Approaches Nonprofit Organizations Use to Engage Women in Engineering

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ABSTRACT

The engineering field has one of the lowest rates of female employment. In order to promote women in the field of engineering, many nonprofit organizations have formed with the purpose of increasing female engineers and retaining women already working in the field. The current study explores the approaches nonprofit organizations that promote female engineers use to engage women through semi-structured interviews with representatives and a content analysis of their websites. Findings revealed six major themes: their mission, portrayal of engineering, harassment in the workplace, female role models, community, and member demographic. With the exploration of these themes, it was found that each organization was built on a basis of belonging with each of these themes tying to the idea of allowing women to feel as though they have a place in the engineering field. Each organization had their own unique strategies in order to achieve this goal of "fueling belonging". Future research should increase the sample size to include more organizations to further identify the approaches these nonprofits use and work in increase the employment of female engineers.

Introduction

Women have progressed immensely since their initial introduction to the workforce in the early 20th century. World War I marked the first strategies used to increase female employment to fill the positions left by the men fighting overseas (Ramachandran, Ramanathan, & Khabou, 2020). These approaches were immediately halted upon the soldiers' return, which marked a tradition that would persist to modern day: the trivialization of female employment. The misogyny towards women led to the creation of the first organization promoting women in engineering, the Women's Engineering Society (Domenico & Jones, 2006). Despite the increasing amount of women in the workplace from WWI to now, the gender gap in engineering is a persisting issue. Only 16.5% of employed engineers are women. This discrepancy exists across all types of engineering, displaying the severity of the issue (Bureau of Labor Statistics, 2020). Diversity of thought thrives as new women enter engineering, bringing their own unique traits and experiences to this male-dominated field. Diversity of thought also allows for new problem-solving approaches, knowledge, and innovation (Post, De Lia, DiTomaso, Tirpak, & Borwankar, 2009). Organizations, such as the original Women's Engineering Society, have formed to reach gender parity in engineering. To truly have a society that fosters innovation, a closer look at organizations that have been at the forefront of engaging women in engineering must be taken.

Literature Review

Foundations in K-12 Education

One's introduction to engineering typically occurs during their K-12 education. In 41 states' academic guidelines, engineering skills were found to be included. The knowledge taught was not uniform, and many guidelines were not explicitly regarding engineering, giving rise to the gender gap in the field (Carr, Bennett, & Strobel, 2012). Schools centered around science, technology, engineering, and math (STEM) reportedly decrease the gender gap by 25%; exposure to engineering in early education is vital to reach gender parity (Legewie & DiPrete, 2014). Conversely, an improper introduction does the exact opposite by present a false narrative that hinders women from joining the field.

Along with the improper introduction to engineering, women often lack the confidence to pursue the career due to the gender stereotypes prevalent in secondary education. During high school, the prevalence of gender stereotypes heightens; one study found that 26% of 11th graders believed that males are better than females at math and science (Starr & Simpkins, 2021). This belief often leads to a negative self-image for women in their abilities in STEM. There is a confidence gap between women and men as women are more likely to fear failure and have less trust in their self-efficacy, even when performing at the same rate as men (Ross, Scott, & Bruce, 2012). These experiences with peers inform women's future career decisions.

The Importance of Gender Parity

While the field of engineering has been effective in creating new technologies and advancing the industry with a majority male population, an increase in women would further improve the market. More women in the field would mean diversity of thought, bringing new innovation to the field (Jean, Payne, & Thompson, 2015). With a broader pool of people in engineering, there are more opportunities for quality employees to further improve engineering technologies. This allows for global competition as more local inventions are being created to compete with international companies (Burke, Mattis, & Elgar, 2007). Women have proven their importance in the past through trailblazing accomplishments. Women such as Ellen Ochoa, the first Hispanic woman to go to space, Grace Hopper, who created programming languages written in English instead of mathematical notation, and Rosalind Franklin, who found the double-helix structure of DNA, have pioneered the engineering field (Colon, 2016). These women and many more created the foundation for modern scientific and engineering fields. Their vital contributions to the progression of technology demonstrate the necessity of more women in the field.

