The Society of Women Engineers National Survey about Engineering

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Women Engineers

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The Society of Women Engineers (SWE), founded in 1950, is a not-for-profit educational and service organization. SWE is the driving force that establishes engineering as a highly desirable career aspiration for women. SWE empowers women to succeed and advance in those aspirations and be recognized for their life-changing contributions and achievements as women engineers and leaders.

The SWE Retention Study: Analysis, Outcomes, and Proactive Strategies

The Society of Women Engineers is pleased to provide the Corporate Partnership Council this packet of detailed analysis, outcomes, and resources based upon the SWE Retention Study.

Reproduced together in one convenient reference document is the yearlong series of *SWE Magazine* articles, which meticulously covered the study. Beginning fall 2007 through fall 2008, each magazine issue addressed a key aspect of the findings.

Additional articles from this period reported on the Society's October 2008 Congressional briefing, in which the retention study results were formally released; and examined how and where study results were disseminated. These articles are also included, along with an advance, pre-publication release of the magazine's final installment, slated for the Fall 2009 issue.

For the Society's premier supporters, this final magazine installment is supplemented with expanded guidelines on survey methodology and a survey module template designed solely for the CPC. These tools are exclusively for CPC-member organizations and are unavailable to the general *SWE Magazine* audience.

As the study sponsor, the CPC was keenly aware of the corporate community's need for a clearer understanding of retention issues. The SWE Retention Study was a vital step, providing solid data that should, in turn, form the backbone of effective, proactive solutions and best practices.

Karen Horting, CAE
Deputy Executive Director

Anne M. Perusek
Director of Editorial & Publications

FIRST IN A SERIES

The Society of Women Engineers National Survey about Engineering

Are Women More or Less Likely than Men to be Retained in Engineering after College?

BY LISA M. FREHILL, PH.D., COMMISSION ON PROFESSIONALS IN SCIENCE AND TECHNOLOGY

In 2005, the Society of Women Engineers commissioned Harris Polls to conduct and perform initial analyses on a "National Survey about Engineering" — otherwise known as the "SWE Survey." This was a follow-up to a survey conducted in the early 1990s by SWE in collaboration with a number of other engineering associations. Twenty-one colleges agreed to participate in the current study. Seven provided alumni lists to Harris, who sampled alumni for interviews. The remaining 14 schools asked for volunteers for the study in alumni newsletters. Volunteers contacted Harris for interviews. In total 6,293 people completed an interview, and of these 1,803 were women and 4,490 were men.

This is the first in a series that will examine the results of this important survey. This article will focus on the question: *"Are women more or less likely than men to be retained in engineering after graduation from college?"* We split answers to this question based on gender and when the degree was earned.

The word "retained" is defined as a self-report by the respondent that (s)he is currently employed as an engineer.

Due to the non-random methods of obtaining respondents for the SWE Survey, it is important to understand how the SWE Survey results might be biased. Fortunately, the National Science Foundation's SESTAT data contain some comparable information about engineers in the United States, so we make comparisons to these nationally-representative data.

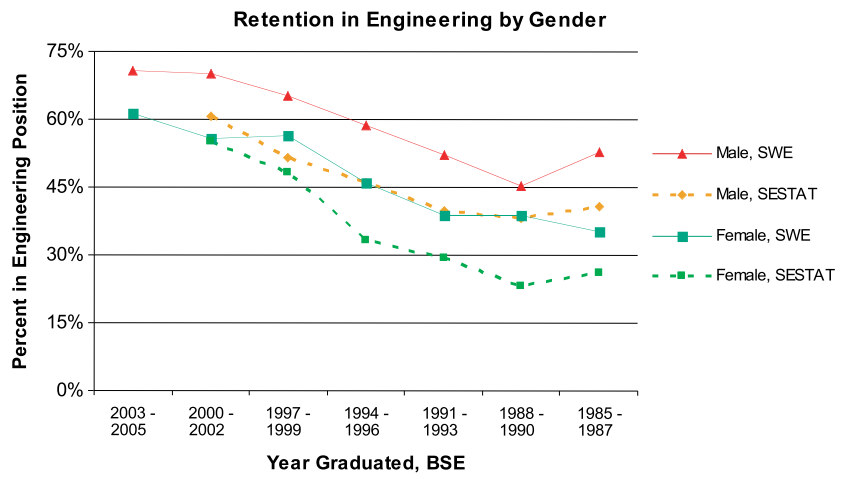
SESAT is a consolidation of three surveys maintained by the NSF. The acronym SESTAT stands for Scientists and Engineers Statistical Data System. It includes:

- ▲ National Survey of College Graduates
- ▲ National Survey of Recent College Graduates and
- ▲ Survey of Doctorate Recipients.

The first two surveys are conducted every two years by the NSF to provide information about people who earn bachelor's or master's degrees in a science, technology, engineering, or mathematics (STEM) field, a STEM-related field, or those currently employed in a STEM field. The restricted-use dataset has more than 100,000 respondents who represent nearly two million STEM workers in the United States.

Due to the different sampling methodologies used for each survey, analyses using the SESTAT system are routinely weighted based on each respondent's original sampling probability, so that the sample information can be used to represent the general population.

It should also be noted that the SWE Survey does a good job tracking the opinions of those working in engineering, and that engineers still in the engineering work force tend to be overrepresented in the



Sources: National Science Foundation SESTAT 2003 data (weighted) and Society of Women Engineers' Nationl Survey of Engineering, 2005.

Demographic Characteristics of Respondents Who Earned a First Bachelors Degree in Engineering in 1980 or Later

	SESTAT, 2003, Weighted		SWE Survey	
	Females	Males	Females	Males
Age - Mean and (std. dev.)	33.8 (6.0)	35.1 (6.4)	33.1 (6.2)	35.6 (6.8)
Labor force status				
Employed	82.0%	95.0%	87.2%	96.7%
Unemployed	6.5%	3.1%	1.3%	0.8%
Not in labor force	11.5%	1.9%	11.5%	2.4%
Race/Ethnicity				
American Indian	0.3%	0.2%	0.3%	0.3%
Asian	23.3%	20.2%	6.9%	6.3%
Black/African American	6.3%	3.4%	3.4%	1.3%
Hispanic/Latino/a	7.0%	6.7%	3.4%	3.3%
White	60.9%	67.6%	84.5%	87.2%
Marital status				
Married*	71.8%	74.9%	68.9	75.5
Widowed	0.2%	0.2%	0.1	0.1
Divorced or separated	6.4%	3.3%	4.8	3.2
Never married	21.7%	21.5%	26.2	21.1
Number of children				
No children aged 18 and under	47.4%	46.0%	58.2	46.4
Average children 18 and under among those with children	1.9	2.0	1.9**	2.0**
Engineering field of bachelors degree				
Aerospace, aeronautical, and astronautical	3.1%	3.7%	3.2%	4.3%
Chemical	12.5%	5.9%	17.0%	9.1%
Civil and architectural	15.6%	14.2%	16.1%	16.3%
Electrical and computer	31.3%	36.9%	17.4%	27.0%
Industrial	8.5%	5.4%	5.1%	2.3%
Mechanical	15.7%	22.8%	17.5%	24.3%
Other	13.3%	11.2%	23.7%	16.7%
Sample size (n)	269,004	1,241,925	1,591	3,436

Notes: *or living in a marriage-like relationship (SESTAT) or living with a partner (SWE Survey)
** SWE Survey asked about number of children under 18 vs. NSCG asked for the number of children 18 and under.

survey, compared to engineers that are not part of the engineering work force.

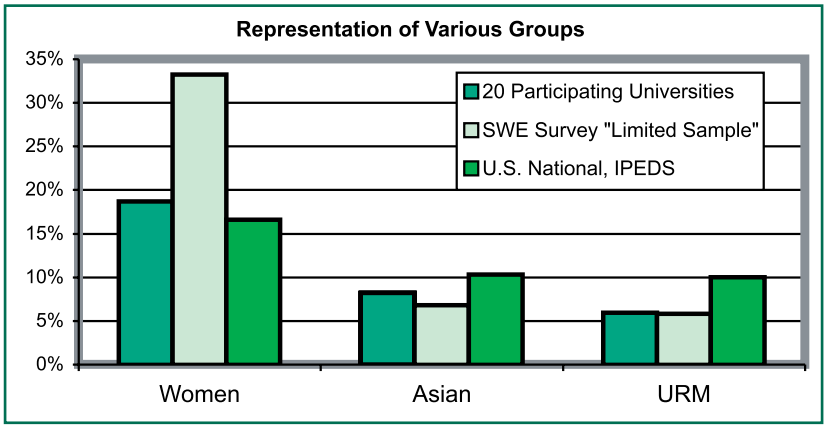
For the purpose of this article, we further limited ourselves to only people who earned a first bachelor's degree in engineering in 1985 or later (n = 11,995). The methodologies for these surveys differ, but to a large extent, as you will see here, many of the general trends and findings are fairly consistent.

To make the data most comparable between the two surveys, we limited our SWE survey analyses to those people who indicated they hold only one bachelor's degree and that degree is in an engineering field. The graph on page 22 indicates the extent to which women and men were retained in engineering as a function of when they earned their engineering bachelor's degree. When we look at retention in engineering shown in this graph, we can see that the general trends are quite similar in the nationally-representative SESTAT data and in the SWE Survey data.

The principal difference is that in SESTAT's larger national dataset women and men are almost equally likely to report working in engineering jobs within five-to-seven years of completing their bachelor's degrees but thereafter, the gap between women's and men's retention widens.

However, in the SWE Survey men were much more likely than women to report that they were working in engineering jobs shortly after graduation and then, for the most part, the gap between women's and men's likelihood of being an engineer remained fairly constant. The exception here is that the gap is narrowest for those people who graduated in 1988-1990 (who would have been 15-17 years "out" from their bachelor's degrees) and then it widens again for those who were 18-20 years out from their undergraduate degree in engineering. We will look at the reasons for this and other disparities in future articles.

In looking at employment status a little more closely, we see that there are some big differences between men and women. Not only are men more likely to be employed as



engineers — 58 percent vs. 48 percent of women — but men are less likely to indicate that they are no longer in the labor force (3 percent) vs. women (12 percent). Women are a little more likely to be employed but not as an engineer and to be in a job where engineering was helpful than were the males who answered the survey.

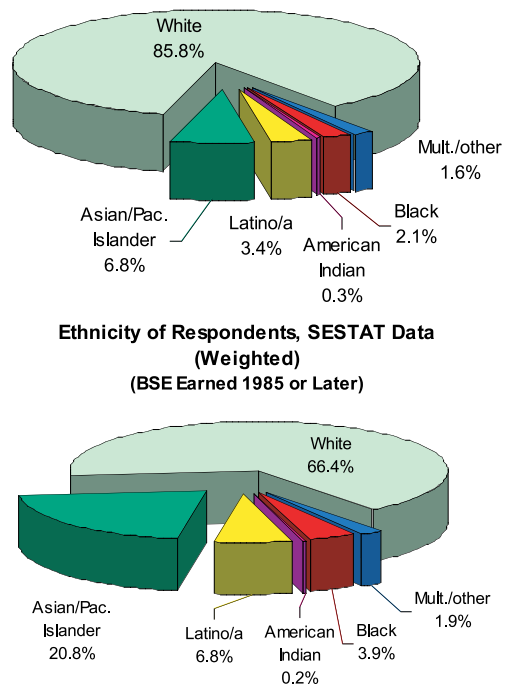
Diversity Considerations

The particular sampling method for the SWE Survey resulted in a pool of respondents that is less ethnically diverse than the engineering graduates included in the National Science Foundation's SESTAT data. With the exception of American Indians, members of the other three major ethnic groups are underrepresented in the SWE Survey. This is important to bear in mind because ethnicity, like gender, can impact people's experiences at work. For example, in the previous SWE Survey from the early 1990s, Patricia Eng showed evidence of a "glass ceiling" encountered by Asian American engineers of both genders.

To understand why the current SWE Survey is less ethnically diverse than the SESTAT data, we compared the participating universities, the SWE Survey limited sample, and data from the Integrated Postsecondary Education Data System, or IPEDS. These numbers come from the National Center for Education Statistics, which is the primary federal entity for collecting and analyzing data related to education.

The bar chart on the opposite page shows the representation of women, Asian/Pacific Islanders, and members of three underrepresented minority groups, or URMs, which includes African Americans, American Indians and Latinos/as. The dark green bar shows their representation amongst the engineering bachelor's degree recipients across the 20 U.S. universities included in the SWE Survey. The light green bar in the middle then shows representation in the "Limited Sample" that we are using for our analyses here — that is, the people who completed a first bachelor's in engineering in 1985 or later. Finally, the bright green bar indicates the relative representation of each of these three groups amongst all U.S. bachelor degree recipients during the period from 1985-2005.

It is clear that the schools opting to participate in the SWE Survey did not, generally, reflect the diversity of the recipients of engineering degrees in the United States. These schools did have a slight overrepresentation of women among their graduates, but it is also clear that women were more likely to respond to the survey, representing a third of all respondents. Had schools with more diverse student bodies participated in the SWE Survey, it is possible that there would have been sufficient minorities included in the study.



What's Next?

Other articles in this series will look more closely at the SWE Survey data to:

▲ Explore how family status impacts retention in engineering and employment satisfaction

▲ See to what extent SWE Survey respondents reflect the National Academies "Engineer of 2020" projections

▲ Compare experiences of workplace discrimination reported in the 2005 survey with those reported in SWE's survey from the early 1990s

▲ Look at how college majors map to workplace technical specialties

▲ See to what extent membership in a professional society plays a role in opinions about work

▲ Compare workplace satisfaction of engineers in the SWE Survey with that of engineers and other kinds of STEM workers in the SESTAT data. ■

Funding for this study was generously provided by SWE's Corporate Partnership Council.

The use of NSF data does not imply NSF endorsement of the research, research methods or conclusions contained in this report.

Lisa M. Frehill, Ph.D., is the executive director of the Commission on Professionals in Science and Technology. Prior to joining CPST, she was an associate professor of sociology at New Mexico State University where she was the principal investigator and program director of that institution's ADVANCE program. In a prior life, she was an industrial engineer at General Motors.

