

Women empowerment through Engineering Education: Opportunities and challenges

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Abstract: *Engineering is usually considered to be a widely popular field of study among men and women but women in engineering are inadequately represented everywhere, including in India. With the emergence and growth of Information Technology (IT) sector since the mid-1990s there has been an enormous increase in the number of women taking up engineering studies. It is providing women with a choice of job and career opportunities and empowering them. However, a closer look into the situation would reveal that most of these women are concentrated in particular engineering streams and mostly at the entry level in the job market and their pace of career growth is constrained by various factors. This paper attempts to study the opportunities encountered by women engineers after completing their undergraduate engineering education and also assess the factors which are creating a constraint on their career growth. Not only factors at the work place but also societal factors play a significant role in enhancing as well as inhibiting their career advancement. Even though today a lot of attention is being given to women's education and their career but still the traditional notions and image of women concentrating mainly on family and home still prevails. It is expected by the society that women will work outside of their private sphere but they will be apt in doing household chores and taking up domestic responsibilities. All these along with workplace factors restrict their opportunities after a certain point. The conclusion of this paper has been reached on the basis of review of various literatures of secondary sources.*

Keywords: *Empowerment, Engineering education, Information Technology, image of women, private sphere.*

I. Introduction

At present, throughout the world, engineering as a degree is increasingly in demand among both men and women. In a developing country like India, a common dream among many middle class parents is that their sons and daughters would study science and take up engineering course which will land them with lucrative job opportunities and accrue economic benefits and a settled future. This dream motivates large number of men and women to take up engineering studies. However, numbers of men earning engineering degree outnumber that of women. Various studies within and beyond the country has shown that the number of women who are taking up engineering is still very low in comparison to men in most parts of the world (Crawford, 2012; Hill et al, 2010; Gupta, 2012; Eden, 1992). Numerous socio-cultural factors barred women from taking part in education since traditional times, and more they were not encouraged to take up scientific education. In the traditional patriarchal structure women were associated with the 'private space'. Different kinds of social practices isolated and restricted their access to 'public spaces' and they were bounded by rigid notions of 'male' and 'female' work spheres. This resulted in a lack of education among women. Indian social reformers of the 19th century advocated women's education but mainly to ensure that they would be better wives and mothers. After Independence education was seen as an instrument for modernization. The Constitution guaranteed equal rights for both men and women. But still because of a patriarchal social structure, education of women remained low. Most families were less motivated to invest in their daughter's education than sons. Parents continued to think daughter's marriage as a universal requirement and obligation and spending in education did not seem beneficial. The education system also reflected biases as in many schools science subjects were not offered in intermediate level. However, in recent times the scenario has changed to a large extent. The prestige associated with science and engineering education enables young women to earn and thereby their chances of attracting a suitable groom encouraged parents to provide higher education for girls. Also, the onset of liberalization and Globalisation in 1990's paved the way for the emergence of the Information Technology (IT) sector in India. Development of Information Technology in the recent decades widened the scope of opportunities for students pursuing engineering degree. IT sector has the potential to create employment opportunities for a huge section of educated youths including an attractive option for the women. It is estimated that while women constituted only 13 percent of the national labor force in 2001, their participation in the Information and Communication Technology (ICT) sector was higher, constituting 21 percent of the total IT workforce (NASSCOM, 2001). At present women constitute approximately one-third of the total IT workforce (NASSCOM, 2007). A major consequence of increased demand for software professionals has been its impact on women's employment. National Association of Software Services Company (NASSCOM) - Mercer Gender Inclusivity Report 2009

revealed that, number of women who are entering the workforce has increased over the years, even they are getting up the ladder till the middle level management but at the senior most level they are not adequately represented. Also women with higher education in science and engineering are still a minority group. Women engineers are getting many lucrative opportunities but the constraints faced by these women are many.

II. Objectives

This paper tries to address the following two objectives:

- 2.1. How the growth of the IT sector in India provided opportunities for women engineers to empower themselves?
- 2.2. What are the challenges faced by women from their workplace and society?

III. Methodology

This paper attempts to probe into the secondary literatures to address the questions raised in the objectives of the paper. Various books, journals, websites has been referred to arrive at the conclusion.

IV. DISCUSSION

4.1. Women's Empowerment:-

The term empowerment has been variously defined. Sen (1999) defined empowerment as the expansion of agency of an individual. This implies a change in the ability of an individual to act and bring about change through access to resources and material well being. It further defines development as a process of removing 'unfreedoms' that constrain individual agency and choices. Kabeer (1999) conceptualized empowerment in terms of "strategic life choices", comprising three inter related components which are resources, that is, conditions under which choices are made; agency, through which choices are made and achievements, which are the outcomes of choices. Kabeer (2005) has defined the term empowerment by referring to those processes by which those who have been denied the ability to make choices acquire such an ability. Those who are powerful and exert a lot of choices may not be empowered in the sense of the term implied here because they may have never been disempowered. Therefore, agency is the ability to make strategic life choices and also to control resources and decisions that affects life outcomes. So, agency is the essence of empowerment and resources as settings which are enabling to exercise the agency and achievements are the results of being empowered.

