

Title of the Project :	Women Engineers in India
Principal Investigator :	Prof. (Mrs) P.P. Parikh , Prof. S.P. Sukhatme
Implementing Agency :	Indian Institute of Technology, Mumbai
Year of Completion :	May 1992

Objectives :

The objectives is to provide a firm basis for formulation of corrective strategies. The study accordingly centres around assessment of the following aspects of the subject :

- ▶ The objectives is to provide a firm basis for formulation of corrective strategies. The study accordingly centres around assessment of the following aspects of the subject :
- ▶ Enrollment history and current trends.
- ▶ Identification and study of the influencing factors.
- ▶ Job opportunities for women engineers.
- ▶ Career profiles and professional achievements of women engineers.

Definition of the Sample of the Study :

The population under consideration for the present study consists of women who have obtained their Bachelor's degree in engineering (B.E., B.Tech., B.Sc. (Engg) from all over the country during the 16 year period from 1975 to 1990. On an enrollment basis it covers the period from 1970 to 1986. Enrollment data for the years 1987 and 1988 have also been collected to affirm the current increasing trends.

The annual out-turn of engineering graduates (men and women) during the period 1974 to 1987 is stated to have steadily increased from 14079 to 25770 [15] [16]. Thereafter it has undergone a steep increase with the output from private engineering colleges joining the stream.

The enrollment of women in engineering degree courses increased from 1.3% in 1974 to an estimated 6% in 1987 [17]. This quite agrees with the data collected during this period as discussed in CHAPTER-2 (TABLE 2.3). The values are estimated to be 9%, 10% and 11% in the subsequent years i.e. 1988, 1989 and 1990. The method adopted for arriving at this estimate of the population of women engineers is described in Annexure-1B

From the above sources of data, the total output of engineering graduates for the period under study is estimated to be 337100, while the population of the women engineering graduates works out to be about 18875. Since the number of women engineers who have graduated prior to 1975 is very small, the estimate of total national stock of women engineers graduated upto 1990 works out to be 19180 on similar basis.

It should be noted that the sample in the present study encompasses the different phases of changing scenarios of women in engineering. The initial era around 1975 relates to participation levels as low as one percent. During this period, being an engineer was, an exception and the number were so low that the relevant problems neither surfaced nor were discussed. From 1981 to 1986 the numbers started increasing and poorer employment opportunities for women engineers became known. The need for a discussion regarding the personal and career problems faced by women engineers also became obvious. A further increase in numbers warranted quantifications of these problems and formulation of possible solutions.

This study has been taken up keeping in view that the participation of women in engineering courses is fast increasing and that the numbers will continue to grow.

Getting them into the main stream of the profession is important for the social and economic development of the country. The sample chosen for this study provides for the identification and quantification of the full cross-section of the problems faced by women engineers in the development of their career

Executive Summary :

A detailed study on the participation of women in engineering courses and in the engineering profession has been conducted for the period 1975-90. The number of women taking up engineering has increased many fold in this period. The percentage has increased from around 1% in 1975 to about 10% in 1990. In a few colleges in some states, women now constitute upto 30% of the enrollment in certain disciplines. On the other hand, the percentage of women in IITs and RECs has remained low.

The national stock of women engineers is estimated to be 18875 upto the year 1990. Of these, 16162 women engineers were located through systematic efforts and primary information about the year of graduation, branch and state obtained. A strctured questionnaire was then mailed to over 5000 women, whose current addresses were available. 2753 completed replies were received and analysed. This set of replies was called the Questionnaire Response Sample (QRS). Checks show that the QRS is a large random sample and is representative of the total stock.

An examination of the data shows that Kerala has the largest population of women engineers closely followed by Tamil Nadu and Karnataka. Maharashtra, Andhra Pradesh, Gujarat, Madhya Pradesh, West Bengal and UP come next, in that order. Electronics is the most preferred branch amongst women. Electrical and Civil Engineering rate next to Electronics followed by Computer Science, Chemical and Mechanical Engineering.

An analysis of the academic career of the respondents shows that about 75% of them have ranked in the upper 10% of their class at the high school/junior college level and that their performance at the engineering degree examination has been very commendable. Most of the girls had decided on taking up engineering as a career at the secondary or higher secondary level. In arriving at this decision, they seem to have received the maximum encouragement from their parents.