SECOND IN A SERIES

The Society of Women Engineers National Survey about Engineering

Is the Engineering Workplace "Warming" for Women?

BY LISA M. FREHILL, PH.D., COMMISSION ON PROFESSIONALS IN SCIENCE AND TECHNOLOGY

This article is the second in a series that uses data from a 2005 survey commissioned by SWE's Corporate Partnership Council. SWE conducted a similar survey in 1992-93 with respondents selected in a fundamentally different way from the 2005 survey. While the 2005 survey solicited respondents from graduates of 21 colleges and universities, including one Canadian school, the 1992 survey was conducted in collaboration with other engineering societies to draw samples of their male and female members. As a result, while the 2005 survey provides information about a substantial number of respondents who have left the field, almost all of the respondents in the 1992 survey were still employed as engineers.

Many of the questions asked in the 2005 survey were the same as those asked in the 1992 survey. This means that we have an opportunity to look at some similarities and differences in the experiences that engineers report at these two points in time. While there are a number of interesting issues we can explore, in this article, we are looking at four survey items that relate to experiences of discrimination. They are:

Do you believe that female and male employees performing the same job are treated equally where you work?

Do you believe that employees performing the same job are treated equally where you work, regardless of ethnicity, nationality, race, or religion?

Are these problems "corporate" in nature, "departmental" in nature, or both?

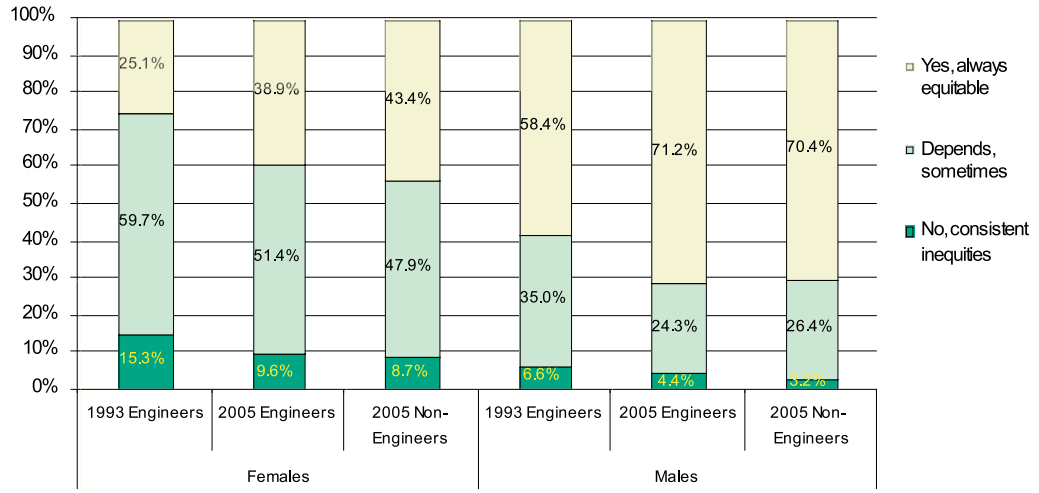
Are you personally aware of instances where women or members of minority groups have been overlooked with regard to career opportunities?

We present data for females and males separately and for three groups within each sex:

- ▼ 1993 engineers.
- ▼ 2005 engineers.
- ▼ 2005 non-engineers.

1

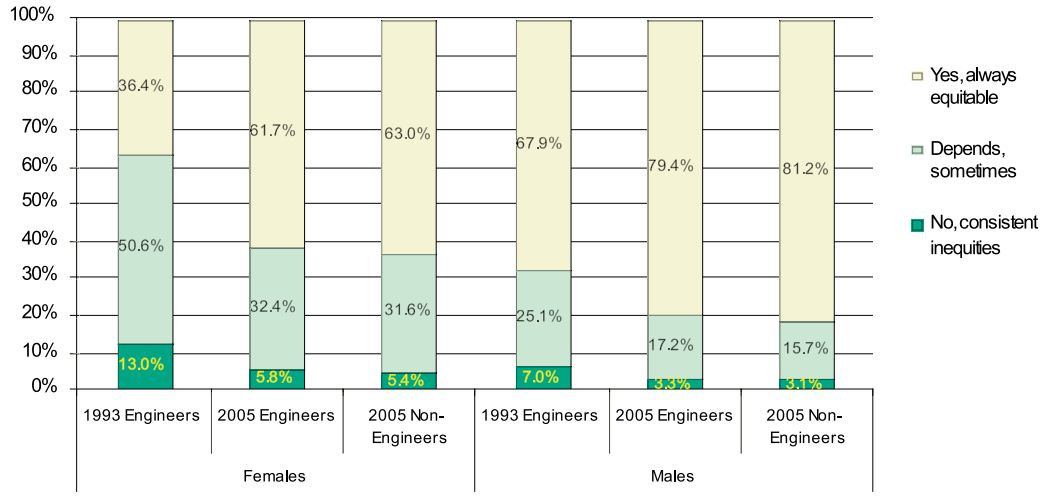
Do you believe that female and male employees performing the same job are treated equally where you work?



As indicated above, so few of the 1992-93 respondents had left engineering that it was not feasible to make the engineer/non-engineer comparison, as we have done with the 2005 data. In addition, we restricted the people included in our analyses to those who reported a first bachelor's degree in engineering within specific graduation cohorts. For the 2005 survey, we looked at those respondents who had graduated in 1985 or later,

Do you believe that employees performing the same job are treated equally where you work, regardless of ethnicity, nationality, race, or religion?

2



which is the original group that SWE wanted to survey. For the 1992-93 survey, we restricted ourselves to the people who had graduated in 1975 or later. Prior to the passage of Title IX in 1972, many engineering schools refused to enroll women. This means that people who graduated from engineering school prior to 1972 are likely to have different understanding of women's roles and experiences in the field.

The first graph shows there is some evidence that conditions might be getting better for women in engineering. In the 1992-93 survey, about three-fourths of women engineers reported that they believed that there were either "consistent inequities" or that "sometimes" female and male employees were treated differently but by 2005, 61 percent of women engineers shared this belief. And, among women who were no longer engineers, only 56.6 percent felt this way.

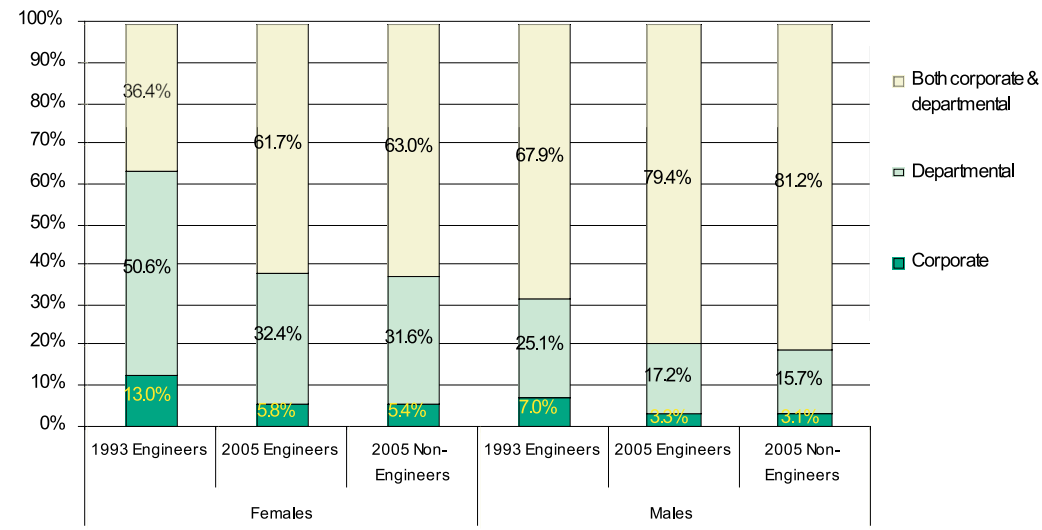
Mens belief's have also changed over the past 13 years. In the 1992-93 survey, 41.6 percent of male engineers believed at some level that male and female employees were treated differently, but this belief was shared by just 28.7 percent of male engineers and 29.6 percent of male non-engineers by 2005. It is possible that more men now work alongside women engineers and assume that the actual presence of women means that women are treated similarly to men. Or it could be that in recent years women have been more reluctant to share stories of inequitable experiences with men. Finally, there has been a general trend in workplaces in which blatant discrimination — such as catcalls on factory floors, sexual comments in public settings and the like — have received increased scrutiny and are less common. Instead, differential treatment now may take more subtle or even covert forms that are less visible.

The second graph shows responses to a similar question regarding whether people of different ethnicities, nationalities, races or religions were treated equally at their workplaces. Women were more likely than men to report a belief that such inequities occurred either sometimes or on a consistent basis at their workplaces. Again, there are substantial differences at the two time-points, with more belief that inequities were present in 1993 versus 2005. Males in 2005 were especially prone to believe that there were no inequities on the basis of ethnicity, nationality, race, or religion; they were about half as likely as women to perceive that such inequities exist.

The third graph reports on

Are these problems "corporate" in nature, "departmental" in nature or both?

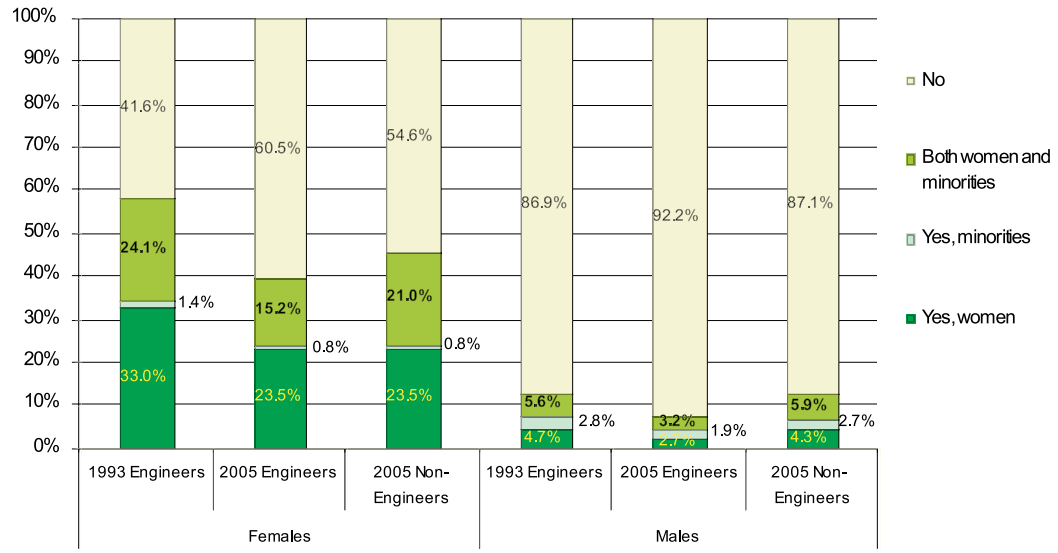
3



people's responses to a follow-up question about whether the inequities they believe occur — due to either sex-based or minority-based factors — were a result of corporate or departmental issues, or both types of issues. This is an important distinction because it is easier for people to see "corporate" issues as outside their span of control than departmental issues. That is, departmental climate is more clearly a result of the behaviors of the respondents themselves.

In the earlier survey, women were more likely than any other group in either 1993 or 2005 to chalk up inequity as a result of departmental issues alone. By 2005, though, women and men, engineers and non-engineers tended to say that problems of inequity were a result of *both* corporate and departmental issues. Women in 2005, however, were still more likely than their male peers to indicate that inequities were largely departmental in nature.

Are you personally aware of instances where women or members of minority groups have been overlooked with regard to career opportunities? **4**



Finally, a fourth question presented in a different section of the two surveys asked people whether they were personally aware of an instance where a woman or minority group member had been overlooked with regard to career opportunities. Back in 1992-93, 58.4 percent of women engineers were personally aware of an instance of gender or ethnic discrimination but a smaller percentage were so aware in 2005 — just 39.5 percent. There was generally little awareness of discrimination against minority group members in 1993 or 2005 amongst both women and men. What this means is not entirely clear. Not only were few minorities included in the survey but this low level of awareness is not surprising given the relatively small number of minorities in engineering. Many white engineers may come in contact with a minority-group member rarely, if at all. In addition, white engineers could just be unaware of discrimination due to their own "blinders." Women were quite a bit more likely to indicate that they knew of instances of discrimination but this may be because the item combined "women and members of minority groups," which is not precise.

What do these results tell us? It is clear that there are still substantial gaps between female and male perceptions of whether engineering is a "level playing field" for women and minorities. Despite this persistent gap, all of the data shown here indicate that circumstances appear to have improved somewhat for women and minorities in engineering, based on the differences in women's responses from 1993 versus 2005. However, the continued gap between men and women is noteworthy. Men are less likely to be aware of discrimination against women or minorities and, subsequently, are more likely to believe that things are generally equitable at their workplaces. This may mean that it is harder now for women and/or minorities to discuss possible cases of discrimination with white men.

The results caution us all to be more aware of how engineering can be more inclusive and welcoming of diversity. Because engineers work in teams and we know that diversity can increase creative output, it is important for there to be open lines of communication amongst engineers to keep the profession an attractive and worthwhile pursuit for everyone regardless of gender and/or ethnicity. ■

Funding for this survey was generously provided by SWE's Corporate Partnership Council.

Lisa M. Frehill, Ph.D., is the executive director of the Commission of Professionals in Science and Technology. Prior to joining CPST, she was an associate professor of sociology at New Mexico State University where she was the principal investigator and program director of that institution's ADVANCE program. In a prior life, she was an industrial engineer at General Motors.

THIRD IN A SERIES

The Society of Women Engineers National Survey about Engineering

Why do Women Leave the Engineering Work Force?

BY LISA M. FREHILL, PH.D., COMMISSION ON PROFESSIONALS IN SCIENCE AND TECHNOLOGY

In previous articles, we showed that women were more likely to leave engineering after completing their bachelor's degrees. Here we will look at what the SWE Retention Study data tell us about the reasons women give for leaving engineering compared to those that men state. Are women more likely to leave due to negative work climates and family issues than men, as many people claim? While we investigate the answers to these questions, we also look at what kinds of jobs are held by women and men who have left engineering. Again, the study defines this group as those whose first bachelor's degree is in engineering, but who are not currently employed in engineering.