Boys-Club

As women enter the field of engineering, many do not feel welcomed due to the uncomfortable male-dominated work environment. At the career-level, women leave engineering at a much higher rate than males. While some of this is due to the lack of flexibility in the career, many feel unwelcome in the 'boys-club' of engineering. A key part of the why women leave engineering are the "hostile macho cultures" (Fouad, Chang, Wan, & Singh, 2017) that leave women feeling uneasy. Women feel as though they are outsiders in their own workplaces, being excluded from certain conversations deemed for 'men-only' (Fouad et al., 2017). Along with excluding women, the conversations observed in male-dominated workplaces tend to shame women for family obligations (Fouad et al., 2017; Jean, Payne, & Thompson, 2015). The boys-club mentality seen in engineering not only creates an uncomfortable environment for women, but also hinders their career advancement. Socializing with managers is a key way to gain advantages within the workplace. Due to their similar socialization practices, male managers are more likely to promote male employees and thus perpetuate the patriarchal workplace (Cullen & Perez-Truglia, 2021). This unpleasant environment for women is seen in youth's experiences as well. In one instance, young women who attended a coed engineering summer camp for adolescents were found to be less likely to pursue a career in engineering compared to before entering the camp (Schilling, & Pinnell, 2019) alluding to the negative impact of male domination.

Sense of Belonging

When one feels unwelcome or uncomfortable in their work environment, they are less efficient (Monk-Turner & Fogerty, 2010). This is connected to the isolating work environment experienced by women in engineering leading to lower levels of productivity, yet another obstacle of female advancement. With the male-dominant workplace, many women feel alone in their experience without another woman to turn to with similar senti-ments. This can lead to unmanaged shame, lack of motivation, and a withdrawal from belonging (Beckmon, Huff, Sochacka, Walther, & Okai, 2019). Being the gender minority within an academic space or workplace forces people to either conform to the majority or face estrangement. When it comes to women, they often have to portray a more masculine persona to attempt to fit in and be perceived as 'respectable' (Madsen, Holmegaard, & Ulriksen, 2015).

The lack of women also impacts faculty and mentor positions in engineering. This also leads to a disconnect in the field, as women studying do not have female examples or support for them (McElroy, 2010; Silbey, 2016). With the lack of assistance from fellow women, many are discouraged to enter the field, thus continuing the cycle of a male-dominated environment.

Stereotypes and Harassment

Throughout women's education and career, many face harassment and stereotyping based on patriarchal beliefs. 'Rachel' in Susan Silbey's 2016 article stated, "They'll treat me like I know nothing" in reference to her male peers at her engineering internship. The ideas perpetuated by these stereotypes tend to do with female inferior-ity, often leading to women's struggle with identity (Jensen, & Deemer, 2019). As stereotypes become more prevalent in the workplace, as does an emphasis on gender identity over professional identity. The experiences that devalue an engineering identity, leave female employees feeling devalued in their work (Hatmaker, 2012). Struggles with identity paired with feelings of devaluation lead to high levels of burnout and emotional exhaus-tion among women in STEM fields (Jensen, & Deemer, 2019).

Gender stereotypes are the basis of gender discrimination that often impede women's deserved ad-vancement in the workplace (Tabassum & Nayak, 2021). As engineering is viewed as a traditionally masculine career, gender discrimination limits the proportion of female new hires, further limiting the amount of women in the field (Gorman, 2005; Oswald, 2008). Once women work in engineering, gender stereotypes limit their advancement within the field. With women being perceived as less intelligent, competitive, and ambitious, opportunities for leadership positions are often given to their male counterparts (Rudman & Phelan, 2008).

Along with stereotypes, women in engineering are faced with harassment at both the educational and vocational levels. According to a study done by Ilies, Hauserman, Schwochau, and Stibal, 58% of women re-ported experiencing "potentially harassing behaviors" in their place of work, highlighting the prevalence of this issue (2006). Human Resources (HR) violations are one of the primary reasons for women leaving the engi-neering field. When those with leadership positions perpetuate the harassment, there is the possibility of nega-tive consequences befalling the female employee (Fouad et al., 2017). Similar to gender stereotypes, harassment can often lead to lower levels of productivity, high stress, and even negative health outcomes (Fairchild, Holyfield, & Byington, 2018).