4.2. Opportunities perceived and accrued benefits:-

Engineering is a preferred course among the students in the present times because it provides them opportunities to get jobs. Since the period of Globalisation, the growth of Indian IT sector provided an important source of employment for women (Shanker, 2008). The vast amount of jobs in IT sector and high salary offered makes IT a popular career among many women in India. Women taking up engineering studies are variously motivated. Sometimes it is purely their own motivation and interest to take up engineering with the hope of getting jobs and having a career. Economic rewards, availability of work, international travel mobility, flexible work routine, physically less strenuous white collar job, social respect are factors that motivated women to take up engineering. New technology use, creative activities seemed to have been important sources of satisfaction for them. Also at times their choice is influenced by others especially family members who encourage them to take up engineering. (Sukhatme, 1992, Gupta, 2012). A degree in engineering ensures certainty of a job, moreover it makes easier to find groom for marriage. Computers related streams in engineering gives the image of being friendly, an easy access to engineering education due to growth of large numbers of private engineering colleges, and a flourishing job market in the recent years enable a family to encourage their daughters to pursue engineering career (Gupta, 2012). The ability to earn is an asset while negotiating a matrimonial alliance as the cost of urban living is very high and the desire of potential husbands for an economically "independent" wife to have dual earning families also gets fulfilled (Mukhopadhyay, 1994, p. 121). Women engineers in India appear to have a kind of social aura which enhances their status (Shanker, 2008). Women in India who take up engineering degree do not feel isolation or alienation in their college environment; rather they feel much confident and happy. The positive feedback and expected benefits about engineering course often encourage students to take up engineering. In India, engineering course is seen as a highly respectable course coupled with economic benefits and job opportunities (Escueta et al.)

Among the various streams in engineering like Electronics and Communication, Electrical, Computer science, Mechanical, Civil, women generally prefer Electronics and Communication and Computer science. This is mainly because; computer-related subjects as well as careers are considered women-friendly in India. These fields don't necessitate much physical strain and are much more in demand to the rest of the streams of engineering. Other streams have women but their number is remarkably low. Along with job prospects in IT professions there also exists favorable view regarding women in the IT sector. Varma (2009) found that

computer science stream is considered in India to be women friendly. Even the male family members of women undergraduates in engineering considers computer science as a preferred branch because it requires only mental strength and not much physical strength and moreover the jobs being office based also gives a feeling of security. Bagchi (1999) says, a career in software entails highest social approval because it guarantees a job after graduation. In a study by Parikh and Sukhatme (2004) the respondents felt that computer science and engineering were specializations most suited for women engineers. The respondents interviewed by the authors expressed their idea of balancing their roles of being wives and mothers along with their professional expectations.

The perceptions of the parents regarding engineering education as well as their expectation of their daughters having a career are facilitating the entry of large number of women in engineering education. Building a career and working outside the home provides scope for transformation of gender relations, since it breaks down the traditional division of labor in family into public and private spheres and offers scope for greater women's agency by enhancing their bargaining power within the households (Kelkar et al., 2002). This enables women to make their own decisions and thereby increase their agency and individualization.

4.3. Challenges faced by the women engineers:-

Women engineers working in IT companies in India face number of challenges from both organization and society. Parikh and Sukhatme (2004) in their study observed that career related problems are encountered since being a student. The students face problems in obtaining practical training at a favoured place and they even had difficulties in being called for a job interview. Often large number of applicants for a particular job increases competition and limits their opportunity to be called for an interview.

Moreover, it has not always been possible for women in the IT sector to challenge gender relations at work and home. Women constantly seek to balance work and domestic responsibilities and they usually do not get much help from men. Parikh and Sukhatme (1992) revealed that the women engineers assign huge importance to the role of being a wife and mother. Socialization process inculcates in women since childhood their appropriate role of being a woman and traditional gender roles which at times inhibits their career advancement. Marriage is still considered by many parents as a universal requirement and so they are more inclined to married off their daughters after they get a job. Parents sometimes think that their higher education would be a problem in finding equally qualified spouses for their daughters or it would be difficult if both the spouses do not find job in the same city. Women's choice between career and motherhood requirements occasionally creates a gap. Sometimes job requirements necessitate putting extra hour at work, travelling out of towns, which becomes difficult with role of being a mother. Many women engineers also do not prefer promotions or long term abroad projects. Moreover, in engineering taking a gap from career to pursue motherhood makes one unemployable. It becomes difficult to get work after a gap. The educated women engineers are not outside the grip of the traditional social roles emphasising marriage and motherhood. Middle class women engineers after getting a job are likely to search for partner and get married and take up their roles of being perfect wives and mother (Shanker, 2008).

