

Self-Restrain or Discrimination - Participation of Women Engineers in India

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Abstract

Women in growing numbers are joining engineering in India and making significant dent but even then, it is at the lower side when compared with other disciplines of education. During 2010-11, their participation in engineering was around 28 per cent which is, though, higher than the share of women engineering students in USA (around 20 per cent) and Australia (around 14 per cent) but quite low when compared with other streams in India as science, medical and arts where the participation rate is around 50 percent. Not only that even after joining the labour market, their number dwindles. At lower level of management, there are around 27 per cent women engineers which decrease to 14 per cent at middle level and at upper level, remains as low as .9 per cent. One of the reasons may be lower participation of women in engineering education before liberalization but significant number of women leave labour market during child bearing and rearing age. As both academia and industry are aware of the fact, they are taking affirmative action to improve the gender ratio. Associations like Women in Science and Engineering (WISE)-India should also mentor young women engineers.

Keywords

Women Engineers, Academia and Industry, Affirmative Action, Mentor

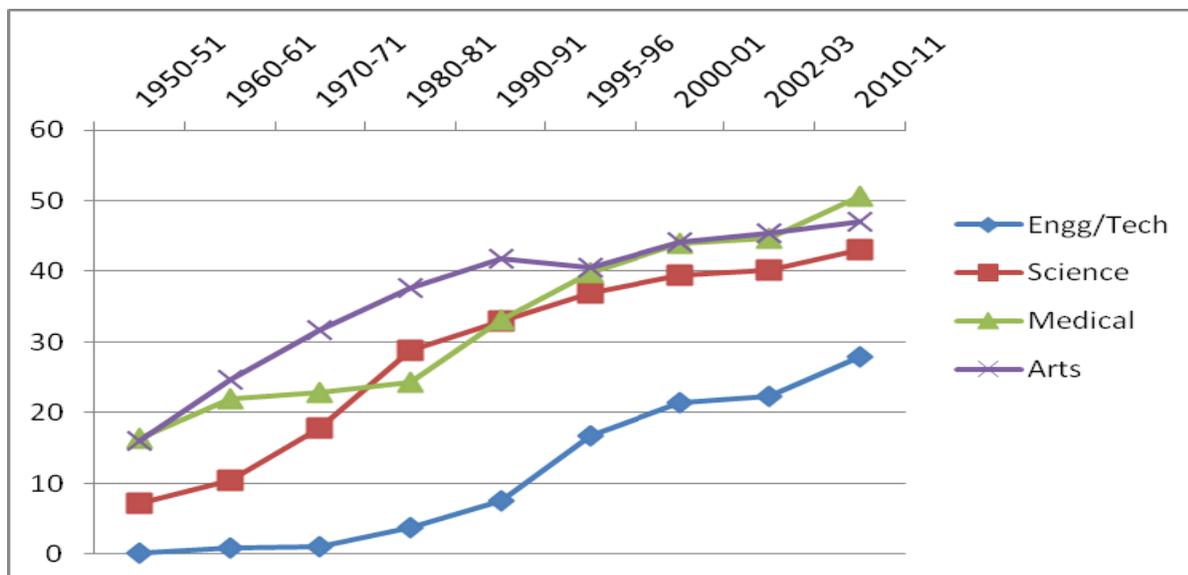
1. Introduction

Today women activity is no more limited to the four walls of house, they are participating in every field of work and are joining even those professions which were once considered as a male bastion as engineering. In India, women in growing numbers are joining engineering and making significant dent but even then, it is at the lower side when compared with other disciplines of education and even those who enter the labour market, could not continue the pressure of their dual responsibility which is evident from the fact that almost half of them quit job within 4-5 years of joining. In the board room of any corporation, male presence is normal and female are few and far between. The paper discusses status of women in the engineering labour market. Both demand side and supply side perspective of women engineer have been discussed. Probable reasons for their low participation in the engineering labour market have been discussed in the third section. Whether it is discrimination which restricts their performance or it is self restrain so that they can perform personal responsibilities better. Some case studies have also been discussed in this section to emphasize the probable reasons. To improve the gender balance, affirmative actions are being taken by Indian academia and industries. Some of these affirmative actions have been discussed in the fourth section. Last section concludes the discussion.