We know that the type of family issues workers face relates to one's age. In addition, variations in the larger economy at the time a young engineer enters the work force can impact the likelihood of starting in an engineering job after college. During the 1980s, the U.S. economy was in recession — some even claim that it was a depression — which meant that many people who had earned bachelor's degrees had difficulty obtaining employment. With these considerations in mind, this article not only compares men and women, but it also looks at how experiences for respondents in different age groups are similar or different.

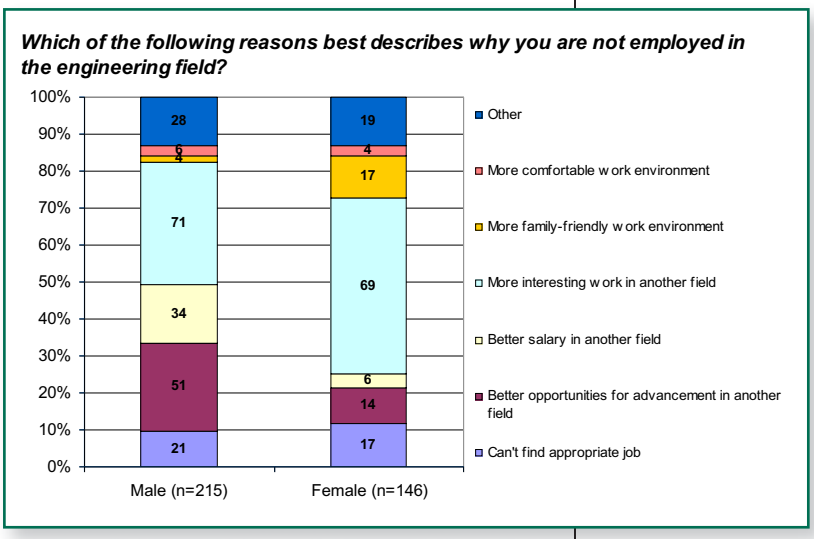
Graduate groups:

There are three graduate cohort groups we will examine: 1985 – 1992, 1993 – 2000, and 2001 – 2005.

These groupings match different economic periods in recent U.S. history. The first saw an economic downturn during the Reagan and Bush administrations. The second period (1993-2000) corresponds to the Clinton presidency in which there was an economic expansion but substantial reorganization and consolidation among major employers of engineers, which impacted mid-career engineers. The final period captures those who graduated in the "post-dot-com" crash period (the dot-com boom period ended in about 2001). This group includes recent engineering graduates who, according to employers, are in high demand once again.

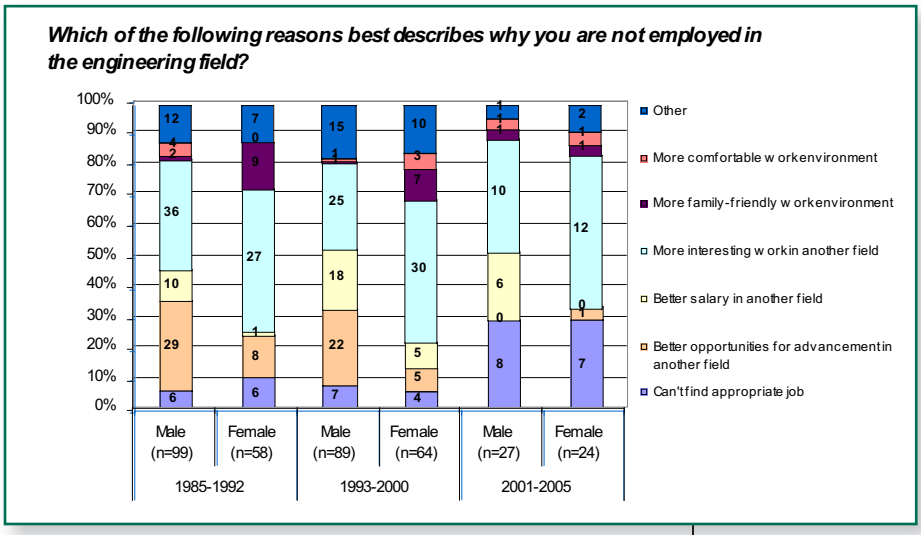
The first graph shows responses, separated by gender, to a question that was asked of anyone who was not working as an engineer. Survey respondents were given a list of six reasons, shown in the graph, and asked to select the one that best described why they were not employed in engineering. About 40 percent of men, but just 15 percent of women, indicated that there were better opportunities or salaries in other fields. Women were much more likely than men to indicate that there was "more interesting work in another field." Nearly half (47 percent) of women but just 33 percent of men indicated this as the best reason they were not working in engineering. Women were also slightly more likely to report that they could not find an appropriate job and a bit more likely to say that they left for a more family-friendly environment than were their male counterparts.

As indicated by the light yellow and magenta slices, about 40 percent of men and 15 percent of women left engineering for better opportunities or salaries in other fields. Nearly half of the women and about one-third of the men left because work in another field was more interesting, as shown by the aqua slices.



The next chart breaks out this information by the three graduation groups, mentioned earlier. Of the more recent graduates — those who had earned their first bachelor's degrees in engineering between 2001 and 2005 — about 30 percent of both women and men who were not engineers reported that they could not find an appropriate job. Most women not working in engineering in this group, though, said they had found "more interesting work in another field."

A fairly small number of respondents across



all three age groups reported that they were not working as engineers because they wanted a more family-friendly environment, but women were much more likely than men to report this issue. As shown in the aggregate in the first chart, men who had received their engineering degrees in 2000 or earlier reported that opportunities for advancement or a higher salary were available in fields outside engineering. Women were more likely than men to indicate they were not working as an engineer because of more interesting work in another field.

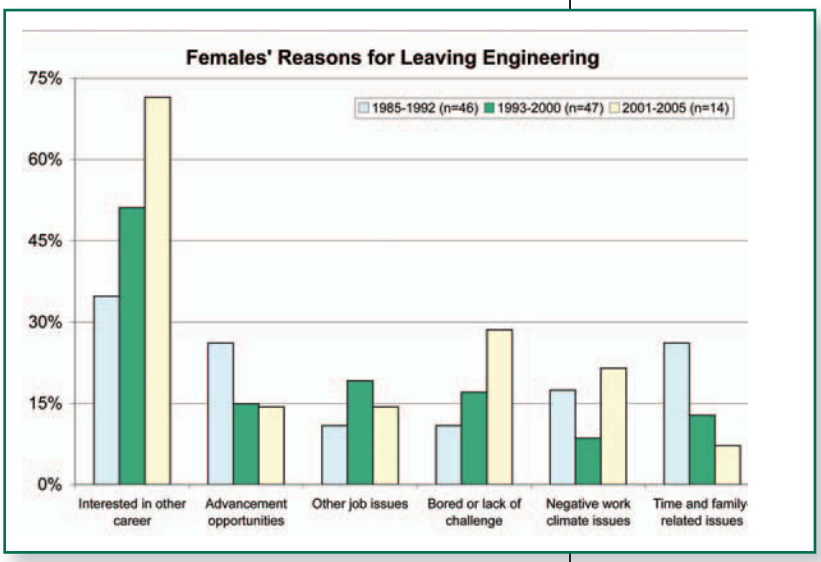
After being asked the "fixed choice" question, above, respondents who were found to have (1) been employed at least some time as an engineer and (2) were not currently employed as an engineer were asked the open-ended question: "What caused you to leave the engineering profession? Please be as specific as possible." We recategorized the 38 different answers provided by respondents into the following:

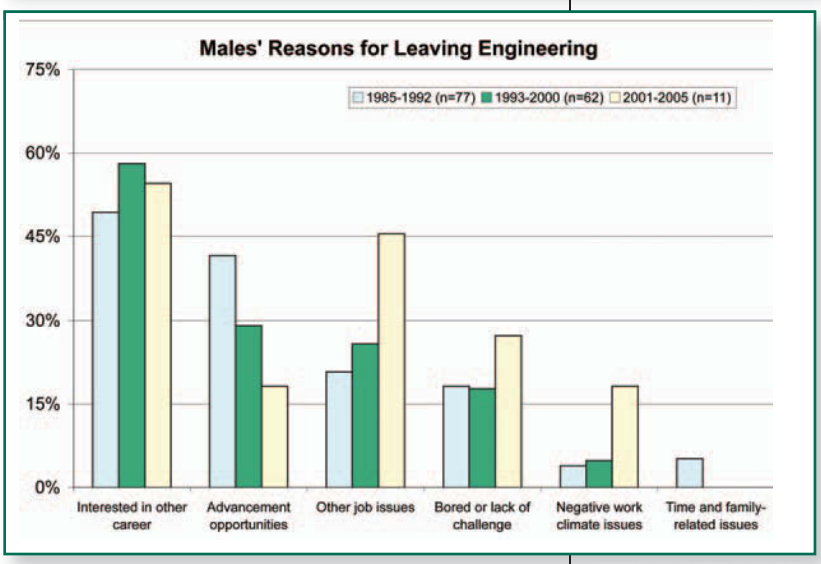
- Interested in other career
- Advancement opportunities
- Other job issues (e.g., could not find suitable job, laid off, or low salary)
- Bored or lack of challenge in engineering
- Negative work climate issues (e.g., no team work/interaction, disliked the people around, dissatisfaction with work, other work environment mentions)
- Time and family-related issues

The next two charts show the proportion of each group, split according to gender and when they earned their first bachelor's degree in engineering, who had left engineering for each of these reasons. Interestingly, among the people who left engineering, women spent more time working as engineers than men. The 107 women in this group had spent an average of 5.6 years working in engineering or a comparable field while the 150 men in this group had worked in the field for 4.4 years on average.

It is possible that this difference is due to a persistent glass ceiling for women, who were far less likely than men to indicate that they had left engineering due to better advancement or salary opportunities outside the field. Or it could be that women may choose to remain in technical engineering work longer regardless of promotional opportunities.

The table on the next page shows the relative percentage of people within each of the three graduation cohorts, separated by gender, who were not employed in engineering. The top row shows the overall percentage who had said that they were employed in a field where their engineering training was helpful. Overall, among the people who responded to the survey and were not retained in engineering, the vast majority held jobs in which they believed engineering training was helpful. As shown here, men were a little more likely than women in each of the three cohort groups to indicate they were in a field where engineering was helpful.





The lower rows report results of a question asked only of people who said that they were not employed as engineers or in a job where their engineering training was helpful. Most of these people indicated they were in other business professional occupations — jobs that tend to require a bachelor's or master's degree (e.g., accounting, finance, etc.). A fair number also reported a range of other jobs, which included art, the military, and so forth.

We have defined a set of jobs we call "manual blue or pink collar" to capture the possible issue of "underemployment" among engineers. We included in this category people who reported jobs that do not require a bachelor's degree such as those in the trades, in food service, clerical employment, and the like. There have been some anecdotal accounts of engineers facing difficulties finding employment, with some reporting great concern over their prospects of finding good jobs and continued work in engineering.

	1985-1992		1993-2000		2001-2005	
	Male	Female	Male	Female	Male	Female
Job where engineering helpful	83.5%	76.0%	81.4%	76.8%	78.4%	73.3%
Employed, but not in engineering						
Business professionals	36.1%	28.6%	39.3%	28.6%	29.2%	13.0%
Health, legal, religious, other science	18.6%	14.3%	17.9%	19.0%	12.5%	8.7%
Computer-IT	6.2%	3.6%	9.5%	3.2%	4.2%	0.0%
Manual blue or pink collar	8.2%	7.1%	7.1%	7.9%	16.7%	21.7%
Education	5.2%	12.5%	1.2%	11.1%	8.3%	8.7%
Other	25.8%	33.9%	25.0%	30.2%	29.2%	47.8%
Total	**97**	**56**	**84**	**63**	**24**	**23**

By including the "lower-level" jobs in one category, we hoped to see the extent to which these fears are borne out in the data. That is, the media often report "bad news" such as negative employment outcomes for those holding bachelor's degrees.

Here, of course, we do not see evidence of a vast pool of underemployed engineers among those who received their engineering degrees between 1985 and 2000, but we do see some possible problems for more-recent graduates. One in five females who graduated in the 2001-2005 period and 16.7 percent of their male peers report that they are employed in these low-level jobs. As one might expect, too, with graduation after the dot-com bust, these recent graduates are less likely than those from earlier cohorts to be employed in computer-IT jobs.

Finally, although it is not a large employment area, women are more likely than men to be employed in education jobs, with those from earlier cohorts more likely to be so employed than those from later ones.

In closing, we have shown that there are important differences in the outcomes for women and men who hold first bachelor's degrees in engineering but that there are important similarities, too. Some observers have been concerned that women do not leave engineering so often as they are pushed out. Likewise, observers have been concerned that older engineers, both male and female, experience age-based discrimination. The evidence shown here does not support these claims. It is important to note, however, that though these claims are not supported as major trends in these data, it does *not* mean there are not cases of discrimination based on gender or age or other worker characteristics. It should also be noted that we have examined outcomes for workers who had received degrees in 1985 (i.e., people who are in their 40s now), so it is likely that we underestimate the instance of age-based discrimination.

The data shown here indicate that women often move out of engineering as a result of changing career interests while men do so for better advancement or salary opportunities in other fields. It may be difficult for employers to increase salaries or promotional opportunities in engineering, but it may be possible for employers to determine ways to keep engineering *interesting*. That is, if women leave as a result of changing interests, companies may do well to determine how to work within their parameters to both retain women and to possibly improve the company's competitive position.

One may wonder why these survey data do not match some of the anecdotal evidence about women being pushed out of engineering. There may be several explanations. First, often bad news travels faster than good news, so that while we hear stories about someone who has left a position with a bad taste in his or her mouth, we do not usually hear about the hundreds of people who are satisfied with that same company. As a result, we may hear stories about discrimination but rarely do people tell stories about non-discrimination.