Current Programs

Since the establishment of the aforementioned Women's Engineering Society, many other programs have formed to help guide women towards engineering. Most engineering programs at the undergraduate level are not using female-focused recruitment efforts. Women who are interested in the field of engineering are usually

seeking to help society through their work. This aspect is not normally highlighted in these programs, limiting female recruitment (Tsui, 2009). In coed summer programs for youth, male participants usually enter with prior knowledge of engineering, leaving female participants confused and unable to fully participate in activities as they are not given complete explanation (Schilling, & Pinnell, 2019). Many current programs attempt to tackle issues affecting women such as the lack of female mentors. They host events or talks presented by women, highlighting their accomplishments and stories to inspire interest in the field of engineering (McElroy, 2010; Barabino, Frize, Ibrahim, Kaldoudi, Lhotska, Marcu., Stoeva, Tsapaki, & Bezak, 2020). One example of this can be seen through the University of Southern California (USC) hosting summits, open to all interested, promoting access to female mentors (Varanasi, 2020). Aside from mentors, teachers and leaders of these programs work to create a more welcoming environment in schools so women can feel they are being heard and understood (McElroy, 2010). These leaders, teachers, and mentors can often be role models, who can inspire young women to enter the field and remain in it through the difficulties (Barabino, et al., 2020). Even promoting engagement between female peers can increase support, as seen in UC Davis' STEM café where students can receive support from other students (Bae, 2021).

The Gap

While some exploration has been done on engineering programs from four-year institutions (i.e., Tsui, 2009), many of the nonprofit organizations centered around engineering have not been explored. The programs studied through research have mostly been viewed through the lens of the people participating in the events, rather than the perspective of the actual representatives involved in creating and administering the events. Many organizations centered around promoting women in engineering have been created in an effort to close the gender gap. These organizations remain unexplored in current research. This begs the question, what approaches are nonprofit organizations using to increase women's engagement in engineering?

Methodology

Objective

The current study explored the engagement patterns of women across several nonprofit organizations through semi-structured interviews and content analysis using the phenomenological method. The purpose of phenomenological studies is to explore a phenomenon through a specific perspective to further understand what the phenomenon is and how it is experienced (Neubauer, 2019). From the perspective of the current research, phenomenology allows for understanding the phenomena of engagement of women in engineering through the perception of a localized group: nonprofit organizations with the intended purpose of promoting women in engineering. This study is an in-depth analysis of three nonprofit organizations catering to women in engineering, using interviews with representatives and content from the organization's websites. Phenomenology allows for both primary and secondary data to be utilized so that the phenomena is fully understood.

Sample/Participants

The target group for this study were nonprofit organizations that target women in engineering. The study focused on nonprofits that promote women in engineering to highlight the approaches aspect of its inquiry.

The samples used for content analysis and interviews stemming from the target group are Girl Develop It (GDI), Society of Women Engineers (SWE), and Portland Women in Technology (PDXWIT). All three of the organizations chosen are based around promoting women in engineering or technology as a whole. A population meeting the criteria was contacted via email (Appendix A), and based off of the respondents, the three participants were found. The participants all held leadership positions in their organizations as executive directors, managers, or board chairs.

For the primary data being collected, the participants of the study were representatives from the three nonprofit organizations. Their interview consisted of a series of open-ended questions regarding how they understand women are being engaged in engineering (see Appendix B for full list of questions). This helped answer the research question as these organizations are directly involved in women's introduction to the field of engineering through attempting to increase their interest in the field. The information gathered was utilized to further understand the patterns across organizations that are directly affecting women's engagement in engineering.

Each organization's website described the strategies it uses to engage women in engineering. The content found surrounded the key factors that affect the whole community involved in each organization. This included how to become a member, the descriptions of the events they host, social media, and other forms of communication with all the members of the organization. This digital information goes into further detail on how these nonprofit organizations are directly interacting with women in their community.

