organizations. Participants explained how a diverse corporate culture provides an atmosphere where the diversity of employees’ gender is appreciated and often celebrated. P3 shared, “When [women] are supported, more collaboration can happen.” Participants added that recognition of both women and men can help to minimize gender discrimination during group projects, promotion considerations, and career-building opportunities within the organization. P12 said, “True gender diversity only works if management supports it” and P17 explained, “When given the chance, women can show men alternate methods of solving problems.” Even when an organization has a disproportionate number of men versus women employed, how the company handles the culture can make a big difference. P28 said, “The stress of not belonging can be debilitating. Removing this stress will help retention.”

Participants agreed that an important strategy to increase gender diversity in STEM corporations was to encourage a diverse corporate culture. Encouraging a diverse corporate culture had an 86% consensus with 10 participants strongly agreeing and 22 participants agreeing with the strategy. All participants felt that encouraging a diverse corporate culture is a good strategy to help increase gender diversity in STEM corporations.

Conclusion

The first theme derived from this study was the importance of implementing a mentorship program as a strategy to increase gender diversity in STEM corporations. Guevara-Ramirez et al. (2022) shared how women are empowered by encouraging one another and mentorship can facilitate this empowerment. Stelter et al. (2021) explained how mentorships are especially important within STEM corporations because the mentors can help generate interest and excitement in STEM topics and careers. Mentors can also take on the role of an advocate for their mentee as they navigate the political spectrum of a STEM corporation (Hansen, 2020). Beck et al. (2022) outlined how women often feel isolated within a STEM corporation and having a mentor can help to establish connections which are vital for long-term success. Mentors can also prevent women from feeling imposter phenomenon based on their feelings of isolation (Shanafelt et al., 2022). In some STEM corporations, there is such a low number of women currently employed that women might have to look outside their current organization to find a suitable mentor (Beck et al., 2022). Another alternative is to recruit male allies who understand the difficult situation women are placed in when joining a STEM corporation.

The study results were consistent with the current research on the topic of mentorship programs. Study participants all agreed or strongly agreed that implementing a mentorship program was an effective strategy to increase gender diversity in STEM corporations. Several participants mentioned the importance of a formal mentorship program which matches mentors and mentees for a specified amount of time. Beck et al. (2022) agreed and explained how this formalized approach was found to be more effective than programs where mentor assignment is left to individuals. Aligned with what Hansen (2020) shared, some participants also mentioned the importance of mentors when dealing with advancement and promotions within a STEM corporation. Guevara-Ramirez et al. (2022) and study participants were consistent with their thoughts about how important it is for women to have female mentors to guide them through the unique challenges men might not be aware of.

As the second theme, the study participants all agreed or strongly agreed that encouraging a diverse corporate culture was an effective strategy to increase gender diversity in STEM corporations. Griffen et al. (2021) explained how a gender diverse board is an effective steppingstone towards generating a corporate culture of diversity. Study participants also mentioned how a diverse corporate culture is only possible if it is supported by the leadership of the corporation. When women are included in senior leadership or corporate boards, studies have found there to be more cohesiveness and results in overall increased performance for the company (Shukla & Pandey, 2022). The chance of increased performance has led some STEM corporations to shift their focus towards recruiting more women into their male-dominated roles.

In contrast to what study participants shared, Mather et al. (2021) explained how the inclusion of women on corporate boards could lead to more cautious actions and ultimately result in lost opportunities. The caution stems from the unwillingness to potentially overcommit which could result in failure (Mather et al., 2021). While avoiding failure helps to keep the company away from lost revenue, the risk of adversity can limit the potential future growth of the

organization. Mather et al. (2021) explained how women tend to require a higher chance of potential success than men prior to committing towards an action.

The findings from this Delphi study could provide leaders and practitioners with new strategies to implement within their STEM organizations to address the issues of gender diversity and female manager representation. This study resulted in two main themes which experts agreed were the main areas to focus on to effect change in an organization. The two themes which aligned with strategies to increase gender diversity in STEM corporations were the implementation of mentorship programs and encouragement of a diverse corporate culture. According to this study, STEM leaders following these themes are more likely to create a gender diverse workforce in the future.

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