Another interpretation is that women do not feel pushed out of the field so much as they experience a pull into other areas. Movement in careers is much like migration in a geographic sense: It is a balancing of push and pull factors. Perhaps people prefer to regard major life decisions such as a career change as positive actions rather than negative reactions. Because they operate within a strongly "masculine" culture, both male and female engineers may be reluctant to admit that anyone "pushed" them out of anywhere. So it could be the case that both push and pull forces operate, but given the manner in which the questions were framed, respondents tended to choose a more proactive answer. ■

Funding for this study was generously provided by SWE's Corporate Partnership Council.

Lisa M. Frehill, Ph.D., is the executive director of the Commission of Professionals in Science and Technology. Prior to joining CPST, she was an associate professor of sociology at New Mexico State University where she was the principal investigator and program director of that institution's ADVANCE program. In a prior life, she was an industrial engineer at General Motors.

SWE Retention Study and recommendations from the Beyond Bias and Barriers report form the backbone of congressional briefing.

The Leaky Science and Engineering Pipeline:

HOW Can We Retain More Women in Academia and Industry?

BY ANNE M. PERUSEK, SWE DIRECTOR OF EDITORIAL AND PUBLICATIONS

The leaky pipeline problem in science and engineering is receiving greater recognition due in large measure to ongoing public policy and awareness efforts by SWE and similar-minded groups. The Society's most recent effort took place in mid-October, at a SWE-led congressional briefing held in conjunction with the House Diversity and Innovation Caucus. Moderated by SWE Director of External Affairs Semahat Demir, Ph.D., the briefing was co-sponsored by 11 engineering and women's organizations.

There, the Honorable Donna Shalala addressed the progress made in the year since the National Academies released its report, "Beyond Bias and Barriers: Fulfilling the Potential of Women in Academic Science and Engineering" (National Academies Press, 2006). Dr. Shalala chaired the committee that wrote the report. She is the former secretary of the U.S. Department of Health and Human Services and current president of the University of Miami.

House Diversity and Innovation Caucus leader Rep. Silvestre Reyes is one of the caucus' original co-chairs.

Dr. Demir, SWE's director of external affairs, moderated the briefing.

In addition, results of the SWE Retention Survey were released, showing how women in industry experience problems similar to women in academia. Lisa Frehill, Ph.D., executive director of the Commission on Professionals in Science and Technology, presented the findings.

"Women leave earlier and at a more rapid rate than men," Dr. Frehill stated, pointing out that one in four women entering the engineering profession leaves after the age of 30, while only one in ten of their male counterparts does.

Exacerbating the problem is the fact that baby boomers are heading toward retirement. "We are facing a major retention problem and losing some of our best and brightest at a time of critical need," she said. (Note: The third installment of Dr. Frehill's series on the retention study results is on page 24 of this issue.)

A Matter of Timing

The briefing was timed to follow the House Science and Technology Committee's hearing on gender bias in the sciences, held the previous day. Dr. Shalala testified at that hearing, also outlining the findings and recommendations from the Beyond Bias and Barriers report, discussing challenges and solutions, and ending with a call to action.

"The fact that women are capable of contributing to the nation's scientific and engineering enterprise, but are impeded from doing so because of gender and racial/ethnic bias and outmoded 'rules' governing academic success is deeply troubling and embarrassing," she stated.

"All of us — faculty, university leaders, professional and scientific societies, federal agencies and the federal government — must unite to ensure that all our nation's people are welcomed and encouraged to excel in science and engineering in our research universities. Our nation's future depends on it," Dr. Shalala concluded. The full text of Dr. Shalala's remarks can be found at: http://science.house.gov/publications/Testimony.aspx?TID=8895

Capitalizing on this momentum, the message from the SWE-led briefing was clear: Women in science, technology, engineering, and math (STEM) fields

leave both the academic and business worlds at steady rates, and remedies must be sought.

Newly formed caucus a cause for optimism

The House Diversity and Innovation Caucus is led by U.S. Representative Silvestre Reyes of Texas. Representative Reyes and five other original co-chairs created the caucus in March 2007 to help develop policy solutions regarding the under-representation of minorities and women in STEM fields. The caucus held an inaugural event in June in which SWE played a key role (see Fall 2007 issue of *SWE*, pg. 30).

Speaking at the October briefing, Rep. Reyes said, "If we are to remain an innovative and economically competitive nation, the face of our high-tech work force must reflect the true face of America. Our work force will not be the best that America has to offer if we do not ensure that we are taking advantage of all pools of domestic talent."

Representative Eddie Bernice Johnson, also a Texas Democrat and caucus co-chair, served with Representative Reyes as an honorary co-sponsor of the briefing. She is a senior member of the House Committee on Science and Technology and long-time advocate for women and minorities in the STEM professions.

The Diversity and Innovation Caucus has approximately 51 members and is growing, with plans to take a more visible role in the upcoming year. This group cares about and thinks about the issues critical to the SWE mission. It would be worthwhile for readers to determine whether their congressional representatives are members, and if not, encourage them to become part of it. See the public policy section of SWE Web site for details.

Policy solutions in development

At this writing, Congress has returned to session following the Thanksgiving break, facing a full agenda as the year comes to a close. The Higher Education Act has been approved by the House Education and Labor Committee, and should be considered by full House sometime in early 2008. Included within this bill is a provision supported by Representative Johnson to encourage universities to hire and promote more women and underrepresented minorities. The provision is consistent with a recommendation made in the Beyond Bias and Barriers report.

Representative Reyes and Dr. Shalala confer before the briefing.

SWE President Michelle Tortolani, left, with Dr. Frehill, SWE Executive Director and CEO Betty Shanahan, and Dr. Shalala.

According to Representative Johnson's office, the provision would award a one-time, competitive grant to a consortium of organizations to "assess the feasibility and potential design of an inter-institution monitoring organization on gender and racial equality in campus faculty and administration." Funding for the provision would be provided by the Fund for the Improvement of Postsecondary Education (FIPSE), an existing program that supports innovative education improvement projects.

Essentially this provision means that a group would study the feasibility of establishing a National Collegiate Athletic Association (NCAA)-like body to monitor academic equity. If that monitoring body were to be permanently established in the future, the impact would be considerable.

"While there are many steps in the legislative process before this provision becomes law, the fact that a congressional caucus and a congressional champion like Representative Johnson are analyzing such major legislation through a diversity lens is an exciting development, one that we hope will continue for many years into the future," said Melissa Carl, SWE's Washington representative.

Another piece of legislation introduced by Congresswoman Johnson in fall 2007 is the Gender Bias Elimination Act of 2007, H.R. 3514. It is, "A Bill to authorize workshops to eliminate gender bias for women in careers in science, technology, engineering, and mathematics, and for other purposes." Still in committee, it is not likely to move to discussion on the House floor in 2007, and likely will need to be re-introduced. In keeping with recommendations from the Beyond Bias and Barriers report, this bill would authorize workshops designed to eliminate gender bias for women in STEM careers and direct research-funding agencies to better enforce federal anti-discrimination laws.

H.R. 3514 was endorsed by SWE and more than 65 other organizations as a "critical first step to ensuring that talented and accomplished women scientists and engineers are provided with an equitable work environment." The endorsement is available online at: www.swe.org/stellent/groups/website/@public/documents/webdoc/swe_007565.pdf

What this means for SWE

SWE President Michelle Tortolani observed that, "It will require a collective effort to improve the recruitment and retention of women in engineering and science, and no single organization or activity will solve the problem." Consequently, as one part of the overall solution, public policy efforts help members of Congress understand and recognize the lack of female retention in the STEM profession.

Referring to recent legislative developments, particularly Representative Johnson's provision in the Higher Education Act, Betty Shanahan, SWE executive director and CEO, states, "This provision brings needed attention to issues of gender and racial diversity at the university level. We see it as a concrete step and important victory for women and minorities, and appreciate the leadership shown by Representative Johnson and the House Education and Labor Committee for including this provision."

"We are now entering the fourth year of our formal public policy program," Tortolani said, "and we find that policy makers are interested in our point of view. We have moved into a position where we are recognized and sought after, and need to continue building the momentum." ■

FOURTH IN A SERIES

The Society of Women Engineers National Survey about Engineering

Making Our Mark: Ensuring the Retention Study Results Reach the Right Audience

BY ANNE M. PERUSEK, SWE DIRECTOR OF EDITORIAL AND PUBLICATIONS

This article will depart somewhat from the previous three in this series, authored by Lisa Frehill, Ph.D., executive director of the Commission on Professionals in Science and Technology. All three articles analyzed specifics of the SWE Retention Study, ranging from the construct of the survey to answering such questions as, "Is the engineering workplace 'warming' for women," and "Why do women leave the engineering work force?"

Shifting focus, this installment examines how and where the study results have been disseminated. Making sure these important results are available and accessible to the right audience is equally important as asking precise questions and utilizing correct methods when conducting the research. Having addressed the latter points in previous articles, let's look at the attention the survey has received as of this writing.

The study legitimizes and gives credence to individual experiences, and by doing so, also points the way to solutions.

Tied to Public Policy Initiatives

The survey both reinforces and confirms the Society's public policy efforts. Quite naturally, then, the survey results were formally released at a SWE-led congressional briefing held in mid-October in conjunction with the House Diversity and Innovation Caucus.

The purpose of the briefing was to look at the progress that had been made over the past year since the release of the National Academies report, "Beyond Bias and Barriers: Fulfilling the Potential of Women in Academic Science and Engineering" (National Academies Press, 2006).

Releasing the survey results in this setting provided an industry context and offered a contrast and comparison to the situation facing women in academia. [See *SWE Magazine* Winter 2008, "The Leaky Science and Engineering Pipeline: How Can We Retain More Women in Academia and Industry?" pgs. 20-22.] It also introduced those attending the briefing to SWE and the retention study and marked the beginning of a "media tour" — a method of clearly and concisely getting one's message out to targeted publications.

That day of the briefing and the next — Oct. 18 and 19, 2007 — Vickie Elmer of *The Washington Post* ran stories about the survey in her column, "Working." The Oct. 18 article briefly addressed the difference between where men and women go when they leave engineering jobs, and why they leave. Her second column reiterated survey findings — that women leave at twice the rate as men — and quoted SWE President Michelle Tortolani, who also offered career advice that young engineers should "find a mentor."

Additional Media Attention

Sometimes coverage occurs indirectly, meaning that SWE may not be mentioned but an aspect of the survey or of our public policy efforts is. One example of this occurred on Oct. 19, when *The Washington Times* ran a story, "Reyes seeks ways to get minorities in science." This article stated that U.S. Rep. Sylvestre Reyes, D-Texas, a champion of diversity in science, technology, engineering and mathematics, or STEM, "discussed retaining women in engineering fields at a House Diversity and Innovation Caucus."

Around the same time, the online arm of *Control Design* magazine, ControlDesign.com, posted "Women Leave Engineering More Than Men," which provided a thorough overview of the retention survey and discussed the efforts of the House Diversity and Innovation Caucus (www.controldßesign.com/industrynews/2007/042.html).

In December, the National Journal's *Technology Daily*, an online publication that is sent to policymakers and others on Capitol Hill, ran a story, "Science: Closing the Gender Gap in Engineering and Science." The writer, Aliya Sternstein, interviewed both Tortolani and Dr. Frehill. The National Journal also publishes the *Congressional Quarterly*.

While there has been an ongoing series in *SWE Magazine* that discusses the survey, articles are also in progress for discipline-specific venues. The survey data can be analyzed in ways that address particular disciplines or fields. This provides valuable insights to those disciplines, but is of less interest to those outside and consequently would not appear in broader-interest publications.

Collecting Dust versus Making a Difference

Over the course of a single year, an untold number of studies are undertaken and subsequently published. What keeps one study from collecting dust on a bookshelf while another one

forms the cornerstone of significant social change? For one, the subject matter and methodology often determine the impact. In many cases, the research is significant primarily within the confines of the discipline in which it becomes part of the body of knowledge.

However, timing and social conditions are additional factors at work. The retention study was undertaken and released during a historic moment of great concern about the United States' ability to remain competitive; at a time when the issues surrounding underrepresented groups in STEM are receiving more attention; and at a time when greater momentum is underway to address those issues.

The retention study is naturally of high interest to the engineering community because it provides information on the state of the profession. The methodology is solid, and the results clarify what many had an inkling of. The study legitimizes and gives credence to individual experiences and, by doing so, also points the way to solutions.

It is important to keep in mind that the SWE Corporate Partner-ship Council funded the study as part of an effort to retain more women engineers in the work force. Based on the information provided by the study, these companies can find meaningful solutions, and both establish and share best practices.

Consequently, what at another time might have been regarded more or less as a narrow, industry-based study has taken on a much broader social significance.

In addition, through its public policy and other efforts, the Society has built an infrastructure to ensure that the issues — as well as the data backing them up — do not go unheeded.

Next Steps

There are a variety of possible next steps. For the individual SWE member, Michelle Tortolani succinctly addressed this in her President's Note column, appearing in the conference 2007 issue of *SWE*. "How do the results of the retention study benefit you?" she asked.

Tortolani stated that by conducting the study and disseminating the results, the Society is fulfilling an essential component of its mission. In fact, the SWE mission obligates us to promote these results. Certainly members can take pride in being part of the force that champions and improves the retention of women in the engineering work force. But in a more immediate and day-to-day sense, she states that, "Early application of the findings by our corporate partners and their sharing of best practices will be integrated into our professional development programs."

In a broader sense, as policymakers continue to focus on STEM fields, U.S. competitiveness, and gender bias, SWE will continue to be a resource. The seeds have been planted so that when additional kernels of information are available from the study, editors and journalists can take note. ■

What keeps one study from collecting dust on a bookshelf while another one forms the cornerstone of significant social change?

