

CREW revisited in 2007 - The Year of Women in Engineering

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Abstract

The Careers Review of Engineering Women (CREW) was a nationwide survey conducted by the National Women in Engineering Committee of Engineers Australia in 1999. It showed that women were generally less satisfied with their engineering careers than were men, and that they were more likely to leave the profession. In 2007, which has been declared the Year of Women in Engineering by Engineers Australia, the CREW survey has been repeated. This paper discusses the initial results of the 2007 survey and compares them with the 1999 data. The results indicate a slight improvement in the workplace satisfaction of both men and women. However, sexual harassment, discrimination on the basis of gender and bullying (of both men and women) remain major concerns.

1. INTRODUCTION

In a time of severe skills shortage in the engineering profession, women still make up less than 10% of professional engineers in Australia. Engineers Australia has recognised that the attraction and retention of women in engineering is both morally and economically important and has declared 2007 - The Year of Women in Engineering, to raise awareness about the issues of concern to women in the engineering profession, as well as to celebrate their contribution to it.

A nationwide survey was conducted by the National Women in Engineering Committee of Engineers Australia in 1999, titled the Careers Review of Engineering Women (CREW) (Roberts & Ayre, 2002). The CREW study indicated that disturbing levels of sexual harassment and discrimination were being experienced by women in the engineering profession, that they were generally less satisfied with their careers and career progression than were men and that they were more likely to leave the profession than men. The initial survey was then followed up in 2002-3 with in-depth interviews of both women and men engineers, which showed that women tended towards one of three ways of coping with engineering workplaces. The first was to adopt a feminine identified strategy, often being considered as a daughter figure by their co-workers. The second was to become "one of the boys" and the third was to become a change agent in the workplace. Unfortunately, leaving the profession tended to be the strategy adopted when any of these three failed or became too hard to sustain. (Mills et al, 2006). In 2007 the CREW survey has been repeated and this paper provides an early analysis of some of the data.

2. RETENTION AND WORKPLACE SATISFACTION OF WOMEN ENGINEERS

The number of women entering the engineering profession in Australia and other western countries remains low, and recent figures indicate that both the number and percentage of women entering university to study engineering have decreased in Australia since 2001 and that this trend is also being mirrored in the UK, USA and Canada (DEST 2000-2006). Not only are the numbers of women entering the profession on the decline, the retention of women in the profession after they have completed their study remains a major concern. A major US report on women in Science, Engineering and Technology (SET) indicated that women are twice as likely as men to leave engineering and science careers and also have much higher exit rates than women in

other professions (CAWMSET, 2000).

The CAWMSET report in the USA was released in the same year that the European Technology and Assessment Network (ETAN, 2000) reported on mainstreaming gender equality through science policies in the European Union, and more recently in 2002, the SET Fair report was released in the United Kingdom (Greenfield et al, 2002). The workplace related recommendations of each of these reports followed similar themes. All recommended that the regular gathering and reporting of gender-disaggregated statistics, either by employers or a national body, on the career development and advancement of female employees in areas such as participation, pay, career development and advancement was essential if progress was to be monitored. The CREW survey is one means of collecting such statistics in Australia. Legislative measures such as removal of existing laws that impede the advancement of women, awarding of government contracts to be conditional on compliance with equal opportunity requirements and aiming for gender balance on public bodies related to SET were recommended in the ETAN report. All of the reports included recommendations relating to the adoption of a workplace environment that is inclusive and respects diversity.

The database derived from the CREW survey is not particularly useful for gauging retention of women engineers, as the survey was only sent to current members of Engineers Australia, which is the largest learned society for engineering in Australia and represents engineers from all discipline areas. Hence if respondents have retained membership you would expect them to be still working in the profession.

The first female members of Engineers Australia joined in 1952 and the number remained below 100 until 1981. Current membership is still only 6.4% female (Engineers Australia, 2007, pers. comm.) In comparison IChemE in Australia has 18% female members (excluding students). One measure of retention that can be gleaned from the longitudinal membership statistics provided by Engineers Australia, is the progression of women from graduate membership to full membership, which would usually occur 3 to 4 years after joining as a graduate member. If women are progressing and remaining in the engineering profession, then the difference between the cumulative total of females at member grade and the total number of female graduate members four years previously should be both a positive and increasing number. However, this figure was actually negative from 1997 to 2006 and has only become a small positive number in the last two years. This indicates both that women were not progressing to full membership, so presumably were leaving, and that women who were already full members were also exiting the profession. It appears that this trend may have just turned the corner and that the retention of women within Engineers Australia is starting to improve.