Instruments

Due to the COVID-19 pandemic, all interviews with the representatives were held virtually on the video-conferencing platform: Zoom. Meeting virtually allowed for participants to be involved in this study from across the country. Zoom also permitted for sessions with participants to be recorded allowing for later analysis.

For the content analysis, the websites of the nonprofit organizations were utilized to analyze the basic aspects of membership. This study chose to focus on the factors that affect most, if not all, members involved in each organization. The websites were organized according to different areas of interest: membership, staff, events, and general information. These, paired with contextual information from the interviews, provided insight as to how women involved in these organizations are being engaged.

Approach to Data Analysis

The data gathered from the interviews and websites of the organization were analyzed to identify the commonalities and differences in the content. The interviews went through two cycles of coding: manual and pattern. Using transcripts of the interviews, manual coding was used to recognize any ideas that stand out by highlighting, circling, and writing phrases (Manyam & Panjwani, 2019). Once those ideas were identified, the second cycle of pattern coding began. This entails grouping the ideas into final themes that encompass the major concepts of all the interviews (Saldaña, 2013). The data gathered from the websites was analyzed using priori coding. A set of predetermined codes were used to analyze the content from the websites (Blair, 2015). Finally, the researcher used inductive reasoning to apply the themes to a larger population (Borgstede & Scholz, 2021).

Ethical Considerations

All human participants have signed a consent form agreeing to the nature of the interview (see Appendix C). If at any point the participant would prefer to decline to answer a question or end the interview, they are free to do so. The identity of each participant was kept private as each participant was referred to as the nonprofit organization they are associated with. In regard to the content analysis, all digital content is free, open to the public, and properly credited in this paper.

Delimitations

Due to this study exploring nonprofit organizations that center specifically on the idea of women in engineering, there is limited sample size. With the time constraints of this study, the researcher was unable to receive responses from every organization in this category, choosing to proceed with the three respondents. While the three organizations involved are vastly different, they may not reflect all the ways nonprofits are engaging women in engineering. There could be key aspects missing in these results due to the smaller sample size. The time constraints of the study also led to some variance in data collection. As the length of answers varied from participant to participant, the researcher was unable to ask all questions asked to the other participants due to the lack of time. This could have left out some key information from the interview, causing the results to be varied.

Results

For the purpose of fully answering the research question, what approaches are nonprofit organizations using to increase women's engagement in engineering, manual and pattern coding were used to organize themes in the data collected from interviews with the organizations. This helps to understand and interpret the data collected. The following table defines the themes found in the data collected from the interviews for the purposes of this study.

Table 1. Definition of Themes-Interviews

Theme	Definition
Mission	A basic summary of the organization's goals and values as well as what they hope to accomplish with the approaches they conduct.
Portrayal of Engineering	The perspective the organization uses to present engineering to their members. With a field primarily presented for a masculine audience, organizations portray another perspective of engineering.
Harassment in the Workplace	The attitude the organization uses to address the stereotypes and harassment women often face in the engineering field,
Female Role Models	The demographic of those who interact with the members of the organization such as executive directors, guest speakers, and team leaders.
Community	How the members of the organization interact with each other.

Member Demographic	The kind of people involved in the organization in terms of age range, and size of the organization.

All participants are referred to by their respective organization to keep their identities anonymous. The results from these interviews have been summarized in the table below to maintain clear and organized results. The interviews have been categorized according to the theme they fall into. The questions used in these interviews can be found in Appendix B. The full transcript of each interview can be found in Appendix D (GDI), E (SWE), and F (PDXWIT).