FIFTH IN A SERIES

The Society of Women Engineers National Survey about Engineering

A Review of the Findings

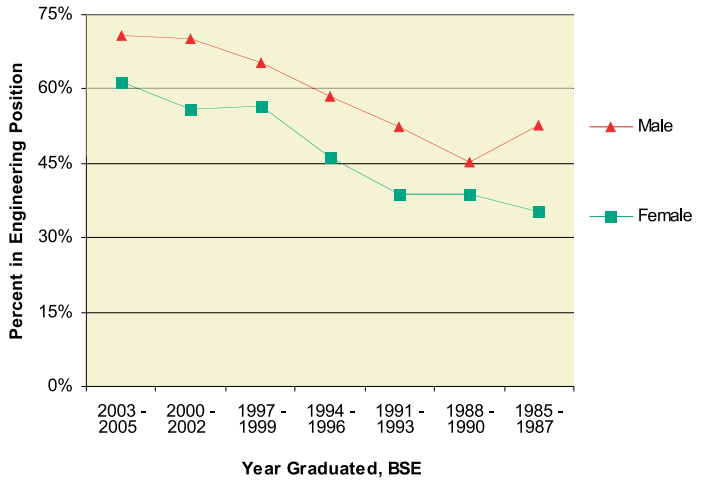
BY LISA FREHILL, PH.D., COMMISSION ON PROFESSIONALS IN SCIENCE AND TECHNOLOGY

STAY TUNED The retention study is naturally of high interest to the engineering community because it provides information on the state of the profession and both quantifies and clarifies what many people have understood anecdotally. Based on the information provided by the study, meaningful solutions and best practices can be established and shared. Look for the sixth and final installment of this series in the Fall 2008 issue of *SWE*, available in late August.

In 2005 the SWE Corporate Partnership Council provided generous support to the Society to conduct another study like one that had been done in the early 1990s. The SWE Retention Study collected data from more than 6,000 bachelor's and master's graduates of 25 engineering schools (24 U.S. and one Canadian) to explore why people left the field after earning their bachelor's degrees. A series of three articles appeared in *SWE Magazine* last year — here we have reproduced a few of the charts and findings that were presented in those articles. The first chart shows that even upon graduation, there is a gap in women's and men's participation in engineering: Less than 71 percent of men but only 61 percent of women who responded to the SWE Retention Study indicated they were employed as an engineer within the first three years of college. By the time we look at people who graduated 18-20 years prior to the survey, only about one-third of women but about half of the men were still in engineering jobs.

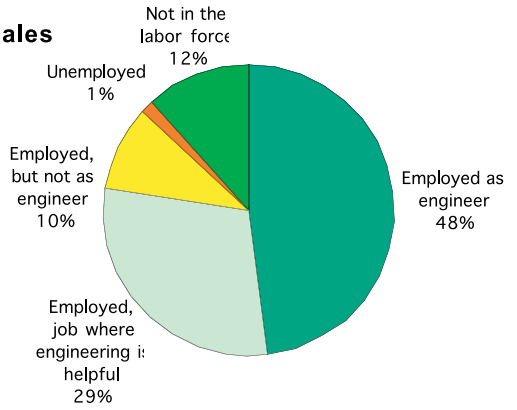
The pair of charts below show that just 48 percent of women were still in engineering jobs, with men a little more likely to be employed as engineers. Nearly one-fourth of women were either unemployed, not in the labor force, or employed in jobs they saw as very different from engineering. Only 11 percent of men were in these same types of positions.

Retention in Engineering by Gender



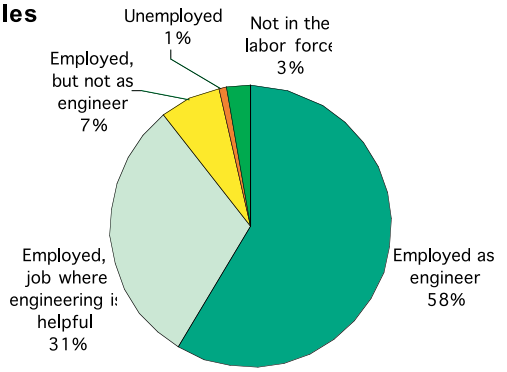
Source: CPST analysis of Society of Women Engineers' National Survey of Engineering, 2005.

Females

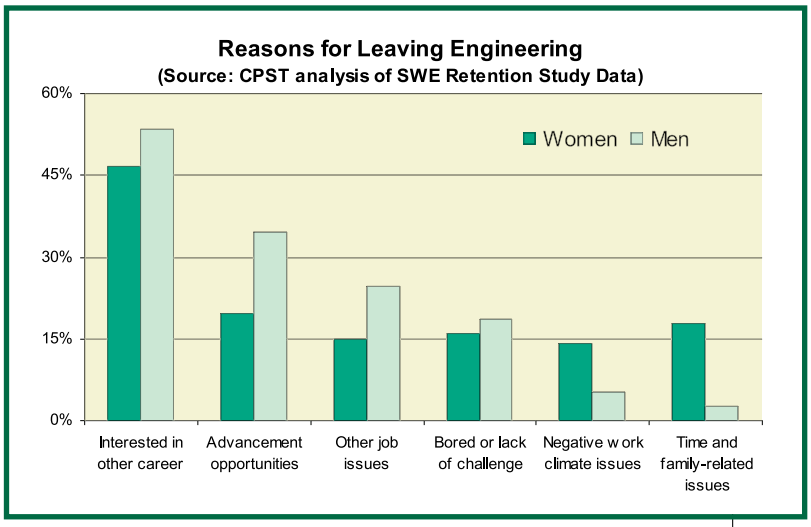


Source: CPST analysis of Society of Women Engineers' National Survey of Engineering, 2005.

Males



Source: CPST analysis of Society of Women Engineers' National Survey of Engineering, 2005.



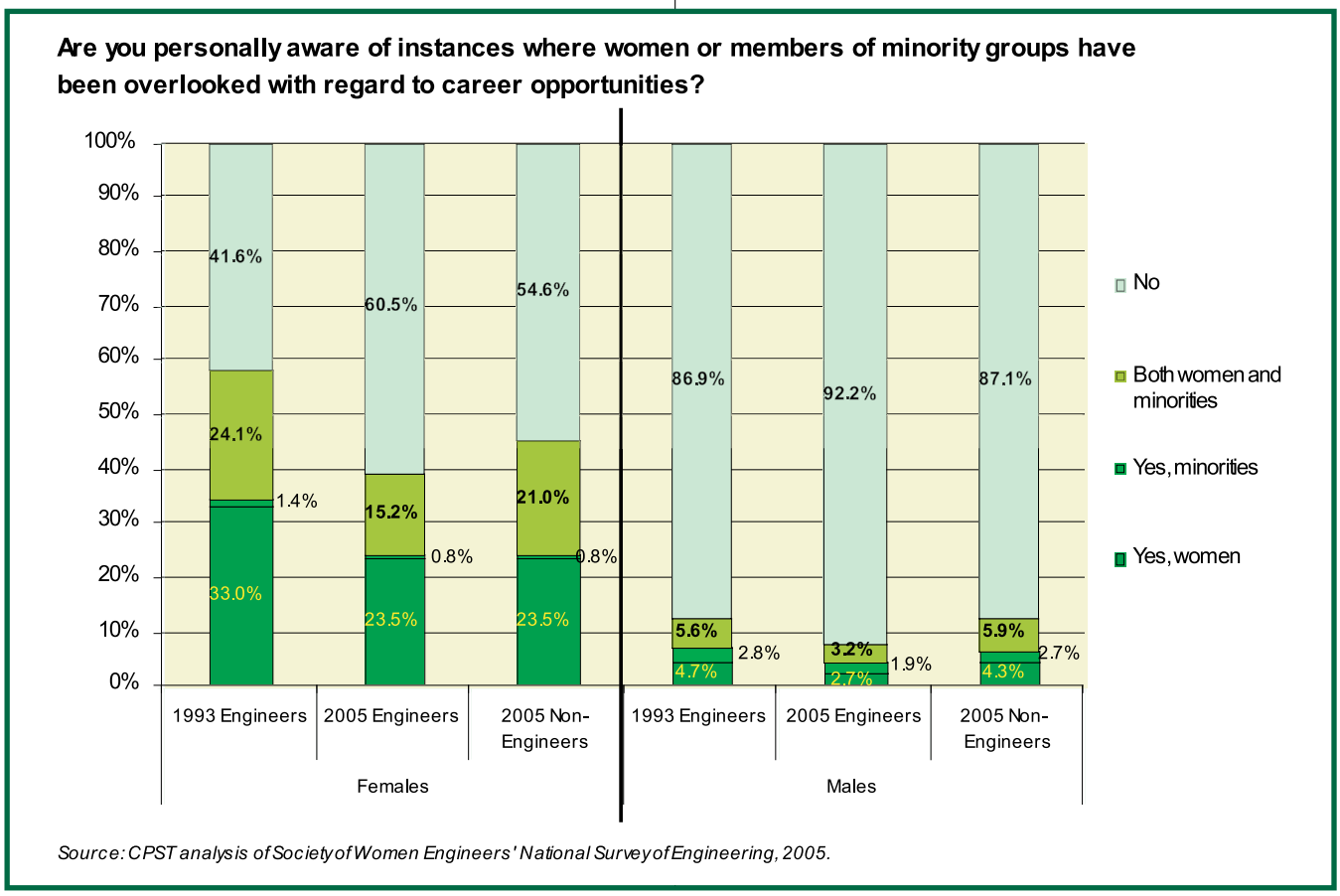
Why do people leave engineering? According to the SWE Retention Study, men and women who had left the field had some different reasons for doing so. The next chart shows that the majority of people who leave engineering do so to pursue some other career interest. Men are more likely to leave the field for advancement opportunities or "other career issues" (which include salary), but women are more likely than men to indicate that they are leaving a negative work climate. Women were also much more likely to cite time and family-related issues as reasons for leaving the field.

Although not shown here, the issues affecting women's exit from engineering vary for different age cohorts. For example, "negative work climate issues" were less important for those who graduated between 1993 and 2000 than they were for those who entered the engineering work force prior to 1993 or after 2000. The salience of family and time issues in leaving engineering also varied: 26 percent of women in the 1985-1992 degree cohorts indicated this reason, but only 13 percent of those in the 1993-2000 cohorts and just 7 percent of the most recent graduates cite this reason (Frehill 2008).

The second of the three articles compared the new data with that of an earlier study of engineers sponsored by SWE in 1992-1993. This article showed that there appears to be a "warming trend" for women in engineering but that there is still far to go to ensure that workplaces are equitable. The data shown in this second article also illustrated a growing gap between female and male perceptions of discrimination in the workplace, with fewer men now than in the early 1990s "seeing" instances of anti-female or anti-minority discrimination.

The chart below is one of the graphics that appeared in the second article, describing differences across groups in perceptions of discrimination. While there were no differences in men's perceptions of discrimination in 1993 versus 2005, women's perceptions changed over this same time. For women, though, while almost 60 percent reported an awareness of discrimination based on gender and or race in the 1993 survey, by 2005, slightly less than 40 percent were aware of an instance of this kind of discrimination. ■

NOTE: The above overview is an excerpt from the expansive SWE 2007 literature review, beginning on page 34 of this issue.



Source: CPST analysis of Society of Women Engineers' National Survey of Engineering, 2005.

SIXTH IN A SERIES

The Society of Women Engineers National Survey about Engineering

Engineering Retention and Gender: Cross-Disciplinary Differences

BY LISA FREHILL, PH.D., COMMISSION ON PROFESSIONALS IN SCIENCE AND TECHNOLOGY

This is the final installment in this series on the SWE Retention Study. In the previous installment (see Summer 2008, p. 10-12 and p. 54-56), we provided "A Review of the Findings." To wrap up our analysis, this article examines and compares data according to discipline.

Of the many engineering disciplines recorded in the study, four accounted for 78 percent, or 3,349, of the 4,258 respondents whose first bachelor's degree in engineering was awarded in 1985 or later. The remaining disciplines did not have a sufficient number of respondents to permit in-depth analysis like that presented here for the "big four": chemical, civil and architectural, electrical, and mechanical engineering.

The table below shows the number of males and females within each of the four degree cohorts. These four fields represent 82 percent of all male respondents and 73 percent of the females.

As shown in the table at right, the SWE retention data had a fairly high percentage of women in bioengineering, industrial, materials, and environmental engineering. Both bioengineering and environmental engineering are relatively new fields and may have many women, but trend data are lacking. In addition, the small overall numbers of women in the remaining engineering fields means that cohort-level analysis is not feasible. This is important to bear in mind because retention rates may, as with the big four disciplines, vary greatly. It should be remembered that about one-fourth of women but just one-fifth of the men are in these five other fields.

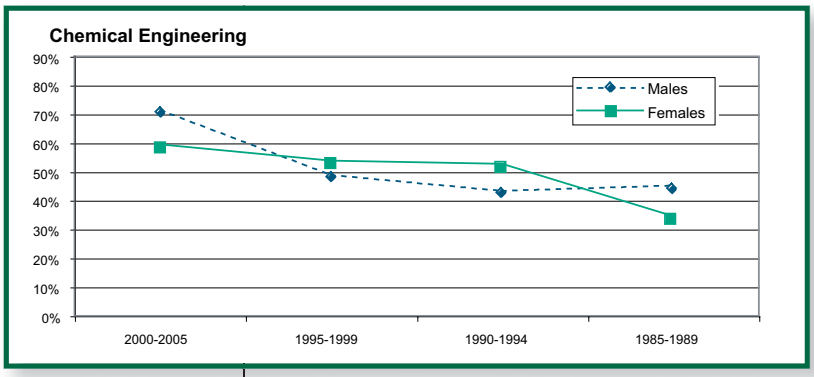
A series of five graphs shows the retention rates for men and women in each of the big four engineering disciplines plus all other engineering fields. The graphs are important in demonstrating what happens when we break down retention by discipline. We know that women are distributed across engineering disciplines differently than men. Therefore, much of the overall gap in retention originally shown (see Fall 2007, p. 22) can be attributed to gender differences among engineering disciplines.

