

Women in Engineering: Changing Scenario

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Abstract

Women constitute nearly half the world's population. Despite this, it has been observed that the participation of women in the engineering field is less compared to that of males. This paper presents the various factors which are contributing to less presence of women in the engineering field. Various facts and figures have been presented to support this analysis. This paper also highlights the measures to be taken to improve this number along with the advantages which can be achieved by employing more women engineers.

Keywords- United States (US), United Kingdom (UK), The Institution of Engineering and Technology (IET)

INTRODUCTION

Despite the fact that many women engineers have contributed to the diverse field of engineering, women are often underrepresented in the engineering field. This paper has been focused on bringing forward the various aspects which are contributing to the current status of women in the engineering field. Gender disparity is an existent issue in this field, which is why several committees and organizations have been formed and are working to understand the various causes of it. It has been found that gender stereotypes, low rates of female engineering students and lack of engineering culture are factors that contribute to the current scenario. As a result, men are dominating in the engineering field. Having said that, things are now changing. To cite here, in India, currently, 30% of all engineers are women. This figure has improved substantially over decades.

Background

In the early years of the twentieth century in the United States (US), the greater numbers of women [1] were beginning to be admitted to engineering programs. The first university to award an Engineer's bachelor's degree for women [2], [3] was started by the University of California Berkley. Elizabeth Bragg was the one who received a bachelor's degree in Civil Engineering in 1876, thus becoming the first female engineer in US [4].

One major reason contributing to the participation of women in engineering program was that in the US, World War II had created a huge shortage of engineering talent. On-the-job training for women with a degree in maths and physics was being provided, which thus created a new opportunity for women. In addition to the wartime shortage of engineers, the number of women grew due to the

gradual increase of public universities admitting female students.

If we look into history, women also played a crucial role in developing the computer ENIAC. Female ENIAC programmers made a considerable contribution to programming techniques.

LOWER RATE OF FEMALE STUDENTS IN ENGINEERING

There are many factors leading to why women don't go into engineering; one of the main reasons is that it is felt that women are not suitable for fieldwork (workplace constrictions) [3]. According to the society of women engineers, one in four females leave the field after a certain age. The reason may be working conditions, responsibility for family or any other constraint.

A study by the Harvard Business Review has put forward the reasons why the rate of women in the engineering field is low. The study revealed that women are treated differently in group works in which there are more male than female members, and male members often exclude women from the real engineering work. One more reason which supports the slow rate of increase for women in engineering is that they are often judged to be less competent than men to perform masculine jobs.

Communication is also a factor that creates a divide between men and women in the workplace. There is the presumption that men are more qualified than women, and this assumption leads men to treat women as inferior instead of equal. If we look upon the figure in India, in the year 1960, women were around one percent of all engineers, in the year 2000, it rose to 11% of all engineers, whereas in the year 2018, 30% of all engineers were women.

SETTING APART IN ENGINEERING FIELD

As women make advances in the field of engineering, it is now worthwhile mentioning some points as to how they can excel in it. There is a high demand for engineering professionals in several industries, and salary expectations are promising.

One way to set yourself apart is by earning a master's degree. This will give you specialised knowledge and provide you with valuable skills and knowledge that will equip you to take on a leadership role in organisation. Besides that, there is online engineering master's programs that will help in earning a degree while working in the field.

To get an overview, the data from engineering UK 2018 [5], [6] report has been put here; it has been observed that 12.4% of all engineers are women, 21.8 percent of women work in engineering sectors. Age-wise data analysis shows that 46.4 % of girls in the 11-14 age group consider engineering as a career compared to 70.3 % of boys, 42% of girls in the 14-16 age group consider engineering as a career compared to 66% of boys, 25.4 percent of girls between 16-18 years consider engineering as career compared to 5 1.9% boys. These figures show that inclination towards engineering as career decreases as age increases, so corrective measures have to be taken so that this figure can be improved. It will be further discussed in the later section.

It has been observed that 79.8% of female engineering students get a first or upper second class compared to 74.6 % of males, which shows that women are performing well academically. This is due to the fact that women perform their tasks sincerely and with dedication.

WOMEN ENGINEERS IN INDIA

If we take the example of any country, there is the pre-existing problem of gender inequality, more so in engineering. The percentage of women engineers is hovering around 20% for decades. If we look at the data, women only account for 13% of employed engineers.

Considering the case of India, in the 1980's women earned less than 2% of engineering degrees, but since then, India has seen a growth in the number of women in the engineering field. In 2018, the MHRD's annual survey of higher education showed that 31% of all engineers were women. So we can say that one-third of all the engineers in India are women. This figure is better compared to many countries of the world.

According to a recent article by 'The Economist' the most recent employment rate of women in India has fallen to 26%. Despite the huge increase in the number of women engineers, only 12.7% of working engineers in India are women, and the unemployment rate of women engineers is about 40%. Thus the point arises, what about the rest 60% of women engineers. Few from these switches over to civil services, some to engineering services, education field, entrepreneurship and so on. Few of them also give up their career owing to families.[6]

Factors Attributing to Lower Enrolment of Women in Engineering Program

1. Failure of higher education programs to explain how engineering can improve other's lives.
2. A lack of awareness as to what engineers do.
3. Lack of networking opportunities and discomfort of being in a male-dominated environment.

4. Perception that women must adapt to fit in.

In the workplace, only 13% of engineers and 26% of computer scientists are women.