Clearly these statistics indicate that women in engineering as a profession, and almost certainly at the vast majority of individual engineering workplaces, still fall well short of the critical mass required for them to be able to influence culture and communication within, and attract other women to, the profession or workplace. When women constitute less than 20 per cent of a profession and/or workplace they may be termed a “struggling minority” subject to unequal treatment (Martin, 2004).

3. THE CREW STUDIES OF 1999 AND 2007

The 1999 CREW study was carried out using hard-copy questionnaires mailed to a total of 2269 members of Engineers Australia - 1819 to female members (representing all females at graduate or higher levels of membership at the time), and 450 to male members, matched with the female sample in terms of membership grade, engineering discipline and geographical distribution by state. Responses were received from 767 female engineers (42.2% response rate) and 122 male engineers (27.1%).

The 2007 CREW study was carried out using an on-line questionnaire survey, which respondents accessed following an invitation by email (or by letter to approximately 500 female members who did not have email listed on EA database) to a total of 8214 members of Engineers Australia – 3214 to female members (representing all females at graduate or higher levels of membership at the time), and 5000 to male members, matched with the female sample in terms of age, college affiliation and geographical distribution by division. Responses were received from 1,187 female engineers (36.9% response rate) and 605 male engineers (12.1%). Figures 1 and 2 show the profile of respondents with respect to age and college affiliation and indicate a well matched sample with respect to gender.

Female and male engineers joined the engineering workforce in similar proportions after graduation, at 86.1% and 87.3% respectively, slightly closer figures than in 1999. The study found that 95.9% of men were currently working as engineers whilst 4.1 % of men were no longer working as engineers, and 92.7% of women were currently working as engineers whilst 7.3% were no longer working as engineers. This is not surprising since only current members of Engineers Australia were invited to participate in the survey.

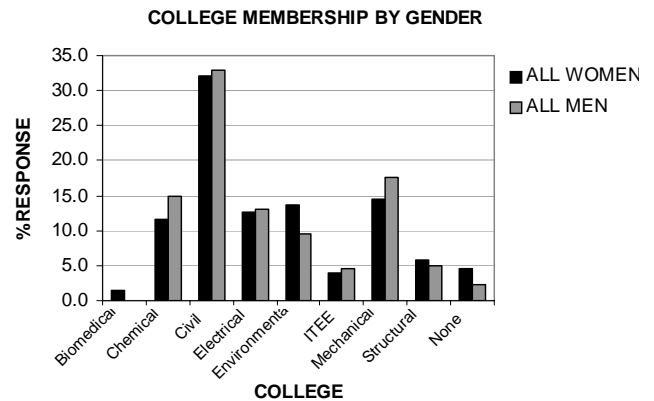
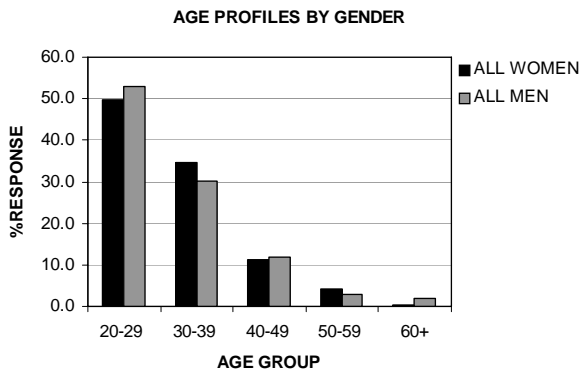


Figure 1 Respondent profile by age and gender (2007)

Figure 2 Respondent profile by college affiliation and gender (2007)

Figure 3 shows that women who were no longer working as engineers have an age profile that peaks in the 30-39 year age bracket. While 39.0% of the women who were currently not working as engineers said they had left the engineering profession altogether and were working in another role, 21.1% reported that they were taking a career break and intended to return to engineering eventually. Males who were no longer working as engineers had an age profile that peaked in the 20-29 bracket, with another group over 60 who generally indicated that they had retired. Of the men who were currently not working as engineers 25.6% reported that they had left the engineering profession altogether and were working in another role, while 23.1% said that they were taking a career break (often for travel) and intended to return to engineering eventually.