Table 2. Summary of Interviews

	Girl Develop It (GDI)	Society of Women Engineers (SWE)	Portland Women in Technology (PDXWIT)
Mission	"To provide software development education for women and non-binary adults through events, classes, and building community."	"Promote, educate, and excel... Creating a network of support to push members along with the goals of professional excellence, globalization, advocacy, diversity, and inclusion."	"Building a better tech industry by creating access, dismantling inequities, and fueling belonging... Advocating for underrepresented folks in tech."
Portrayal of Engineering	Accessible and easy to learn. Tech is the great equalizer that anyone can jump into	No limits for women in this field. Their presence is seen, heard, and felt. There is equity for women.	Engineering is accessible and for everyone, even if they are not the popular demographic of the field.
Harassment in the Workplace	Leaders speak about their experiences at events. There is no reason women should not be involved in tech, so this should not hold them back.	Discussions on people's experiences and a podcast. Speakers who advocate for combatting these stereotypes.	Guest speakers/panels talk about their experiences. In contact with companies to help them create a more inclusive environment.
Female Role Models	Amplify those who are doing well, mentioning them in blog posts, having them host classes, and sharing their stories with members. The instructors and imagery used surrounds women.	Guest Speakers, majority of board and managerial team are women, creating a comfortable environment for women to express their frustrations and mentors to reach out to.	Connects members with mentors to guide them through career aspirations. Many of the panels and 'lightning' speakers are women, displaying the possibilities in the field.
Community	Smaller virtual classes for people to connect. Slack group for community-based interactions. Teams and breakout rooms. Blogs to connect with all members.	Newsletters to connect to the whole organization. Affinity groups to connect people of similar backgrounds. Comfortable environment where people feel heard.	Highlighting different demographics and giving them the space to connect. Feeling acknowledged and validated in the obstacles they face.
Member Demographic	Centers around adults, most members being from age 29-45, with about 2,300 people	Programs for people of all ages across the globe. 400-500 people attending regular events they hold. (41,309 members from website).	Centers around adults of all ages with a diverse group of individuals, averaging 100 people at regular events they hold.

	having attended a class they have hosted.		

In an effort to understand how these organizations are engaging women, the content they release to the members of the organization must be considered as well. The following table provides the definitions of certain aspects of their organization available on their website that will be used as priori codes.

Table 3. Definition of Concepts- Website

Concept	Definition
Membership Cost	The price, if any, to join the organization in order to take part in the events/programs they have available.
Community Engagement	The organizations' way of communicating information to all members. E.g., newsletters, podcasts, social media, or blogs
Types of Events	The direct form of engagement the organization is using to introduce engineering to members.

The following information is based on the information displayed to the public on each organizations' website. The table below identifies the presence of the above concepts on the organizations' websites. The results detail the specifics of how each organization utilizes the concepts listed above to cater to their own organization. Due to the COVID-19 pandemic, all three organizations have transitioned to an online space to host their events. The results in the table below are based on the current virtual state of the organizations.

Table 4. Concept Exploration-Website

	Girl Develop It	Society of Women Engineers (SWE)	PDXWIT
Membership Cost	4 options for membership, each gaining access to more aspects. The four options are: free, pay as you go ($20/hour), $45/month, or $55/month. The higher the payment, the more personalized the package becomes.	Pricing depends on education level and other factors. Collegiate membership ranges from $20-50/year, professional ranges from $20-125/year depending on career, and discounts to people from other nations with large economic variance from the United States.	There is no membership fee to join the organization.
Community Engagement	Slack, blog highlighting members, upcoming events, and advice, most active on Instagram and Facebook, there is also a Code of Conduct addressing harassment across the organization.	SWE magazine, podcast, blog, "All Together" (a news outlet highlighting members and advocacy), actively use Twitter, Instagram, Facebook, and YouTube to advertise and share news.	Slack, newsletter to publicize events and news organization-wide, active on Instagram, Facebook, and Twitter, podcast, and a blog with an advice column.

Types of Events	Coding classes, panels, career exploration, mentoring, "lunch and learn" to give advice, and hackathons.	Affinity groups, mentoring, local/world conferences, SWEN-ext (youth program), career skills events, and many other specific programs.	Affinity groups, mentorship program, mixers, "happy hour" to discuss career skills, job boards, and hackathons.