2. Women in the Engineering Labour Market in India

Both supply side and demand side analysis has been discussed, here, to understand status of women in the engineering labour market in India. First the supply side, it is clear from the graph 1 that in 1950-51, percentage of woman students in engineering was meagre (0.2 per cent) in comparison to other disciplines as in Science it was 7.1 per cent, 16.3 in Medical and 16.1 per cent in Arts. Over the year, trend of participation was positive among all streams of education and so as for engineering. In 1990-91, it was 7.6 per cent in Engineering and Technology where as 32.9 per cent in Science, 33.2 per cent in Medical and 41.8 per cent in Arts but beyond 1990-91, growth in

women enrolment in engineering and technology is quite amazing. During the first decade of liberalisation, it grew almost three times and rose to 21.5 per cent in 2000-01. In 2010-11, percentage participation in engineering and technology further grew and was 28 per cent which is higher than the share of woman engineering students in USA (around 20 per cent) and Australia (around 14 per cent) (Singh, 2012).



Graph 1: Percentage of Women Students in various streams of Education in India

Source: for data up to 2002-03 -Prabhswamy & Raghvendra (2011)

For data 2010-11 –UGC, Higher Education in India at a Glance, Data for 2010-11- UGC

As there is paucity of wise state data on women engineers, so whatever latest data is available, has been discussed in Table 1 and some trends have quite clearly emerged. First, there is variation in participation among the states also. There are more engineers in southern states than the northern states. Second, participation has increased during later period in all the states.

Table 1: Participation of Women Engineering Students in Percentage at Various States of India

Sl. No.	Percentage of Women enrolment	Graduate Degree		Post- Graduate Degree	
		2000	2005	2000	2005
1.	< 10 per cent	West Bengal	nil	Maharashtra, Rajasthan, West Bengal	Rajasthan
2.	Between 10% and 15%	Delhi, Himachal Pradesh, Karnataka,	West Bengal, Rajasthan	Tamil Nadu	Assam, West Bangal

		Rajasthan, Punjab			
3.	Between 15% and 20%	Chandigarh, Gujarat, Haryana	Madhya Pradesh, Himachal Pradesh, Haryana	Karnatka	---
4.	Between 20% and 25%	Tamil Nadu	Punjab, Karnataka, Gujarat, Delhi	Gujarat	Karnatka
5.	Between 25% and 30%		Chandigarh, Tamil Nadu	Kerala	Gujarat
6.	Between 30% and 35%	Kerala			Kerala, Tamil Nadu
7.	Between 35% and 40%		Kerala, Andhra Pradesh		---

Source: Made from the data of Singh, 2010

Third, in the southern states, there are more private colleges than the northern states. Again, between two time periods under study, there are more private colleges during the second period than the first period. In the private engineering colleges getting admission is easier. If we map incidence of more woman students, these are the areas where they are more private engineering colleges.

When analysed the employment situation, finding the first job after graduation is a major hurdle in the career path of women engineers. This is duly reflected by a higher percentage of unemployment amongst younger members and the fact that the unemployment were about without job for over a year at the time of data collection. Resistance to entry in the job market seems to be an issue. This is supported by the fact that participants report having faced difficulties in being called for campus interviews and getting a job through campus recruitment. It is further corroborated by the fact that 28.4 per cent in the study did not get their first job in the areas of specialisation. To a question as to what factors governed their accepting the first job, a significant number have responded with phrases like 'something better than nothing' or 'for experience'. Regarding quality of employment, Parikh and Sukhatme has compared the situation at two point of time. One is just after globalisation and the second is at the time of the beginning of new millennium. Technical Education Institutes (TEIs) provides largest avenue for employment for women engineers. Around 27 to 30 percent women engineers are employed in TEIs (this has been found in Singh, 2010 also). Another sector which provides significant employment and positive growth is private sector companies, both small and large which are related to computer and software sector. However, their participation has decreased in Government/ civil services and Public Sector Undertaking. (Parikh and Sukhatme, 2004). The number of women engineers decreases while moving up the corporate ladder as family and other social commitments take a priority over career goals. Lesser number of women involved in management activities vis a vis men (Wij et. al., 2010). At lower level of management, there are around 27 per cent women engineers but at middle level, the percentage decreases to 14 per cent and at upper level, that is as low as .9 per cent (Prakash, 2012). One of the reasons may be lower participation of women in engineering education before liberalisation but significant number of women leave labour market during child bearing and rearing age (Singh, 2012).