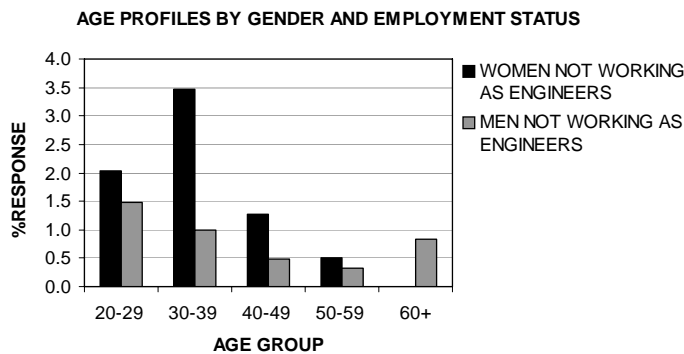


Figure 3. Age and gender distribution of those not currently working as engineers (2007)

4. WOMEN’S EXPERIENCES IN ENGINEERING WORKPLACES

The studies, both in 1999 and 2007, show that many women in engineering experienced a difficult workplace. For some women that was their experience on a daily basis. Workplace culture and conditions remained a source of dissatisfaction for women in 2007, and the practices of discrimination, harassment and bullying were still prevalent.

4.1. Workplace satisfaction

The study explored multiple individual factors contributing to workplace satisfaction. Table 1 shows women’s and men’s ratings of selected workplace conditions in order of those that women found to be most

dissatisfactory. In evaluating their overall satisfaction with workplace conditions, 74.2% of all women reported that they were satisfied or very satisfied and 11.6% that they were dissatisfied or very dissatisfied, compared with 78.4% and 8.0% of men respectively. These results indicate some positive change for both men and women when compared to the 1999 study in which the equivalent figures were 60% and 19% of all women, compared with 70% and 10% of all men. The conditions that both women and men found to be most dissatisfactory were related to opportunities and recognition for promotion. Results for the Chemical Engineering college members were similar to the overall sample.

Table 1. Degree of workplace satisfaction by gender (2007)

Workplace condition	% dissatisfied & very dissatisfied		% satisfied & very satisfied	
	Women	Men	Women	Men
Chances of promotion	21.7	17.4	47.0	54.6
Opportunities (with pay) for staff development/training	17.9	18.5	63.4	60.4
Opportunities to use your abilities	17.7	15.1	66.3	66.6
The amount of responsibility you are/were given	11.3	8.3	76.0	77.8
Overall Job as a whole	11.6	8.0	74.2	78.4

It was common for women to report a lack of opportunity if they worked part-time because of parental or other carer responsibilities.

Management do not reward people working part time, regardless of the contribution they make to the organisation. While things are improving, I have had to fight tooth and nail to gain promotions because I am "only part time". This is despite the fact that I manage my own projects without assistance, contribute to company profitability on par with my full time colleagues, win new work on par with my full time colleagues, and work extra hours when needed to "get the job done". Therefore, I expect that I will need to continue to argue my merits in order to gain promotion next time too.

I do feel that even though employers are prepared to employ me part time since I have children they are not really prepared to promote me. I actually have significant and rare experience that is increasingly sought after but feel that since I am a parent I am denied opportunities for promotion.

4.2. Sexual harassment, discrimination and bullying

One of the most disturbing findings of the 1999 CREW study was that 36% of all women reported that they had experienced discrimination while working as engineers, and 27% reported that they had been sexually harassed. The 2007 study also surveyed these aspects and in addition respondents were asked to report if they had experienced bullying. In this study 42.3% of women reported that they had experienced discrimination while working as engineers, 22.0% reported that they had been sexually harassed and 28.2% had experienced bullying. It is pleasing that the reported incidence of sexual harassment has decreased (although 22% is still unacceptably high), but very disappointing that reported discrimination has actually increased since 1999. By comparison, 15.8% of men reported that they had experienced discrimination while working as engineers, 2.8% reported that they had been sexually harassed and 18.6% had experienced bullying.

Table 2 shows the basis of discrimination as indicated by the women who reported it. It is clear from this table that gender remains the overwhelmingly dominant basis of discrimination experienced by women in all age groups in engineering workplaces. Although the question asked whether they had experienced discrimination at any time during their career, it is also clear that it is not a historical phenomenon, since significant numbers of women in the younger age groups reported experiencing discrimination due to their

gender. Comments from women also indicated that both discrimination and sexual harassment remain as ongoing issues for them. Women reported that they were harassed, and also their opportunities were reduced, because of actual or potential family responsibilities and pregnancy.