Analysis

The results gathered from the interviews and websites of each nonprofit organization illustrated the approaches these organizations are using to increase women's engagement in engineering. Each interview was transcribed and using coding, six themes were identified: Mission, Portrayal of Engineering, Harassment in the Workplace, Female Role Models, Community, and Member Demographic. Each theme provided information on how these organizations are interacting with women in engineering, the results coming directly from a representative of the organization. To fully grasp how women are being engaged, a content analysis was done on their websites. Three major concepts were looked at in the viewing of the organization's websites: Membership Cost, Community Engagement, and Types of Events as these are how the organizations directly interact with their members. The purpose of this section is to examine what each of these themes has revealed about how these organizations engage women and apply them to a greater context.

Interview Analysis

Theme 1: Mission
This theme is vital to understanding how these organizations are engaging women as their goal is what directly shapes how the organization functions. Each participant directly quoted their respective organization's official mission statement. Both GDI and SWE use the term "education" in their mission statement. GDI's entire mission statement surrounds the idea of education. The presence of education in the organization's missions reveals how women involved in these organizations are being taught the essential concepts of engineering, gaining personal experiences as to what the field entails and knowledge that would help in future careers.

Another connection between organization's mission statements is the idea of building community. SWE stated, "creating a network of support" and PDXWIT stated "fueling belonging", alluding to the idea of forming a community. Since women in tech are scarce, creating connections between those who are in engineering is essential to keep women in the field. As this is a priority among organizations, women are being exposed to the community aspect of engineering that inspires them to remain in the field or pursue it in the first place. The term "advocacy" was directly stated by SWE and PDXWIT. The term advocacy refers to support as well, displaying the approach of community-building as a key aspect of these nonprofit organizations.

In this theme, there was a unique aspect to the mission statement of SWE with the term "globalization". SWE is a much larger organization, spanning to places outside of the United States, hence this aspect of their mission statement. This goal displays the importance of SWE and similar organizations, as their approaches to engage women in engineering span across the globe.

Theme 2: Portrayal of Engineering
The next theme identified was how each organization portrayed engineering, as it is often seen as a 'boys club' where women do not belong (Fouad et al., 2017). GDI and PDXWIT used the term "accessible" in their response to this question. While SWE did not use the term "accessible", their answer did allude to a lack of "limits" for women in the field of engineering, continuing to portray that idea of accessibility. The prevalence of this idea

throughout all three of the organizations exemplifies the lack of belonging women feel in the field of engineering. These organizations foster that belonging and portray engineering in an attainable light.

More specifically, both GDI and PDXWIT present engineering as attainable for "all" rather than specifically women. The gender neutrality of these organizations displays how they go beyond women, expanding to men and non-binary individuals in what they hope to accomplish.

Theme 3: Harassment in the Workplace

All three of the organizations addressed the issue of harassment in a similar manner. They use guest speakers to speak about their experiences and host discussions to combat stereotypes. This ties back to the mission of building community. Communities are often built on similar experiences and as many women experience harassment in engineering, this allows women to connect with each other. This discussion-based approach to addressing harassment gives space for women to express their emotions on the matter, seeing they are not alone, and helping them deal with the situation at-hand. Allowing for women to get support with the difficulties they face in the workplace, increases the likelihood of them remaining in the field.

Theme 4: Female Role Models

One of the key issues identified in the exploration of the body of knowledge is the lack of female role models in the engineering field (McElroy, 2010; Silbey, 2016). When asked a question pertaining to this, all three organizations mentioned a majority of their staff being women. This allows for members of the organization to have women to turn to for support who are more likely to understand the experience they are going through. A more comfortable environment is created when they are around other women, in contrast to the male-dominated field. PDXWIT specifically describes their mentorship program in the interview:

We can give you mentorship so that you can help work through these challenging challenges you might be facing in the workplace. We can help you upgrade your skills so that you can climb up the ladder if that's what you want to do. We can help you find a new job in tech with a company who is a lot more aware of the challenges that folk who are underrepresented will face in the tech industry.

This displays the variety of support offered through the mentorship provided in these organizations, helping to promote female advancement.

The other pattern across the responses from the organizations was highlighting members. GDI specifically mentioned amplifying the accomplishments of successful female members through blog posts, having them host events, or teach a class. This introduces the GDI community to examples of women overcoming similar challenges and finding success.