3. Discrimination or Self-retrain

The capability of paid work has been given a lot of focus in Amartya Sen's framework of development as freedom but the case of women engineer does not validate it. Available literature says that women engineers not only face difficulty in getting job as employers are reluctant but they get less promotion and less salaries as compared to men

which eventually lead to less professional recognition. However, employers have also point in their favour. At the page of globalisation, all companies are under so much pressure to perform and women engineers have personal commitments takes priority over their professional commitments. Family takes a priority over career ambitions. They are less willing to travel and to relocate or shift base (Wij et.al. 2010, Singh 2012). Here, twelve case studies of women engineers have been portrayed to analyse whether women engineers suffers from discrimination or not.

3.1 Case studies

As E1(47 years) was a good student, she wanted to be a civil engineer as her father but the idea was vehemently opposed by her guardian because a civil engineer has to go for field work frequently which is not an ideal situation for a woman. They wanted her to pursue medical. The negotiating point for both sides was electrical engineering. She graduated in electrical engineering in 1988 from Maulana Azad Regional Engineering College (Now, NIT, Bhopal). She joined ITI (a public sector undertaking) at Allahabad, UP. When she got married, she could not managed and left job to join her husband. Later on, as her in-laws were at Delhi, she joined Delhi College of Engineering (DCE) as guest faculty in 1992-93 later on as a permanent faculty. She did her ME and Ph.D. from DCE and now she is guiding also a student for the award of Ph. D. degree. Her husband is a civil engineer from Roorkee Engineering College (now IIT Roorkee) who was in Army Civil Supplies (a Government sector job). Now, he has opted for Voluntary Retirement Scheme (VRS) and is working in Delhi as a consultant. She has a son who is also pursuing civil engineering at NIT, Suratkal, Karnatka.

E2 (52 years) is a Civil Engineer and works in a consultancy firm. When she expressed her preference for engineering profession it was opposed by the family members. No one in her father's family was engineer. A maternal uncle, who was himself an engineer, supported her. She graduated in Civil Engineering from Delhi College of Engineering in 1982. She was selected through campus placement by Loyd Punj (a private construction company). But when the company came to know that she is preparing for Indian Engineering Services, she was fired. Then she took up few other jobs but ultimately left to take care of her two kids. In 1995, she started her own consultancy firm but could not handle and now, working as an senior executive in an Engineering Consultants Ltd in New Delhi. Apart from her consultancy firm, she is quite busy with growth of the profession. She frequently participate in International conferences and seminars on engineering education and is founder President of Women in Science & Engineering (WISE) India. She has two grown up kids. Her son is studying civil engineering in UK.

E3(27 years) is a Computer Engineer. She works as Contract faculty in a reputed engineering institution at Delhi. She graduated Computer Engineering from Maulana Azad College of Engineering & Technology from Patna in 2006. She migrated from Patna to Delhi to join the Dept of Computer Engineering as Contract Faculty and pursuing post graduation in Computer Technology Application from the same place. Though she was having Biology also at plus two level but she was more interested to join engineering like her father. Her father is an engineer at Bihar Electricity Board. She is eldest of five. All her three sisters are pursuing professional education and the brother studies in school. Her mother is a Post-graduate Degree holder in Zoology and was teaching in schools but as the daughters grew up, she preferred to stay in home to look after her daughters.

E4 (37 years) is also a Computer Engineering- Contract faculty in Delhi Technological University. At plus two level, she had both Mathematics and Biology. But she could clear engineering entrance test only and graduated in computer engineering at North Eastern Regional Institute of Science & Technology. She passed out in 2002. Her father is a teacher who gave importance to education. Thus, all three sisters are well educated and are employed, but only she is an engineer. After graduation she started teaching in Assam Engineering College as guest Faculty but migrated to Delhi when her husband who is also a computer engineer joined as Assist Director (Training) in the Ministry of Labour & Employment at Delhi. At Delhi, she joined as contract faculty at Delhi Technological University and also joined Master's programme at the same place.

E5 (50 years) is daughter of a businessman in the capital. Family belonged to upper middle class. As she was good in mathematics and at that time, there was no entrance test. She joined engineering in a government engineering college. Just after passing final examination she got teaching job and later on, married her classmate. Her husband

started his own business. She continued teaching till the time she completed 20 years of service. After that, she took voluntary retirement and joined her husband in his business. Her two children are now grown up but during their childhood, her mother looked after them, whenever required.

