A NATIONAL SURVEY OF WOMEN AND MEN ENGINEERS

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Introduction

In 1993, the Society of Women Engineers completed a survey of 2000 male and female engineers selected from the members of 22 engineering societies. Significant findings were published in a 40 page report, available from society headquarters. This paper will provide background on the survey and highlights of the findings, focusing on career advancement, job satisfaction, and salary comparisons.

Background

In the 1970s and early 80s, the Society of Women Engineers did what many organizations do, that is survey its membership and publish descriptive reports. SWE published several reports called "A Profile of the Woman Engineer", containing information on SWE members including age, marital and family status, education, geographic distribution, type of employer, and salary data. The work of collecting and analyzing the data and publishing the report was all done by volunteers. In the late 1980s, the Society decided to take the Profile project a step further and attempt to collect data on women engineers who were not members of SWE and to attempt to compare data on women engineers to information about the engineering workplace as a whole, that is with men engineers. SWE contacted the Engineering Manpower Commission (now known as the Engineering Workforce Commission), and with their encouragement developed the questionnaire and conducted a pilot test of the survey.

The pilot survey was conducted using members of the Society of Women Engineers and members of the National Society of Professional Engineers in the upper midwest, SWE's Heartland Region, including Michigan, Indiana, Illinois, Iowa, Wisconsin, Minnesota, North and South Dakota. A single mailing was distributed and a 46% overall response rate was obtained, with a significantly higher response from the women than from the men. The resulting database contained approximately 200 women and 200 men. The data were analyzed and published in January 1991 as Engineering Manpower Commission Bulletin Number 107. Based on the success of the pilot survey, financial support was solicited for national implementation.
SWE contracted with the American Association of Engineering Societies, the parent organization of the Engineering Workforce Commission, for national implementation of the survey. Members of engineering societies were selected as the easiest and most cost effective pool of potential survey respondents. Approximately 500,000 engineers belong to one or more of the 22 societies participating in the study, representing about one third of the total number of engineers in the U.S., so any compromise in the representativeness of the data due to restricting the sample to society members is believed to be small. Mailings were sent out to over 3000 engineers across the country, with two follow-up mailings to improve the response rate. The final response rate was 55%, somewhat short of the goal, but good enough to provide a margin of error in the data analysis of plus or minus 3%.

The sample is stratified by specialty in order to obtain sufficient data on many of the smaller engineering disciplines. During the data analysis, weighting factors were applied based on the actual distribution of engineers across gender and discipline according to data maintained by the Engineering Workforce Commission.

Findings

The SWE survey collected data on demographics, family status, motivations to enter the profession, education, employment history, performance assessment, salary, career progression, and job satisfaction. Due to space limitations, this paper presents highlights of the findings, including an overview of education, professional registration, and number of employers, and a more in-depth look at the data on salary, management participation, career obstacles, and discrimination.

Education The survey respondents are a highly educated group, with forty-four percent of the weighted sample having advanced degrees. Women are slightly more likely than men to have a non-engineering bachelor’s degree. Women are slightly less likely than men to have an advanced degree (38% vs. 45%), but this is an artifact of age. For engineers under 40 years old, women are actually more likely than men to have an advanced degree (27% of women vs. 17% of men). About 14% of the male respondents have PhD’s compared with only about 6% of the women.

Professional Registration Across the board, regardless of discipline, type of employer, or age, men are much more likely than women to pursue and obtain registration as professional engineers (40% of men vs 14% of women). Broken down by technical specialty, even in the civil and environmental areas, where career advancement often requires the P.E. license, a higher percentage of men are registered (82% vs 51%). The reasons for this discrepancy are unknown, but worthy of further investigation. In today’s uncertain engineering marketplace, with cutbacks in defense spending and restructuring of the manufacturing sector, professional registration can be a valuable credential in an engineer’s job search.

Average Number of Employers The difference between male and female engineers in number of employers is slight. Regardless of gender, the typical mature
engineer has worked for four different employers over the course of his or her career. It will be interesting to track changes in this statistic as a result of the current restructuring of the engineering workplace. An engineer entering the workforce today is much less likely to spend his or her career with a single employer than in the past.

Organization Shakeups in Last 5 Years SWE asked its survey respondents the same question asked of all U.S. adults by the National Opinion Research Center's General Social Survey. This finding is one of the most striking of SWE's study. Fully three times as many engineers experienced major reorganizations in their employers during the last five years as did the general population (60% of engineers vs 21% of the general population). This comes as no surprise to many engineers, and graphically demonstrates the changes going on in today's engineering workplace.

Average Annual Salary According to the College Placement Council, entry level salary offers for women engineers are as good or better than those offered to men. SWE's data confirm that finding, but show that before engineers enter their thirties the men pull ahead in base salary and continue pull farther ahead for the rest of their careers. This graphic was used on the cover of the survey report.