Many a time's unsatisfactory work opportunities or an unsatisfactory environment also creates problems among women. Fouad, Singh, Fitzpatrick and Liu (2012) discussed the reasons why many women leave engineering career. The women in this study were separated into those who worked as engineers but left engineering more than five years ago and those who worked in engineering but left within the past five years. In their study, about ten per cent of the women stated that they left the domain in order to spend more time with their family. Nearly half of women left a career in engineering because of working conditions - travelling, no career advancement, or poor pay, thirty percent left engineering because of organizational climate and a quarter left a career in engineering because they wanted more time with family. Women who were interviewed expressed negative experiences in their role-related pressures and behaviours encountered at work. This study also mentioned that variety of personal and organizational factors are there behind current women engineers' career success. Those engineers who experienced excessive workloads and whose efforts by being successful were undermined by their supervisors and co-workers were experiencing job dissatisfaction.

The extended working hours are legitimized by the policy of 'flexi time'. It gives an employee freedom to choose his or her working hours. But in practice, one needs to work as long as necessary to finish the task at hand. Work schedule of the women engineers are varied. Unlike any other profession, women engineering graduates who has joined the industry has a very demanding job schedule. Sometimes they need to stay overnight to finish projects. This sometimes creates stress on the women engineers. Those women engineers who work in Core Sectors have a scheduled time of work but those who works mainly in IT sector, their work timings are not fixed. They need to give at least 8-10 hours at work to finish the amount of work allocated to them. Most of the respondents need to travel for almost an hour to reach their workplaces. And in total they get only 4 hours for their relaxation and personal work or bulk of domestic work are also required to be done within this time. Also, few companies give the option to work from home. That is of benefit for these women who can

do the work from home also if they need. IT work requires sometimes night shift work. But it generally does not continue for a very long time. Sometimes night shift work continues for 15 days and then again day shift for 15 days, and again night shift for 15 days and in this way the cycle is repeated for 3 months. At times it continues for 3 months at a stretch.

Engineers in core sector are sometimes required to go for plant visit. Those plants are located far away from cities and do not even have a proper toilet facility for women. This creates health hazards for the women engineers. Moreover, women working in Telecom sectors are also sometimes required to go for field visit which becomes quite stressful for them, as they need to go to office, then field, then again return back to office and then they return home. The home to workplace and from workplace to home schedule gets extended as a result. The field work in distant places sometimes becomes a cause of security concern for the female employees. They prefer to go to those places if they are accompanied by some other female or male employee.

The works of these engineers are not homogenized. There are multifarious factors which creates constraint on the female employees.

From this research it could be seen that informal communication and contacts are essential for exchange of professional information, collaborations and recognition. But many women are unable to participate in this type of communications because of their need to balance work and home. Women, compared to men spend less time in informal networking among colleagues (Shanker, 2008). Most of these interactions occur in social gatherings which take place outside of office hours which sometimes prohibits the women employees to engage in those communications.

It is generally observed that though women are employed and work outside the home, they are required to do a large share of work at home than men does. The educational level of women had no significant impact on the activities done by women. Household burden mostly falls on women. The demands of home and career lead to a dual burden. Patriarchal system imposes greater marital obligations where the in-laws families and relatives are required to give special attention. Sometimes, migration from an earlier place of work to another due to marriage also affects a woman's career. The traditional mind set about stereotypical men and women roles prevents men from sharing domestic responsibilities with their spouses. However, many men today understand and share a large segment of the household work.

These are the few constraints faced by women in their life as a result of their job which creates an impact on their work life. Women are found at entry level and middle management roles, there is still a lack of presentation of women across all job functions and at senior levels within many organizations.

V. Conclusion

Presently a large number of employments occur in the Information Technology sector. It has become the largest private sector employing women in India. Women's participation in IT industry has enhanced their mobility (Shanker,2008). Women engineers are attracted by the economic benefits as well as the employee friendly human resource policies. However, in spite of the advantages, in reality, a large number of constraints inhibit women's entry, retention and career growth. This restricts women to remain mostly in the lower level jobs. Half of the Indian women fall into the category of empowered in terms of having higher education, exposure to mass media, job, freedom of movement and large part of them do not have any autonomy in matters of decision making. Moreover, culture and social influences have a larger role to play in shaping women's autonomy and agency. Shanker (2008) also believes that emancipation and agency of women is limited to public spheres only and not much has changed in the domestic private sphere and patriarchal domain highlighting instances of women leaving up job and career in IT sector to take up domestic familial responsibilities.

It can be concluded that the emergence of IT sector has no doubt enhanced job opportunities for women and have help them to empower themselves economically and to a large extent socially in spite of the constraints and the challenges faced by them from workplace and society. They are in a process of transition whereby they have been able to establish their sense of agency and autonomy in the public sphere at least to some extent but still a lot more remains to be negotiated with respect to private domestic sphere.

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