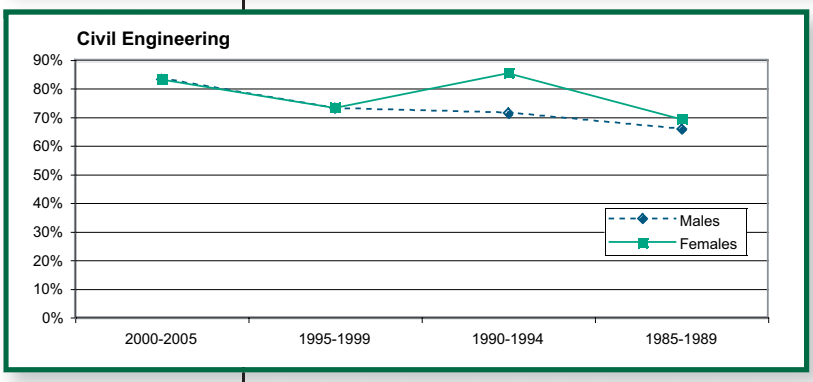
Number and Percent of Women in Engineering Fields

	Males	Females	Total	Percent Females
Chemical	276	259	535	48.4%
Civil	479	247	726	34.0%
Electrical	826	262	1,088	24.1%
Mechanical	740	260	1,000	26.0%
Subtotal	2,321	1,028	3,349	30.7%
Aerospace, etc.	134	49	183	26.8%
Bioengineering, etc.	7	25	32	78.1%
Industrial	73	79	152	52.0%
Materials, etc.	77	66	143	46.2%
Environmental	25	65	90	72.2%
Other engineering	207	102	309	33.0%
Total	523	386	909	42.5%

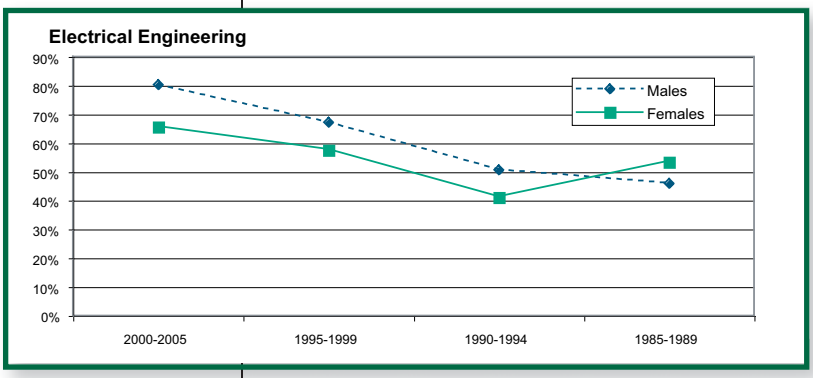
Number of Respondents by Degree Cohort, Gender, and Engineering Field

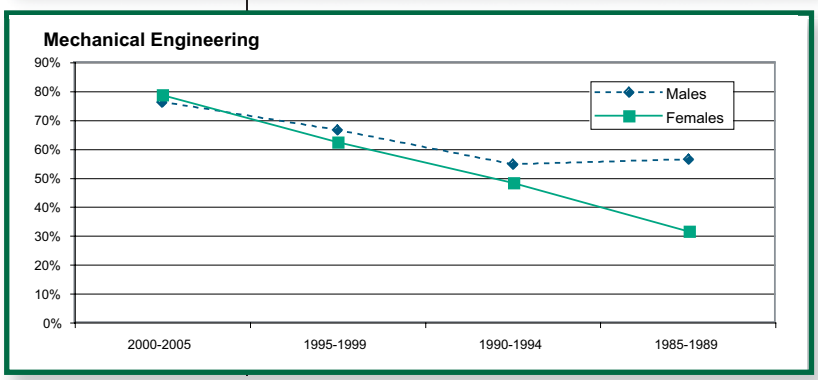
	Chemical			Civil and architectural			Electrical			Mechanical		
	Males	Females	Total	Males	Females	Total	Males	Females	Total	Males	Females	Total
1985 - 1989	66	33	99	88	26	114	253	73	326	190	61	251
1990 - 1994	67	44	111	81	43	124	204	68	272	174	66	240
1995 - 1999	84	86	170	172	106	278	191	51	242	192	71	263
2000 - 2005	59	96	155	138	72	210	178	70	248	184	62	246
Total	276	259	535	479	247	726	826	262	1,088	740	260	1,000





When the SWE data are broken down by discipline, results show that retention for women is lower in chemical engineering than the other fields, but that both men's and women's retention are fairly comparable. At the other end of the spectrum, overall retention is quite high in civil and architectural engineering, with women's surpassing that of men's for the cohort that graduated from college in the early part of the 1990s. In chemical, electrical, and mechanical engineering, there is declining retention in the field for both men and women as engineers age.





Turning now to electrical and mechanical — the two largest engineering disciplines — we see that women's retention in electrical engineering tends to be lower than men's except for the cohort of engineers that graduated in the late 1980s. In the cohort of late 1980s college graduates, women were more likely than men to be retained in the field. Interestingly, in mechanical engineering men's and women's retention is on par except for this same age group. But unlike the electrical engineers, in mechanical engineering the men who graduated in 1985-1989 have a higher retention rate than do the women.

The next table reports overall job satisfaction within gender, engineering discipline, and job category. The survey reports the percentage who indicated that they were "very satisfied," which is a fairly extreme answer because opinion survey respondents typically give midpoint answers. Hence, when respondents do select answers at these extremes, it reflects strong opinions.

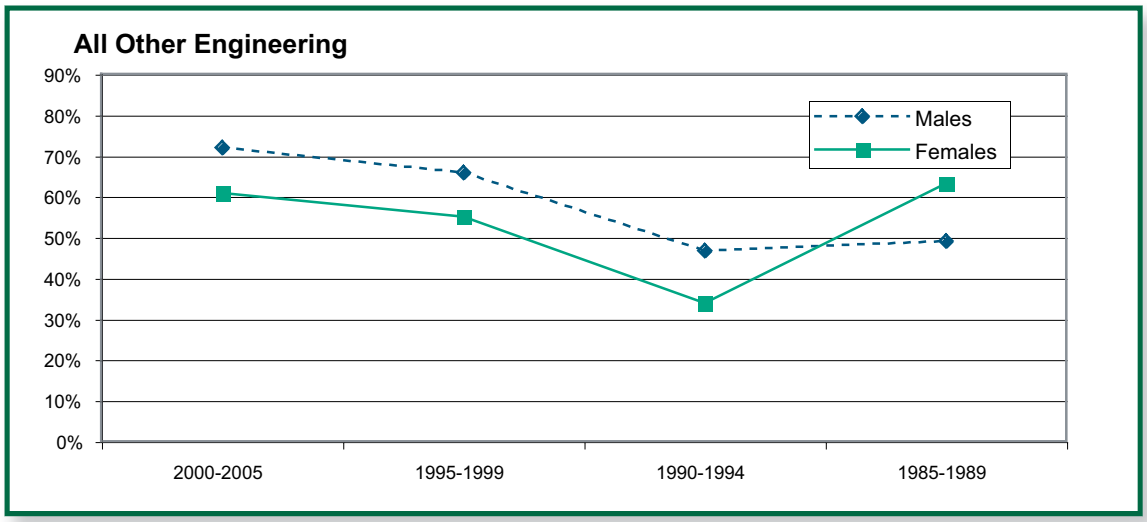
It is interesting to note that in some cases overall job satisfaction is higher for people who are non-engineers compared with peers still in engineering or in jobs that are related to their original engineering degree. The green shading indicates those cells that appear to have important gender gaps in satisfaction levels. In most of these cases, men's overall job satisfaction surpasses that of women, with the only exception being female mechanical engineers. Women in jobs related to their areas of training (but not in engineering) were more likely than comparable men to indicate that they were "very satisfied" with their jobs.

The last table provides information on answers to one of the several survey questions about equity in respondents' workplaces. Here we look at how engineers, those in jobs "related to engineering," and those no longer in engineering assessed the extent to which women and men were treated equitably at their workplaces. There are some important differences across fields and across these three engineering work statuses.

For example, women employed as engineers in civil and architectural engineering were most likely to indicate that conditions were equitable, while those in mechanical were least likely. Also, with the exception of civil engineering, women trained in engineering and now in non-engineering jobs were more inclined than women in engineering or engineering-related positions to indicate that women and men were "always"

Job Satisfaction by Field and Gender

Overall Job Satisfaction, Percentage "Very Satisfied"	Chemical		Civil and architectural		Electrical and computer		Mechanical		Other	
	Males	Females	Males	Females	Males	Females	Males	Females	Males	Females
Engineer	27.8%	19.3%	26.8%	26.2%	23.6%	23.6%	22.7%	23.2%	28.8%	24.3%
Related-engineer	28.4%	28.2%	32.3%	20.5%	24.2%	27.8%	25.3%	32.9%	28.7%	26.3%
Non-engineer	35.3%	27.6%	25.0%	18.2%	54.0%	26.1%	25.6%	26.1%	42.1%	26.1%



treated equitably in their workplaces.

Men in jobs that were related to their engineering training — generally managers of engineers — tended to be more likely to report that things were not always equitable with respect to gender in their workplaces. This is not a big surprise because as engineering managers, they may be likely to hear of instances of inequity, especially if their own employees may have a particular complaint.

In conclusion, when looking at women's and men's retention in engineering, it is important to keep in mind differences between disciplines. Generally speaking, over time both men and women leave engineering — often at fairly comparable rates — but the difference in patterns between men and women suggests larger labor market issues unique to various engineering fields need to be explored.

For example, the industries that tended to employ large numbers of chemical engineers underwent major transformations throughout the 1990s, with concurrent unstable labor conditions. On the other hand, infrastructure projects nationwide provided more stable work for civil engineers with the 1990s building boom. These disciplinary and engineering work status differences are also important to bear in mind when understanding the subjective assessments of equity in workplaces. ■

Funding for this study was generously provided by SWE's Corporate Partnership Council.

Lisa M. Frehill, Ph.D., is the executive director of the Commission on Professionals in Science and Technology. Prior to joining CPST, she was an associate professor of sociology at New Mexico State University where she was the principal investigator and program director of that institution's ADVANCE program. In a prior life, she was an industrial engineer at General Motors.

Assessment of Workplace Gender Equity

Do you believe that males and females performing the same work are treated equally where you work. Percent saying "always equitable"	Chemical		Civil and architectural		Electrical and computer		Mechanical		Other	
	Males	Females	Males	Females	Males	Females	Males	Females	Males	Females
Engineer	75.9%	38.6%	76.1%	47.7%	72.2%	39.8%	67.5%	32.0%	68.4%	35.5%
Related-engineer	67.4%	39.4%	58.3%	35.9%	74.0%	39.2%	69.6%	34.2%	71.9%	41.4%
Non-engineer	76.5%	51.7%	75.0%	45.5%	72.0%	56.5%	67.4%	65.2%	71.1%	63.0%

The Society of Women Engineers National Survey about Engineering

SWE Retention Study and Work/Life Balance

Extensive analysis of the SWE Retention Study and emerging research on work/life balance yields valuable insights and practical policymaking tools.

BY LISA M. FREHILL, PH.D., COMMISSION ON PROFESSIONALS IN SCIENCE AND TECHNOLOGY

Is it really true that women are more likely than men to leave engineering once they get out of college and into the work force? To what extent can work/life policies increase retention of valuable employees? The SWE Retention Study went far in helping us to see the complex answers to the first question. In this article we will review some of the key findings from the *SWE Magazine* series about the retention study; show the family status for engineers at different career stages; and provide some information related to the work/life balance question.

Work/life balance policies and work/life work arrangements help workers to combine employment with caring responsibilities and family, personal, or social life outside the workplace.

Over the past year, the Commission on Professionals in Science and Technology (CPST) analyzed data from two sources: the SWE Retention Study, with data collected in 2005 by Harris Interactive, funded by SWE's Corporate Partnership Council; and data managed by the National Science Foundation (NSF) on U.S. scientists and engineers. The 2005 questionnaire was modeled on one that had been completed by SWE in partnership with other professional engineering societies in 1991-1992. While the earlier survey used professional society membership lists to draw the sample, the new study sought to better understand why people left engineering. Thus a different sampling strategy was used in which engineering bachelor's and master's graduates of 25 engineering schools (24 U.S. and one Canadian) were surveyed, with more than 6,000 respondents. A series of six articles based on CPST's analysis of these data appeared in *SWE Magazine* in 2007-2008.

Because they were based on a survey of graduates of specific colleges and universities, the SWE data were limited in scope. Therefore, in order to validate the findings, NSF data from the 2003 Scientists and Engineers Statistical Analysis System (SESTAT) were used to examine engineering retention. These NSF data, though not perfect, are considered some of the best data about engineers and scientists in the U.S. labor force. With its focus on engineering retention, however, the SWE Retention Study involved many questions that were not asked in the SESTAT surveys. So the SESTAT data provided us with a benchmark to determine the extent to which the limited-sample SWE data might vary in comparison to the more general SESTAT population.

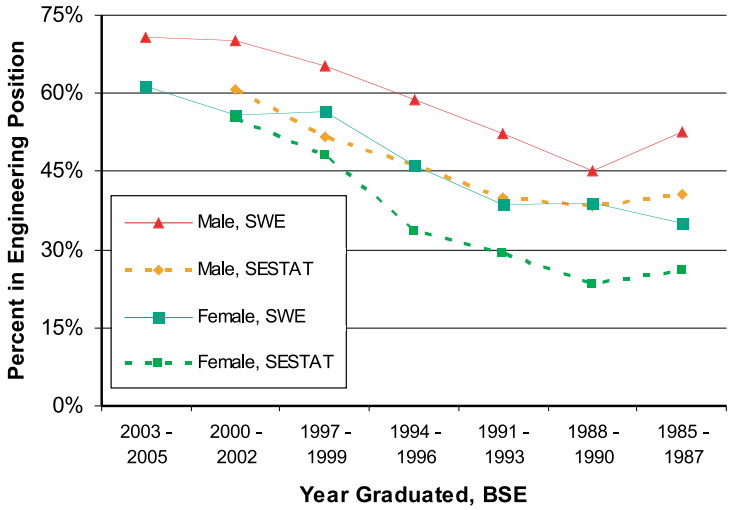
As shown in Figure 1, *both sources provided the same answer*: *Yes*, women do leave engineering at a faster pace than men. Indeed, the SWE data actually seemed to show a slightly higher rate of retention than did the national-level SESTAT data. That is, the SWE data provide more *conservative* estimates of attrition. Even upon graduation, there is a gap in women's and men's participation in engineering: Less than three-fourths of men but only about 60 percent of women who responded to the SWE retention survey indicated that they were employed as engineers within the first three years of finishing college. By the time we look at people who graduated 18-20 years prior to the survey, only about one-third of women but about half of the men were still in engineering jobs.