Average Annual Salary (Weighted Data, Fall 1992)

Satisfaction with Salary Compensation The SWE survey collected satisfaction data on twelve aspects of the engineers' current jobs, on a scale ranging from plus two for "very satisfied" to minus two for "very dissatisfied", with zero being neutral. A plot of satisfaction with salary by age and gender is particularly interesting when compared with the actual salary data above. Women engineers in each age decade are more satisfied with their salaries than their male colleagues, even though for the most part they are earning less.
Participation in Management  Fifty-one percent of the men in the SWE survey feel they are a part of management, while only 32% of the women do. This difference holds true across age groups and size of employer, so it is not purely a result of the fact that the average male engineer is nine years older than the average female engineer. The survey also asked how many layers of management between the engineer and the top of their organization, and the responses confirm this result.

Once engineers become managers, the differences between male and female managers are slight. They both manage, on average, twelve other people, seven of whom are engineers. The male and female engineering managers in SWE's study earn comparable salaries through their mid-forties, with the salary curve diverging only for engineers over 50 years of age.

Satisfaction with Advancement Opportunities  When asked how satisfied they are with advancement opportunities in their current job, men and women both start their careers with a somewhat optimistic outlook. As they progress through their twenties and thirties, reality sets in and their assessment becomes more neutral. In their forties, however, men's outlook becomes more positive for the remainder of their career, while the women's outlook levels off.

Satisfaction with Career Prospects  When asked about satisfaction with career prospects in the context of their overall engineering careers (not just their current position), the engineers are little more positive, but the trend across the age groups is similar. Younger engineers start their careers with a positive outlook, becoming less optimistic as they grow older. As they mature, the outlook becomes more positive again, but older women are considerably less satisfied than older men.

Greatest Career Obstacle  The survey instrument included an open ended question asking respondents to describe their greatest obstacle to career advancement. About 80% of the women and 70% of the men responded to this question. Their answers can be grouped into five major categories: the economy, personal issues, management, discrimination, and work/family conflict.

Men in all age groups cited the economy as their greatest career obstacle. Women also were concerned about economic conditions, but other types of obstacles were more important for women in most age groups. This category includes comments about the lack of promotion opportunities in organizations that are experiencing downsizing and layoffs and references to cutbacks in defense spending as well as general comments about economic conditions.

The category of personal issues includes things that the individual has some control over, such as the need for specialized training, an advanced degree, or preference for a different type of job. This was the most frequently cited category for women under 30, and the second most frequently cited category for men under 40.

Comments about management include complaints that upper management is only interested in short term profits with no long term perspective and that the organization was managed by accountants and lawyers with no technical understanding as well as comments about the incompetence of their immediate supervisor. These comments
were more frequently made by men than by women.

Discrimination was cited as one of the top three obstacles by women in all age groups, becoming a more important factor for older women. Comments referring to the "glass ceiling" were included in this category.

Work and family issues become the most frequently cited obstacle to career advancement for women in their thirties. This category includes the need to spend more time with children and comments about the need to relocate to accommodate a spouse’s career.

**Equitable Treatment** The survey results show a big difference in perception between men and women regarding equitable treatment. More than twice as many men as women feel that the sexes are always fairly treated. Three times as many women as men feel that there are consistent inequities. Over eighty percent of the men say they have no personal awareness of incidents where people have been "overlooked", but 58% of the women engineers say they are aware of such incidents with respect to women.

**Are Men and Women Treated Equitably?**

Twenty-eight percent of respondents are aware of inequities affecting minorities. 65% of the non-minority men say people are always treated equitably on the job, but only 44% of the minority men agree. 37% of the non-minority women and 32% of the minority women agree that people are always treated equitably.

**Satisfaction with Equitable Treatment** This disconnect is echoed in the satisfaction data. When asked how satisfied they are with the equitable treatment of people in their current jobs, both men and women are somewhat positive, with the men being more approving than the women, becoming more so with age. Women tend to become less satisfied with the equitable treatment of people as they get older, perhaps as they encounter the "glass ceiling".

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Conclusions

In summary, the SWE survey collected a wide range of information on the career experience of women and men engineers. Some of the most significant findings relate to the high level of uncertainty in today’s engineering workplace for both women and men, and as illustrated by the salary graph, women tend to start out in the workplace at parity with men or better, but as they progress through their careers the men catch up and continue to pull ahead.

Next Steps

The survey report published last summer presents only the most significant findings of the study. Additional analysis of the salary and satisfaction data by engineering specialty and type of employer is underway and will be presented at the SWE convention in Pittsburgh in late June. We have plans to analyze the data on Asian Americans in more detail. Many other opportunities remain for more in depth analysis.

SWE plans to repeat the data collection on a periodic basis in order to track changes in the engineering workforce as women continue to increase their participation in the profession. Additional funding is being sought for these continuing studies.

SWE is using the findings of the survey to increase corporate awareness of obstacles to women engineers in the workforce and to set priorities for career development and work/family programs for its members.

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1 A National Survey of Women and Men Engineers: A Study of the Members of 22 Engineering Societies, Society of Women Engineers, 120 Wall Street, New York, NY 10005-3902.