Theme 5: Community

An essential part of how women interact with engineering is through the community built in these organizations. Creating subgroups to highlight specific communities was one similarity in the responses. SWE mentioned affinity groups for people of similar backgrounds and PDXWIT highlighted different demographics that could connect with one another. While GDI did not specifically mention anything about affinity-style groups, they do have more organization-wide aspects with blogs, newsletters, and Slack that allow for interaction with the community as a whole. GDI specifically focuses on smaller groups since their classes have less people, often putting members into teams or breakout rooms with each other to encourage interaction.

One common idea across all three organizations was the idea of employing this community to create validation and belonging in the field of engineering. Speaking with others in similar situations fosters a sense of acceptance and validation that women often need in a male-dominated field (McElroy, 2010). As all three organizations employ this aspect, most women are introduced to a vast supportive community through these organizations.

Theme 6: Member Demographic

It is vital to understand the kinds of women being engaged through these organizations to address the research question. In this theme, PDXWIT and GDI have the most similarities. They are both on the smaller side, with under 5,000 members located in the United States. Both organizations are for adults, with GDI's members mostly being from ages 29-45. SWE breaks this pattern as they have upwards of 40,000 members in their organization, spanning across the globe. This allows them to have programs for people for a variety of different ages, from kindergarten to adulthood. With engineering foundations in early education being vital to closing the gender gap (Legewie & DiPrete, 2014), organizations similar to SWE are employing effective ways of reaching gender parity through youth.

Website Content Analysis

A key way these organizations are engaging women is through the content on their websites. These serve as a way for organizations to communicate information to all members, displaying its importance. The three priori codes used for analysis of the websites were membership costs, community engagement, and types of events.

When it came to membership costs, there was a lot of variation between each of the organizations. GDI and SWE both require membership fees and have different levels of payment. As SWE is involved around the globe, they have more tiers of payment. This variation in tiers of payment allows for more people to be involved. With people having differing incomes, this allows women to choose the tier that works best for them and continue to be involved in these nonprofit organizations. Although the tiers are beneficial to suit different incomes, it still limits some women who are unable to afford membership. Both SWE and GDI offer scholarships, but the possibility remains that this will not be available to every person who wants to be involved. PDXWIT has no fee for membership, allowing anyone to join the organization. This displays the multitude of options for women to engage with engineering through these organizations. With the variety of levels of payment or free membership, women can be involved with engineering through an organization without cost preventing this.

The next section explored in the content analysis was community engagement to understand how organizations were interacting and forming connections between their members. All three of the organizations have a blog or newsletter to spread information across the organization. These blogs/newsletters serve as a way to highlight members of the organization, keep members up to date with events of the organization, and give advice. The community is further built through social media as all three organizations are active on Facebook and Instagram, allowing them to communicate events they are hosting to increase engagement. PDXWIT and SWE also have podcasts that allow for a voice to be heard across the organization that can highlight issues and other concepts affecting the organization. In terms of one-on-one community building, both GDI and PDXWIT have a Slack (businesses communication platform) for the whole organization. Slack allows for different channels to be made as well as direct messages, enabling the building of community especially among individuals. Overall, all three organizations have unique ways to engage the members of their community to help foster positive relationships and retain interest.

The final aspect of the website content analysis was the type of events hosted by each organization. A key feature throughout all of the organizations involved in this study is a mentorship program. All three organizations allow for members to be directly connected with a mentor who can help them, allowing them to ask questions and gain the advice necessary to advance in the future. This mentorship tackles the lack of female role models in engineering that lead to feelings of isolation (Beckmon et al., 2019). All of the organizations also had some form of larger event for members that was geared towards careers. These events taught career skills, explored the variety of careers available in engineering, workers in the career talked about their experiences, and directly connected members with hirers. This inspires women to get involved in engineering as a career, helping to close the gender gap. As seen in the aforementioned mission statements, SWE and GDI both

have a goal of education. This is reflected in the kinds of events they host as both have classes teaching aspects of engineering to their members, immediately connecting women to engineering. These engineering skills can also be built using hackathons (computer programming competitions) which both PDXWIT and GDI host. This also serves as a way to build community among members as they are put into teams and are able to meet new individuals, working together to practice software engineering. The idea of building community is continually heightened with affinity groups, groups of people linked together by a common trait/interest often along the lines of race, gender, or ethnicity (Merriam Webster, n.d.), which both SWE and PDXWIT host. There are a variety of events that each organization hosts with the general idea stemming around community, education, mentorship, and career-building.