Further analysis revealed that 48 percent of women were still in engineering jobs, with men a little more likely to be employed as engineers (58 percent). One in 10 men but 22 percent of women were not in the labor force

or employed outside engineering. Men and women were equally likely to report being unemployed (1 percent of women and men). Finally, 29 percent of women and 31 percent of men indicated they were in jobs for which their engineering training was helpful.

How important were family-care issues in women's higher rate of attrition from engineering? A number of analyses showed that they were only somewhat important. First, Table 1 shows the marital status and percentage of respondents who indicated they had no children under 18 living in their home, separately by gender and degree cohort. There are few statistically significant sex differences when we split the data on marital status by degree cohort. Among those who completed their engineering degrees in 1990-94, women were slightly less likely to be married than were men (and more likely to have never been married or divorced or separated). And, among those in the 1995-99 degree cohorts, women were slightly less likely to be married and more likely to be separated or divorced than their male counterparts.

Second, within most cohorts, women were less likely than men to report having children under 18 living in their homes. But this merely begs the question of whether *engineering* has a specific impact on childbearing. That is, in recent years much attention has been given to the generally lower rate of childbearing among professional women. So, we ran an analysis to determine whether women who reported that they were still engineers were less likely than other women in their same graduation cohort who were no longer in engineering to indicate they had children. Put simply, it made no difference whatsoever for women, although for some men, engineers were less likely to have children than those who said they were in jobs where their engineering was helpful. Furthermore, the difference between the likelihood of women and men engineers having children narrowed over the course of the degree cohorts. This finding indicates that engineering women, like other professional women, may be delaying childbirth but there is no evidence that the presence of children in the household causes them to leave engineering.



Sources: National Science Foundation SESTAT 2003 data (weighted) and Society of Women Engineers' National Survey of Engineering, 2005.

Figure 1. Engineering Retention by Cohort.

The SWE Retention Study asked respondents why they were no longer in an engineering position, with responses differing for men and women, as shown in Figure 2. The majority of people who left engineering did so to pursue some other career interest. Men were more likely to leave the field for advancement opportunities or "other career issues" (which included salary), but women were more likely than men to indicate they left a negative work climate. Women were also much more likely to cite time and family-related issues (18 percent) than were men (3 percent) for leaving the field. Although not shown here, the issues affecting women's exits from engineering vary for different age cohorts. For example, "negative work climate issues" were less important for those who graduated 1993-2000 than they were for those who entered the engineering work force prior to 1993 or after 2000. The salience of family and time issues in leaving engineering also varied: 26 percent of women in the 1985-1992 degree cohorts indicated this reason, but only 13 percent of those in the 1993-2000 and just 7 percent of the most recent graduates cited this issue as a basis for leaving the profession.

Over the past several years, there has been quite a bit of attention paid to making jobs more work/life friendly. But it should be

Table 1. Marital and Family Status by Gender and Degree Cohort.

	1980-84		1985-89		1990-94		1995-99		2000 & later	
	Women	Men	Women	Men	Women	Men	Women	Men	Women	Men
Single, never married	3.3%	7.2%	10.2%	9.2%	16.2%	12.8%	25.2%	25.0%	48.7%	46.2%
Married or living w/partner	88.5%	87.1%	84.2%	85.2%	77.7%	83.4%	68.9%	72.9%	49.3%	52.9%
Separated or divorced	6.6%	4.7%	5.6%	5.5%	5.8%	3.8%	6.0%	2.1%	2.0%	0.9%
Widowed	1.6%	1.1%	0.0%	0.1%	0.3%	1.0%	0.0%	0.0%	0.0%	0.0%
No children < 18 in home	26.2%	25.9%	30.3%	24.6%	37.3%	34.0%	65.3%	57.0%	89.7%	83.1%
n, sample size	61	363	304	806	327	741	453	827	446	699

Source: CPST analysis of SWE Survey Data, 2005.

remembered that engineers are people with "means." That is, engineering salaries are routinely higher than those of the general labor force; therefore, engineers are quite likely to have the means to afford accommodations and may work for companies that provide these. In the 2003 SESTAT data, for example, median salaries among those whose highest academic degree was a bachelor's were $58,000 for women in engineering and $62,000 for men.

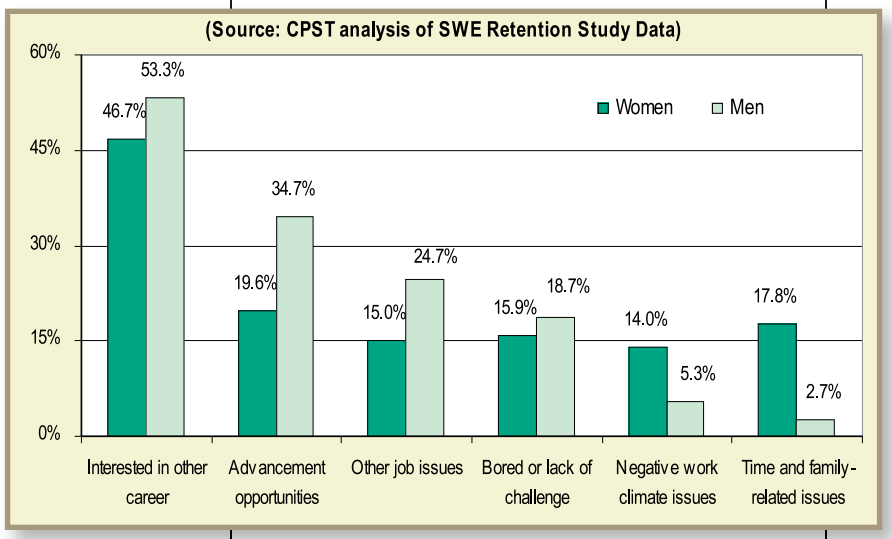


Figure 2. Reasons for Leaving Engineering.

In addition, a common complaint in the natural sciences has to do with the timing associated with the completion of one's education and entry into the labor force. Some analysts fail to draw the important distinction between engineers' and scientists' career trajectories. Engineering careers are quite different compared to those in the natural sciences because most engineers possess a bachelor's degree rather than an advanced graduate degree. Hence, young women who leave engineering school in their early 20s have a number of years to become established at their workplaces, to develop a good working relationship with their peers and their supervisors. As a result, by the time engineering women begin to have children, they have reached even higher salary levels and have developed the interpersonal skills to configure their jobs as they might need. At the same time, however, they may have strong attachments to their team and a strong team ethic, which needs to be considered when implementing accommodations, as discussed in the next section.

Some issues associated with making work/life accommodations were discussed during a meeting of SWE's Corporate Partnership Council. Several attendees spoke of women at their workplaces who felt guilty because they could *not* work longer hours or had to be away from the office. Many of these companies have implemented the same strategies as other employers who are attempting to retain women during the childbearing years. Such arrangements include flexible work hours and days, day care assistance, phased part-time work after the birth or adoption of a child or as an employee moves toward retirement, and extended family leave (*Working Mother* 2008). While these accommodations may be present, the low number of women in the engineering workplace continues to cause them to feel greater general scrutiny of their work — especially in workplaces where there are few other women — so they may be quite self-conscious about making use of these accommodations. As members of work teams, when they take time off, team members know that others on the team will have to work harder.

Work/life balance

Family-friendly policies are no longer a rare luxury. Work/life balance has come to mean more than just the provision of unpaid leave for new parents. Many employers have developed a suite of policies designed to accommodate the increasingly complex lives of employees. Many observers have commented that the priorities that appear to operate for the current generation of new workers (i.e., those between 18-30 years of age) sometimes seem different from those for past generations. The "millennials" expect to maintain a complex web of personal relationships as a priority, with work occupying a more subordinate role than for past generations of new workers. In addition, the large cohort of baby boomers — and the smaller cohort of their children — are likely to experience increased demands to provide elder care.

And, as with engineers in the past, the need to maintain one's skills to compete in the 21st century with constant and rapid technological change, means engineers will continue to need to take time to go back to school or gain additional skills. So work/life balance has come to encompass a number of employer policies to accommodate a very large number of potentially variable sets of circumstances — while being *fair* to everyone.

Working Mother magazine compiles an annual list of the 100 "best companies" with an emphasis on those that provide strong support for family life. All of these companies, according to the company representative who completed the voluntary questionnaire, indicated that they provided:

- A prenatal program
- Flextime
- Telecommuting (either ad hoc or on a part-time basis)
- On-site lactation/mothers' room
- Financial planning services
- Elder care referral service

Further, almost all (95-99 percent) indicated they also provided health insurance for part-timers, job-sharing, and a compressed work-week.

Of course, the *Working Mother* list is skewed to represent large, for-profit employers, so how do their results square up with employers in general? In 2008, the Families and Work Institute, with funding from the Alfred P. Sloan Foundation, completed a "National Study of Employers," somewhat replicating an earlier survey by the institute. Their results are less rosy than those in the *Working Mother* article, largely because they use a more scientifically drawn sample with less response bias and represent both large and small employers in the for-profit and non-profit sectors. Some key findings from the Families and Work Institute study:

- 79 percent of employers now allow some employees to periodically change arrival/departure times (up from 68 percent in 1998).
- 47 percent of employers allow some employees to move from full time to part time and back again (down from 57 percent in 1998).
- Even some large employers appear to *not* comply with the Family and Medical Leave Act, but most employers do so.
- 65 percent of employers offer employee assistance plans to help employees deal with various pressures. These were especially important for parents of teenagers.
- More employers (60 percent) offered wellness programs in 2008 versus 1998 (51 percent).
- 39 percent of employers in 2008, up from 23 percent in 1998, offered referral to elder care services.
- Half of employers allow some employees to work some regular paid hours at home occasionally.
- 76 percent of employers with 1,000 or more employees provided "some pay" as replacement pay during maternity leave. Only 17 percent of employers, regardless of size, provided replacement pay during paternity leave.

Other major flexibility and care elements that were reported by more than two-thirds of the respondents as applicable to at least "some" employees:

- Have control over when to take breaks (84 percent).
- Return to work gradually after childbirth or adoption (77 percent).
- Take time off during the workday to attend to important family or personal needs without loss of pay (73 percent).
- Take paid or unpaid time away from work for education or training to improve job skills (74 percent).

Child care assistance was quite rare at the employers in the Families and Work Institute survey. Most commonly, employers provided information to help employees locate child care (35 percent) or set up dependent care assistance plans that allowed employees to pay for child care with pre-tax dollars. In stark contrast with the glowing picture in the *Working Mother* article, only 9 percent offered on-site child care; only 6 percent provided assistance related to back-up care; and only 6 percent provided reimbursement for child care costs when employees traveled on business. Why such differences in the survey findings? The Families and Work Institute implemented a scientific sampling scheme with a broader range of employees and identified an official respondent for each company. The *Working Mother* survey, on the other hand, relied upon self-report by an indeterminate company member and included only for-profit firms. The smallest company included in the *Working Mother* list had 771 employees.

Managers' role in work/life balance

Managers are a critical aspect of any work/life balance program. "People join companies, but leave supervisors," said Debbie Soon, a vice president at Catalyst. "In high-tech organizations people who have great technical skill often advance into managerial roles, and while these folks may be stellar technicians, they are often not given the support and training to enable them to be equally good managers," she said.

The main complaint of women about their supervisors was that they weren't available when needed, didn't give regular feedback, and weren't responsive to suggestions.

Yet few companies really attend to management training for work/life balance accommodations. On the *Working Mother* Web site, for example, negative comments about the top 100 companies revealed potential problems with the implementation phase of work/life policies. Further, in the Families and Work Institute study, only 20 percent of the employers said it was "very true" that "Management rewards those within the organization who support effective flexible work arrangements." Only 21 percent said that it was very true that "The organization makes a real and ongoing effort to inform employees of available assistance for managing work and family responsibilities." While 68 percent of the employers surveyed said that they provide training to supervisors in managing diversity and 59 percent in managing employees of different ages, just half provided training to supervisors in responding to employees' work/family needs.

Another study, conducted jointly by the Michelle R. Clayman Institute for Gender

"One cannot overstate the importance of supervisory relationships to the retention of employees. … employees don't leave companies — they leave supervisors. If companies are to retain highly qualified women, they must recognize that addressing and improving supervisory relationships is a critically important issue."

Catalyst: *Women in Technology: Maximizing Talent, Minimizing Barriers*, 2008: p. 10.

Research at Stanford University and the Anita Borg Institute for Women and Technology, echoed the findings that supervisors are a key component to women's career success. Their study, titled "Climbing the Technical Ladder: Obstacles and Solutions for Mid-Level Women in Technology," surveyed employees in companies in Silicon Valley in California to compare and contrast how women and men experienced career advancement at the critical mid-career stage. The study called attention to the importance of recognizing that most women — but proportionately fewer men — are involved in dual-career couples, so that the family environment differs for the average woman versus the average man. In addition, work cultures — and supervisors are a vital part of these cultures — are critical to whether employees think their contributions are valued or whether they are treated fairly within the workplace. Supervisor training and rewards need to align with flexibility goals if work/family accommodations are to be a successful tool in retaining high-quality employees.

"Employers have largely maintained or increased support they provide to employees in managing their personal and family lives. Interestingly, employers with more diverse leadership at the top and employers that are nonprofits turn out to provide the best support for making work 'work' for both the employer and employees."

Families and Work Institute: *2008 National Study of Employers*: p. 43.

Without training, and relatively little information about available assistance, it is no wonder that employees and their supervisors often struggle with work/life accommodations and that there are numerous anecdotes that focus on the frustration of these accommodations. It is clear: If managers work carefully with an employee, develop a fair set of performance guidelines and goals, and manage team member relations effectively, then a true win-win situation can occur. The company will have retained a valuable, skilled, and already-trained employee, and the employee will have a stronger commitment to a company that truly took the effort to care about their personal situation. Company loyalty is an important side effect of good work/life policy implementation in which an employee feels that he or she has been treated fairly. On the other hand, if any piece of the work/life network is lacking, then a disgruntled employee may give up altogether, leaving the labor force entirely or seeking an alternative employer that seems to care more for the complexity of employees' lives.