E6 (52 years) gives credit to her science teacher for joining engineering. The teacher used to give his students enough time to experience science in their day to day life contrary to today's children whom are in the rat race of getting high marks. He always helped her in exploring science. After plus two, engineering was an obvious choice. Her husband and mother are the pillars for her achievement. At the workplace, she has to fight for his rights. Now, she is senior scientist in one of the government's R&D lab. She has always tried to explore new and emerging fields.

E7 (25 years) is daughter of an Administrative Officer. She was born with proverbial silver spoon. It is always better to pursue technical lines rather than traditional lines and now, it is not difficult to get admission into an engineering college. So, she opted for engineering. Though she could not get campus placement but now, she works with an IT firm on a recommendation of her a relative. For parents, engineering background was a good option for getting a better groom for their daughter but now, she is enjoying her independence and does not want to get married so early in her life. She is bargaining with parents

E8 (30 years) is daughter of a college Professor. Everybody in her neighbourhood was trying for engineering so for her also it was an automatic choice for her and one year elder brother. Both of them could not clear entrance test of government engineering college and the high cost private engineering college was the only option for them. For which their parents opted for. Financially it was a tough decision and all four years were quite difficult for them but ultimately, it paid off. Both of the siblings cleared their engineering and ultimately joined industry. She worked for few years. Though timing was quite erratic but she was enjoying the independence. However, parents were now looking for marriage. Though getting good match is difficult but as she was an engineer, it was not difficult for her. Ultimately, she was married to an engineer who was at that time working in Ireland. She had to leave her job to join her husband. She has planned to search a job there.

E9 (29 years), a civil engineer from not so good engineering college, is a daughter of civil engineer who is running very successfully a construction firm. Though she is sure that she can get a job but she is working in her father's firm. She is not in hurry to get married and concentrating on her work.

E10 (23 years) is one of the two daughters of a police officer. She wanted to pursue English literature but parents forced her to opt for engineering for early settlement and respect associated with engineering and graduated in Information Technology. She got selected through campus in a company but hectic time schedule and uncertainty she has thought of not to join the private sector. She is preparing for Indian Administrative Services.

E11 (45 years) was good students in mathematics and opted for engineering. Her father was a government servant in Andhra Pradesh. After doing graduation in electrical engineering she joined State government and was got married. Her husband is a chartered accountant. After marriage she migrated to Delhi. Very soon had a son and could never join the work again.

Formerly a Class I Engineer of Government of India, E12 (59 years) is a Mumbai based Project Administration Consultant in field of construction on going claims, Adjudication and Arbitration. Basically, she has a rural background. Fondly, she remembers that once an engineer came to his village whom they all use to respect a lot. Being girl of one of the richest family of the village, she got the opportunity to talk to him and it was very inspiring moment for her. But ultimately, it was her brother-in-law who found that she was very quick in solving mathematics and advised her to take up engineering. She did her B.Tech. in civil engineering from a government college. There was not a ladies toilet in the college and she has to share the ladies staff toilet with the clerk- the only ladies staff in the college. She has always to fight for her place. She feels that women engineers need some adjustment according to their domestic responsibilities and they will be far superior employees. She has had brilliant academic career standing first class first in M.E. Construction Management from Mumbai University. She has unique qualification of Master of Business Administration in Construction Law. She has represented Indian fraternity of Engineers at the International Seminar on Concrete Structures at Washington (D.C.) USA hosted by American Concrete Institute. She has been mentioned for her leadership qualities in "2002 HONOREE INTERNATIONAL WHO'S WHO OF PROFESSIONAL AND BUSINESS WOMEN AWARD" She worked as

an Honorary Consultant for rehabilitation of Earthquake affected Amran village in Gujarat and many others work. She teaches construction Law at Post Graduate level including IIT – Mumbai. She has been member of team felicitated for “Award of Distinction” for culture Heritage Conservation work by UNESCO-2007 She has been awarded with Best Woman Professional of the Year (2008-2009) by FICCI.