Limitations

It is important to identify any limitations to this study that could have impacted the results. Although it was asked of participants to answer questions to the best of their ability, there is no guarantee of the accuracy of their responses. By providing the option to decline to answer any of the questions, this allowed participants to be comfortable with answering honestly whenever possible. Aside from that incentive, this factor still remained outside the researcher's control. In regard to the content analysis, as each nonprofit organization formats their websites differently, the variety between each source may affect the data that was available to analyze. This variety cannot be counteracted, but the researcher took steps to ensure that only information found in all organizations participating was analyzed to make certain that each organization is accurately represented, and the engagement of women is properly explored. As previously mentioned, these organizations are vastly different, especially when it comes to size and funding. With an organization such as SWE, there are more possibilities of approaches they can use to engage women in engineering versus GDI and PDXWIT. This makes it difficult to compare certain aspects of their events due to that limitation. There is also the limitation of human error and the personal bias of the researcher. The interview responses as well as the website analysis were all manually coded by the researcher. There is always the possibility of missing or misrepresenting a key aspect of an organization's website/interview due to human error or personal bias.

Future Research

Due to the limitations of this study, more research is suggested. Future studies should pursue a large-scale analysis across more nonprofit organizations engaging women in engineering. This would allow for a true sense of how these organizations are connecting with women and provide more ways to close the gender gap in one of the most male dominated career fields in the United States (Bureau of Labor Statistics, 2020). With future research allotting more time to each interview, this would ensure the same interview protocol for each interview would be followed. This would allow the data gathered in this future research to parallel each organization's respondents, clarifying results. These results would serve to foster innovation within the community of technology, advancing society as a whole through diversity of thought (Post et al., 2009).

Conclusion

In an attempt to answer the research question, what approaches are nonprofit organizations using to increase women's engagement in engineering, an exploration of nonprofit organizations with a message centered around engaging women in engineering was conducted. Three participants were involved in this study: Girl Develop It, the Society of Women Engineers, and Portland Women in Technology. After gathering data from interviews,

the results were manually coded into six themes: Mission, Portrayal of Engineering, Harassment in the Work-place, Female Role Models, Community, and Member Demographic. With the exploration of these themes, it was found that each organization was built on a basis of belonging with each of these themes tying to the idea of allowing women to feel as though they have a place in engineering. As women experience this, the feelings of devaluation and isolation begin to dissipate (Hatmaker, 2012; Beckmon et al., 2019). Each organization had their own unique aspects of doing this, whether it be through smaller class sizes or newsletters, they all communicate women's place in the field. The organization's direct engagement with their members was revealed through the content analysis of their websites. Overall, each organization offered a variety of options in terms of events, cost, and ways to engage with the whole community. The assortment of options within the organizations, and the availability of a multitude of organizations, guarantees that women will be able to find an organization that suits their needs. The organizations involved in this study were only a portion of the vast amount of nonprofits in existence, further providing options to women looking to be involved with these organizations. All three of the organizations take the approach of creating a place for women in engineering.

Implications

This idea of "fueling belonging" as PDXWIT put it, displays how these women are engaging with engineering. Allowing women to see their place in a field filled with male-domination, increases the likelihood of them pursuing or continuing their careers (Miller & Besser, 2000). These nonprofit organizations across the country have a variety of members, those already involved in the technology industry or those who are brand new, their first interaction with the field coming from the organization. The results of this study reveal the importance of these kinds of organizations in empowering women to pursue engineering and retaining women in engineering. Each woman joining the field is one step closer to reaching gender parity. More women entering the field of engineering allows for more diversity of thought as women have unique experiences to bring to their careers (Burke et al., 2007). This allows for greater innovation to flourish, one that spurs global competition that in turn makes the world continue to advance in a positive direction.

Acknowledgments

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