Minor verbal harassment from operators - "you should be at home with the kids". Minor 'well meaning' comments from bosses - "if you're just filling in time before having kids this is all you need to do, otherwise if you're interested I can help you do some other stuff". Senior management making comments as I resigned "how do you think you're going to survive consulting - you're only 25 and a woman" confirmed my suspicion that promotions were not going to be coming my way too soon due to my gender

There is an expectation that women will leave after they have children or at least will no longer be a fully functional human being.

Table 2. Basis of discrimination reported by female respondents (2007)

Basis of Discrimination reported by female respondents	Age groups (% of total females reporting discrimination)					
	20-29 %	30-39 %	40-49 %	50-59 %	60+ %	Total %
Age	3.7	2.0	0.0	0.2	0.0	5.9
Being new to the job	2.0	0.9	0.7	0.2	0.0	3.9
Carer's responsibility	0.2	1.8	0.9	0.0	0.0	3.0
Disability	0.7	0.0	0.2	0.0	0.0	0.9
Gender	19.2	21.8	7.6	4.2	0.2	53.0
Junior status	6.5	2.8	0.4	0.0	0.0	9.6
Marital status	0.4	0.7	0.2	0.0	0.0	1.3
Pregnancy	0.4	1.7	0.6	0.0	0.0	2.6
Race	1.3	1.8	0.6	0.0	0.0	3.7
Sexual preference	0.2	0.6	0.4	0.0	0.0	1.1
Other	5.4	5.4	3.0	1.1	0.4	15.1

The majority of women who responded “other” to the question reported that they had experienced discrimination on more than one basis, such as both gender and age. Women also described numerous instances of sexual harassment that sometimes caused them to resign from positions and was occasionally severe enough to impair their health.

Inappropriate behaviour experienced- i.e. touching, kissing, comments that were entirely unwelcomed and uninvited.

I no longer wear skirts to work as when I was standing on a stool to reach high files my then boss put his hand up my skirt. I resigned rather than make a fuss. Also As a setting out engineer working on site I endured groping, innuendo and sexual propositioning.

Dealing with the porn videos on the mine site that were watched during the lunch break was more than I could handle (hearing pain screams of a woman (with a horse) in a video in the background - while I was trying to eat my sandwich). Contractors asking me if I like sex and things of that nature. ... When I could finally leave I was in therapy for a while.

As reported in the 1999 study, women in 2007 also reported that colleagues, managers and clients expressed views that women were not suited to being engineers and managers.

In the 5 yrs after graduating I worked for a few companies, was sexually harassed by my supervisor, told I couldn't do my job well because I was a woman, told I should go somewhere else, that I was taking jobs from men, that I would be better off quitting and having children, the list goes on.

The study found that 28.2% of women and 18.6% of men reported that they had experienced bullying by their boss or co-workers. This reported incidence of bullying is concerning, adding another disturbing

element to the nature of the workplace culture in engineering organisations. Bullying was the prevailing workplace problem reported by men, but was also experienced by women. It was sometimes also accompanied by worrying reports of unethical business and personal behaviour.

It never occurred to me that I was being bullied until I unexpectedly happened to read an article about it. The personality of the bully was captured succinctly and clearly, and I realised then that it wasn't that I wasn't doing the job well, it was that he didn't know how to communicate properly to get what he wanted from his staff, so he bullied instead. What bothered me most was the use of gossip and stories (by the manager!) to belittle other staff members and to reduce respect for those who did not fit his behaviour expectations, which included lying to clients and falsifying information.

The bully was my direct manager. He used to bully two other staff as well. He would spy on employees, read personal emails, log toilet trips, threaten staff, make up stories to tell the boss to create ill feeling about you (i.e. she's always late, she didn't do this report properly, this is my work, she's not really sick... - which was all very untrue), photocopy personal documents, prevent you getting good jobs, ensure you always were given the 'bad tasks', etc

5. CONCLUSION AND THE WAY AHEAD

Given the increasing awareness by some engineering companies of diversity issues, and the increased introduction of family friendly policies such as paid maternity leave, it was hoped that there would be some improvement in women's engineering workplace experience since the first survey was conducted in 1999. The 2007 study indicates that there has been some improvement in the percentage of women still working as engineers and overall workplace satisfaction has improved for both men and women. While reported sexual harassment has declined marginally, it is still unacceptably high. Disappointingly, the incidence of workplace discrimination has actually increased since 1999, with gender being the overwhelming reason given for discrimination in all age groups of women. Bullying, which was surveyed for the first time in 2007, is experienced by both men and women in engineering workplaces. Achieving an inclusive and supportive workplace culture in engineering organizations remains a significant challenge.

6. ACKNOWLEDGMENTS

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