NEED FOR MORE WOMEN ENGINEERS

The institution of engineering and technology (IET) is encouraging more young women to enter into the profession of engineering [7]. To attract women in this field, lots of good points have been put forward, which can motivate them to take engineering as a profession. To stress the advantages and benefits of selecting engineering as a career [8], the following points have been put forward by the IET:

As per a survey conducted, there is a skill shortage that can be overcome only when more women enroll in the engineering program.

- This field provides equal opportunity to all. IET fellow and past young women engineers of the year award winner Faye Banks is an example of this. Faye left school with no formal qualification and started working as a line operator in a manufacturing plant. When the machines would breakdown, she used to watch and observe the engineers who used to fix them and ask them questions of all sorts. She decided to go to night school to obtain her engineering apprenticeship and afterward became a very successful electrical engineer.
- Currently, we do not have enough engineers to help deliver the innovation and improvements of tomorrow. By not engaging the other half of the population, we are missing out on vital future development. An example to support this is actress Hedy Lamarr who invented spread spectrum technology, which is used in

Wi-Fi. We all know how important Wi-Fi for all of us is.

- If feedback and input from women are also considered while designing new products, then a better outcome is obtained due to diversity. As the need of men and women varies, so by using women's ideas, a better product can be developed.
- Women can contribute substantially in the engineering field, which is termed as a world-changing career. Engineers are helping to solve some of the world's biggest problems and, in turn, improving people's lives.
- Engineering is a highly creative and innovative industry and engineers play a significant role in shaping the future. What else could be more rewarding than working for the future development and upliftment of human living standard.
- Not only does engineering offers job satisfaction and provide an opportunity to work on some amazing and creative projects depending upon the engineering and skill set of individuals, but also Engineers rank as some of the highest-paid professionals in the world. In the engineering field, women's salaries are likely to progress at the same rate as their male counterparts.
- Engineering is literally looking at a problem and finding solutions. Henceforth it is always very satisfying to work on your dreams and seeing them being realized.
- Representation of both genders in the workplace is associated with higher productivity. Having the perspective of both

men and women in the workplace is very important.

- It is required that we recruit more women engineers so that they can serve as positive role model for the next generation. Women can significantly contribute to the future of the profession and help break down gender stereotypes.

EXPERIENCE OF FEMALE ENGINEERS

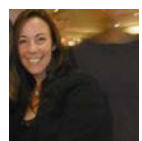
This section will focus on giving some examples of women engineers who have excelled in their field. There have been many outstanding women engineers throughout history. Their example can be taken as a source of inspiration for the coming **generation**. A few of them are presented below [9]:



Yamna Abdel Rehim, instrumentation and control system engineer, Dubai, UAE. Despite being the only woman on the job amongst 40 men, she never felt like she did not belong there, nor did she allow herself to be bogged down by anyone.



Sarah Black-Smith, head of factory operations at Congleton, UK. "There is a load of opportunities as there is a huge shortage of engineers; it does not matter if you are a male or a female." It shows that engineering is not a field now only for men; we have equal opportunity existing.



Victoria Sargeant, head of commodity management at Siemens, UK "Being female in a male-oriented environment taught her the importance of being herself rather than trying to mould herself to

fit in. "It's OK to be female, don't try to be male" is the message given by her.

To mention further, here are a few examples of women Engineers from India who have earned a name for themselves as well as for the country.



A. Lalitha was the first Indian women engineer. In the year 1940, she graduated from the College of Engineering, University of Madras.



Kalpana Chawala did Aeronautical Engineering from Punjab Engineering College in the year 1976. She had a Master's degree from the University of Texas and a Ph.D from the University of Colorado, Boulder.



Sudha Murty completed B. Engg. in Electrical & Electronics Engg. From BVB College of Engg. & Technology, Karnataka University. M. Eng. in computer science from ISC Bangalore. She became the first lady engineer hired by TELCO, the largest auto manufacturer, which was hiring only male engineers at that time. She was granted a special interview and hired immediately.

CONCLUSION

Going through the different aspects covered in this paper, it can be concluded that women are moving ahead in the field of Engineering. It is our responsibility to educate the coming generation and make them aware of this wide field which has definitely very broad prospects.

REFERENCES

1. Bix, Amy Sue (2013). Girls coming to tech!: a history of American engineering education for women. Cambridge, Mass.:

- MIT Press. pp. 14–43. ISBN 9780262019545.
2. Yang, Juemei (2016). The impact of power status on gender stereotypes, sexism, and gender discrimination toward women in the workplace and the career identity development of women. The University of North Dakota: The University of North Dakota. pp. 1–20.
3. Hill, Catherine; Corbett, Christine; St. Rose, Andresse (2010). "Why so few? Women in Science, Technology, Engineering and Mathematics" (PDF). AAUW.
4. Society of Women Engineers Blog. "History of Women Engineers". All Together Society of Women Engineers. Society of Women Engineers. Retrieved 10 November 2017.
5. Fox, Mary; Sonner, Gerhard; Nikiforova, Irina (2011). "Programs for Undergraduate Women in Science and Engineering: Issues, Problems, and Solutions". Gender & Society. 25 (5): 591.
6. Kaspura, Andre (2014). "The engineering profession: a statistical overview". 11. Engineers Australia: 117.
7. Excell, Jon (2017-06-20). "How big is the gender pay gap in UK engineering?" The Engineer. Retrieved 2019-10-21.
8. Rosser, Sue (2014). Breaking into the Lab: Engineering Progress for Women in Science. NYU Press. ISBN 978-1479809202.
9. White, Alice. "The history of women in engineering on Wikipedia." Science Museum Group Journal 10.10 (2018). Online.

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