3.2 Interpretation

Though case studies are only twelve in numbers but respondent engineers have been selected in the way that they represent whole spectrum of Indian women engineers and some significant trends has definitely emerged. Engineering is a challenging professional option for Indian middle class women but certainly, globalization has given a platform to the Indian women to show their efficiency to whole world. However, after getting admission, their performance is as par with male students but they get less chance to participate in co-curricular activities than their male counterpart. At the placement, there is equal chance of getting recruited but large drop out is visible at the time of birth of child and largest is when the child starts going to school. They need some adjustment and understanding from the employer. As both academia and industry are aware of limitation of working with women engineers but at the same time, they have lately realised their plus points and industry wants to leverage on those plus points. They are taking affirmative action to enhance participation of women engineers to improve the gender ratio.

4. Affirmative Action taken by Academia and Industry

Academia has shown keen interest in ensuring higher participation of women in engineering education. In the national capital of Delhi, there was Indira Gandhi Institute of Technology (IGIT) under GGSIP University only for women. The University Grants Commission (UGC) in the 12th Plan has upgraded the institute to a Women Technological University. In Delhi Technological University (DTU) and PEC University of Technology, Chandigarh, there is reservation of one and two seats respectively for only girl child in all branches of engineering. There is 30 per cent reservation for women student in all engineering colleges of Maharashtra and 33 percent reservation in Madhya Pradesh and Rajasthan. UGC, AICTE and DST have also several programmes for women scientists and engineers who are not in regular employment, to hone their R&D skills. In an era of stiff competition, industries have also realised advantage of women engineers which is evident from the recent hiring trend as Auto giants, Maruti and Yamaha are hiring more women mechanical engineers for better productivity and aesthetic input in the design. Engineering firms are coming forward to accommodate work life balance of women engineers. Microsoft has a programme of re-employment of women engineers who have taken break from their regular career. Women First Council is a new chapter in HCL's employee first philosophy. It's a council by the women, of the women, for the women, that provides an organized platform to address unique and special needs of the women. It gives women empowerment a new meaning at HCL Technologies. The council gives its members ample opportunities to make a difference in their lives and those of their women colleagues. Wipro EcoEnergy has partnered with UN Women to Strengthen Women's Role in Business. Most of the firms are organising seminars for their staff for gender sensitising (Singh, 2013). Though companies are adopting affirmative policies to encourage women engineers but at the implementation level, how much flexibility will be given depends on the decision of the project manager and no one likes to compromise with the profit criteria. No one likes to include the pregnant lady in his or her project and so, even though she can work she stays without work, in the corporate terminology 'on the bench' and loose some perks which otherwise she could have earned. Many leave job and though there are programmes of re-employment, it is very difficult to continuously hone skill during the period of unemployment.

5. Conclusion

Women in growing numbers are joining engineering in India and making significant dent but even then, it is at the lower side when compared with other disciplines of education. During 2010-11, their participation in engineering was around 28 per cent which is, though, higher than the share of women engineering students in USA (around 20 per cent) and Australia (around 14 per cent) but quite low when compared with other streams in India as science, medical and arts where the participation rate is around 50 percent. Not only that even after joining the labour market,

their number dwindles. At lower level of management, there are around 27 per cent women engineers which decrease to 14 per cent at middle level and at upper level, remains as low as .9 per cent. One of the reasons may be lower participation of women in engineering education before liberalization but significant number of women leave labour market during child bearing and rearing age. Women engineers need some adjustment according to their domestic responsibilities and they will be far superior employee. As both academia and industry are aware of the fact, they are taking affirmative action to improve the gender ratio. However, once a woman engineer leaves her job and even though there are programmes of re-employment, it is very difficult to continuously hone skill during the period of unemployment. The Indian Continuing Engineering Education System to think in this direction and come out with small programmes on latest technology. Associations and societies like Women in Science and Engineering (WISE)-India should mentor its young engineers because many of the young respondents have said about lack of mentor as a retarding factor.

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Biography

Seema Singh is Associate Professor in Economics and Head, Department of Humanities, Delhi Technological University, Delhi since 2006. Her research interest includes Engineers, Engineering Education and Skill Development, on which she has written extensively in various journal and presented papers in the national and international conferences and seminars. In 2000, she was felicitated with the ‘Career Award for Young Teachers’ of the All India Council of Technical Education (AICTE), New Delhi and has also worked on projects funded by national and international organisations. She is Hon. Joint Secretary, the Indian Society of the Labour Economics and Hon. Vice President, Women in Science and Engineering (WISE) India.