A study of the personal background of the respondents shows that an engineering education does not have a negative effect on the age of marriage. Over two-thirds have had an arranged-type of marriage and nearly one-half feel that their marriage prospects were influenced in a positive manner because of being an engineer. Husbands of women engineers generally have an equal or higher level of education with a large fraction belonging to the engineering profession. Most of the married women engineers feel that their husbands have encouraged their career. Engineering is also the dominant profession among the fathers of the respondents. On the whole, it is seen that most women engineers have family and social attitudes similar to other educated women in India.

Data on the job status of women engineers indicate that 66.3% are employed, 2.4% are self-employed and 5.2% are post-graduate students. It also indicates the very disturbing fact that 26.1% are unemployed. An analysis of the unemployed engineers shows that about 40% of those who graduated in 1989 and 1990 are unemployed, that the highest percentage is in Kerala, and in the branch of Civil Engineering. As far as the sector of work is concerned, it is seen that the largest number (26.9%) of women engineers are employed in educational institutions. This is followed by the government/civil service (22%) the public sector (18.9%) large scale private sector (12.7%) small scale private sector (9.1%) and government R&D (8.9%) An analysis of the salaries and designations of the respondents shows that in general, salary levels are low and the pace of career advancement is slow. A break-up of the salary data in terms of the type of employer shows that the large scale private sector pays the best, while the small scale private sector pays the

least. Government R&D organisations, educational institutions, government/civil service and public sector industries fall in between the above two extremes in the order mentioned. In response to a question on management and administrative responsibilities, it is seen that the number of respondents having top level management responsibilities is very small. This is true even amongst senior respondents, and confirms the fact that the pace of career advancement is slow.

A number of questions have been posed with the objective of determining the career expectations and values of women engineers. Amongst the various sources of satisfaction in their professional life Exposure to new techniques/technologies and Involvement in creative/pioneering activities are rated as the primary sources. As far as their personal life is concerned, married respondents place Happy family life as the primary source of satisfaction. On the other hand, single respondents rate own career development as their primary source of satisfaction. However even amongst single respondents, over a third are looking froward to a happy married life. The preceptions of the respondents on certain competing facets of their personal and professional lives clearly show that by and large women engineers would like to fulfil the role expected of them as wives and mothers. At the same time, they assign equal importance to their career and are determined to make it a success.

Most women engineers have no preference regarding whether their colleagues should be male or female. Professional competence and cooperative attitudes are considered as important qualities expected from colleagues. The sex of the person is considered irrelevant in this context. Inspite of the difficulties faced by them, most respondents have no reservations in advising younger women to take up engineering as a career. The respondents believe that with increase in numbers, acceptance will follow and the present difficulties will get resolved.

Women have to face a variety of problems in their career. A significant percentage have difficulties as students in obtaining practical training at a preferred place. The percentage having difficulties in being called for a job interview is even higher. It increases further when one considers those having difficulties in getting a job. Many organisations do not even hesitate to state that women engineers are not acceptable to them. A large number of respondents have reported that their career has been affected by unsatisfactory work opportunities or an unsatisfactory environment. Low salaries and the lack of suitable accommodation facilities are often cited as major reasons because of which respondents have had to refuse jobs.

Finally a number of recommendations for action have been made in order to improve the present situation. Some of these corrective measures are educative in nature and some regulatory. The educative measures are primarily concerned with the formulation and implementation of awareness programmes for schools girls, their parents and their teachers to inform them about the career opportunities for girls in the engineering profession. Awareness programmes have also been suggested for employers and it has been recommended that IITs take special initiatives for attracting more girls. Free professional education for girls (at least in the states where enrollment levels are low), more scholarships and awards for deserving students, provision of additional seats, and adequate provision for residential hostels for women emerge as some of the immediately needed corrective measures in order to increase enrollment. In order to ensure increasing participation of women in the profession, it has been recommended that industrial concerns be required to submit annually a record of employment of engineering staff with a specific mention of the number of women engineers employed and that a women member should be appointed on interview boards. The creation of physical facilities like working women's hostels and child care centres in manor cities has also been suggested. As far as service rules are concerned, it has been recommended that married women engineers be eligible for long leave upto one year, twice in a their working career, during the child bearing and rearing period

and that they be given the option of flexible working hours and part-time jobs, at least for some part of their working career. It has also been suggested that a national forum of women engineers be formed to take up, publicise and create awareness of the issues related to women engineers.

From the point of view of planning and initiating the above mentioned recommendations, it is suggested that a body be formed under the National Commission on Women. This body would have the responsibility for monitoring the effectiveness of the programmes initiated.