Key sticking points — barriers that can negatively impact the implementation of even the most well-meaning policies — are as follows:

Goals and timeline: Develop an effective plan with achievable goals, timelines, specifications about time boundaries, etc. How long will the accommodation last? Will there be a short-term review period to determine how things are going? How will the employee's work be reviewed?

Amount of work: In many cases, there can be a temptation to assign as much work as the employee completed without the accommodation and to assume that he or she will manage somehow. The employee may even wish to maintain the same amount of work, concerned that in doing otherwise, he or she is letting the group down. It is important to determine a fair amount of work that the employee can complete within the agreed-upon working hours. If the employee will be working 20 hours per week, therefore, they should be assigned half their previous load.

Assistance: The employee's previous position may involve work elements that can be "off-loaded" to an intern, co-op student, or another member of the team. By providing some assistance, the employee may be able to retain a larger level of responsibility than simply cutting responsibilities to adjust workload. In other words, they receive an assistant for some of the constituent tasks while retaining full responsibility for completion of the project.

Co-workers: An employee who works with a team can feel guilty about "letting the team down." At the same time, co-workers can enhance these feelings, even by a seemingly harmless joke about the employee's reduced load and their own increased load.

In the social sciences, we refer to one of the issues at play here as the "free rider problem." That is, whenever there is a social good, such as a set of work/life balance policies to permit accommodations, some people may view these in a narrow way so that they imagine *they* would never benefit from such things. So why should they "help" someone else? In this framework, there is a tendency to see life as "everyone for him/herself."

There are many strategies a manager might employ to head off these sentiments and defuse a situation:

- Involve the team members in crafting the

Why work/life balance?

According to the *2002 National Study of the Changing Workforce*, "employees in more effective and flexible workplaces are more likely than other workers to have:

- Greater engagement in their jobs
- Higher levels of job satisfaction
- Stronger intentions to remain with their employers
- Less negative and stressful spillover from job to home
- Less negative spillover from home to job
- Better mental health."

(Families and Work Institute, 2008: 3)

work plan for the employee who needs the accommodation.

■ Emphasize all the other ways that accommodations may have been made in the past: "Remember when Ted broke his leg skiing and we all had to work double-time to finish the project." In this way, employees will see that accommodations made now for one set of circumstances could well be made in the future — or may have been made in the past — when they had a moment of need.

■ Make it clear that you will use your managerial acumen to ensure that these accommodations won't increase someone else's workload — unless someone may be willing to accept additional work. Anyone willing to take on more duties should receive clear rewards when he or she completes the extra work. In the former situation, though, in which people may be reluctant to take on more work, you will need to determine another way to complete the work of the group.

In closing, women in engineering deal with the same pressures associated with modern work/life balance as all working women. They differ from the average working woman in that they are often one of only a few women within a given work environment and so are more sensitive to how they interact with their peers and supervisors. Often they are married to professional men, so the financial resources that engineering women have often is far in excess of the average working woman in the United States. These resources give women engineers a range of choices so that if work/life accommodations are not effectively made, they might step out of the work force altogether rather than feel like they are not making a contribution or that they are a burden to their work teams. If companies wish to retain these women, then in addition to having progressive policies on the books, they also need to train supervisors in the proper implementation of these policies to the mutual benefit of the employee and the company. ■

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Conducting a Survey — a Proactive Approach

The SWE Retention Study was a major undertaking that required survey administration by Harris Interactive, followed by more than a year of analysis by the Commission on Professionals in Science and Technology. As our final contribution to this project, CPST has developed four question modules that can be used to (1) gauge usage and satisfaction with work/balance policies already in place at your company; (2) assess unmet needs in the area of work/life balance; and (3) determine the potential barriers to use of existing work/life policies. These modules are derived from other national surveys that you should tailor to your own company's needs.

In addition to survey modules, we provide some general guidelines on how to implement a successful survey **process** within your organization. The term "**process**" is intentional, because if a survey is perceived as being part of a larger effort of self-reflection to inform company actions, rather than as a static event, there is a greater likelihood of having a larger number of employees respond, and for new policies or procedures developed from the results to be embraced.

Surveys are not merely about asking questions of passive respondents. Surveys can convey information, provide training, and get people thinking about key issues they may have previously taken for granted. Perhaps your company has a fabulous array of policies on the books that can be applied to achieve better work/life balance, but employees may either be unaware they exist, or not understand them. Typical sentiments might be, "Oh, I thought that policy applied only when emergency surgery was involved," or "Won't my career completely stall if I take leave?" Administering a survey can help identify and then clarify such misperceptions.

A Brief Overview of the Survey Process

Step 1. Setting the stage: form a committee that represents the array of departments or work groups so that there is broad-based input to the process.

Step 2. Committee decides on the survey questions starting with those in the modules included here in consultation with an experienced survey researcher.

Step 3. Committee decides how to implement the survey, including all logistics, such as:

- Who should send the initial notification of a survey?
- What should this notification convey? (i.e., *Why* is the survey being completed?)

continued on next page

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• When will the survey be administered? What kinds of incentives will be offered? When should reminders be sent and who should send them? When will the results be available?

• Where will the survey be located and where will people be allowed to access the results? Will they be allowed to comment on the results and, if so, what will happen to those comments?

• How will a high response rate be encouraged?

Step 4. Survey is administered.

Step 5. Preliminary survey results are developed and some group(s)/individuals are invited to comment and ask for subsequent analysis.

Step 6. A final report is generated and distributed as per step 3.

Step 7. New policies, procedures, or trainings are implemented consistent with the report findings.

Step 8. Follow-up: Are the new policies, procedures, and trainings effective?

We call attention to "trainings" because the research to date indicates that in many cases, work/life balance policies exist "on the books" but are not used due to supervisory or management issues. Additional research, most recently the Catalyst study by Foust-Cummings, Sabattini, and Carter, indicates that women in technical business settings were less likely than male employees and non-technical women to say that their supervisors communicated well. Technical women reported that they were not provided regular performance feedback by their supervisors.

We are not going to go into many of the details associated with steps three-eight. These are actually the *easy* parts of a survey. Instead, the rest of this article will focus on the first and second steps: setting the stage for a successful survey process in your company, and then providing some basic survey question modules to get the process started.

Setting the stage for a successful survey process

Low response rates are a major problem with organizational surveys. Typically, rates are so low that many human resources personnel have decreased their expectations and are "happy" if the rate is higher than 30 or 40 percent. The fundamental problem with such low response rates is that it may be difficult to implement changes based on survey results because such actions are, rightly, criticized as based on unreliable findings. Social scientists have developed many strategies for increasing response rates, which form the basis for much of this article.

Therefore, it is strongly recommended that *prior* to any survey, especially if you wish to use the results to implement meaningful changes, it is critical to get important organizational actors, including key opinion leaders within the organization, "on board" with the survey.

This process of "setting the stage" for the survey may take longer in a large, geographically dispersed organization than it might in a smaller company with fewer locations. The process of implementing a survey must also go beyond a letter or e-mail from a key corporate official to all employees. Simply communicating that they will receive the survey and that the company thinks it is really important for them to complete it, is not effective. Efforts to increase survey response must go beyond a few key reminders or thinly veiled threats for non-completion, or offering incentives for taking part. People will complete a survey if they think it is important, if they feel they have a stake in the results, and if they believe the company is truly serious about change based on the results.

The committee should be given a budget to complete the survey and provided flexibility on how to spend these funds to ensure an acceptable response rate. The committee can decide what they would consider an acceptable response rate, which may be based on past company surveys. Within the social sciences, a response rate of 65 percent or better is seen as critical to being able to generalize about the survey's results to the larger organization. Many companies, though, settle for rates that are around 40 percent, as mentioned above. If response rates to previous surveys in your company have been low, your committee might be pleased to achieve a 40 percent response rate. The committee may decide to use external researchers to program a Web-based survey and then to administer and analyze the results, providing an added layer of confidentiality protection for the respondents.

Finally, as articulated in the process description, there are a number of logistics questions with which this committee needs to be involved. Your human resources personnel are likely to have had experiences with surveys within your organization: They represent key participants. But it is also important to identify employees who have been somewhat skeptical of the past survey efforts of the organization — not anyone who would disrupt the process entirely but who might now offer some new insights. For example, if you are especially concerned with women engineers leaving, it would be critical to have a woman engineer on the committee but just as important to have an engineering manager and a couple of male engineers on the committee, too.

Question modules

Surveys can be conceptualized as a set of modules of questions. Each module should have its own purpose within the context of the larger survey. Some modules may have questions that are more sensitive than other modules. Some may have contingency items, which would be asked only of people who answered a particular way on a screening question. A skilled Web survey programmer should be able to incorporate "skip logic" into the survey so that respondents are not asked questions that are not applicable.

When your committee meets, they should think of questions they want to ask within the context of modules so that they can both keep the survey from growing into a behemoth and are certain they have covered all the key dimensions of work/life balance within the context of your company. As you will see, we have kept each module to one page or less. Additionally, it is useful to have committee members envision these in the way respondents might see them presented in a Web-based survey. A good Web survey designer will permit you to review the Web-based survey version and will make appropriate corrections prior to your survey being fielded.

Conducting the Work/Life Balance Survey in Your Organization

If you decide to use a work/life balance survey in your organization, these survey modules provide questions that have been used in other surveys as a basis for your own. Reviewing questions is a good way to start the process, but it is important that you consult with a trained/skilled survey researcher to make sure that the survey conforms to good principles of questionnaire construction. In addition, if you plan to use a Web-based survey, you should locate a programmer who knows how to incorporate skip logic and who, also, has experience in proper questionnaire construction.

MODULE 1: Current Family and Work Situation

Because this survey covers issues related to work/life balance, we will first ask a series of questions to understand your general family/social situation.

Q1. Gender
1. Female 2. Male

Q2. Marital status
1. Single, never married
2. Married or a marriage-like relationship
3. Divorced, separated
4. Widowed

Q3. Working status of partner *(if applicable – marital status = 2)*
1. Employed full-time for pay
2. Employed part-time for pay
3. Volunteer (unpaid) activities only
4. No paid or unpaid employment
5. Not applicable

Q4. Are you responsible for providing any of the following:
1. Child care
2. Elder care
3. Other family care (sick/special needs)
4. None of the above

Q5. How many children in each of the following age groups are living with you now in your household?

a. Less than 5 years old	0	1	2	3	4 or more
b. 5-12 years old	0	1	2	3	4 or more
c. 13-18 years old	0	1	2	3	4 or more
d. Older than 18 years	0	1	2	3	4 or more

Q6. In your customary week in the past three months, about how many hours per week did you work on *[your company name]* work?
1. <40 hours/week
2. 40-44 hours/week
3. 45-49 hours/week
4. 50-54 hours/week
5. 55-59 hours/week
6. 60 or more hours/week

Q7. How do you feel about the hours per week you work on *[your company name]* work?
1. About right 2. Too many 3. Too few

Q8. In the past three months, about how many hours per week did you typically work at home on *[your company name]* work?
1. 0 hours/week
2. 1-5 hours/week
3. 6-10 hours/week
4. 11-20 hours/week
5. More than 20 hours/week

Q9. How do you feel about the hours per week you work on *[your company name]* work at home?
1. About right 2. Too many 3. Too few

Q10. ASK ABOUT RELEVANT WORK GROUP FOR YOUR COMPANY

MODULE 2:
Experiences with Birth/Adoption while Working at [*your company name*]

Q1. Have you had a birth or adoption since being employed by [*your company name*]?
1. Yes (continue with remaining items)
2. No (skip this module)

Q2. Were you hesitant to tell your manager about your situation?
1. Yes
2. No

Q3. Did s/he adjust your work?
1. Yes
2. No

Q4. How much leave did you take associated with your birth or adoption?
1. <1 month
2. 1-2 months
3. 3-5 months
4. 6-9 months
5. More than 9 months

Q5. Would you consider the amount of leave you took:
1. Too little
2. Too much
3. About right

Q6. What type of back-up arrangements did your unit make during your maternity or paternity leave? *(Mark all that apply.)*
1. Hired a temporary person
2. Distributed work to unit staff
3. Provided me with a developmental assignment
4. *[You may list the types of arrangements your company offers here.]*
5. None

MODULE 3:
Flexible Work Arrangements – Knowledge, Use, and Satisfaction

[your company name] offers a number of flexible work arrangements. We would like to know, first, to what extent you are familiar with/how much you know about each of these arrangements. Then we would like to know whether you made use of any of these arrangements and whether this was via the "formal" channels specified by the policies or whether you made informal arrangements.

Q1. How knowledgeable are you about the specifics of each of these flexible work arrangements options? *[List the various arrangements available at your company.]*

	Unaware	Some knowledge	Know quite a bit
a. Alternative work schedule (AWS)	1	2	3
b. Flextime	1	2	3
c. Home-based work	1	2	3
d. Job share	1	2	3
e. Phased retirement	1	2	3
f. Reduced work schedule	1	2	3
g. Telecommuting	1	2	3

Q2. Which of the following *[your company name]* flexible work arrangements are you currently using or have used in the past? Were the arrangements established via formal channels or informally? By informal we mean that you and your manager have an undocumented arrangement or one that did not require a higher-level approval. *[List the various arrangements available at your company.]*

	Using now, formal	Using now, informal	Used in past, formal	Used in past, informal	Never used
a. Alternative work schedule (AWS)	4	3	2	1	0
b. Flextime	4	3	2	1	0
c. Home-based work	4	3	2	1	0
d. Job share	4	3	2	1	0
e. Phased retirement	4	3	2	1	0
f. Reduced work schedule	4	3	2	1	0
g. Telecommuting	4	3	2	1	0

Q3. Why did you not make use of the various flexible work arrangements policies at *[your company name]*?

	Agree	Tend to agree	Tend to disagree	Disagree	Not applicable
a. I was not aware of the policy.	4	3	2	1	0
b. I was/have been reluctant to use flexible work arrangements because I was afraid my colleagues would think I was less committed.	4	3	2	1	0
c. I was/have been reluctant to use flexible work arrangements because I was afraid it would negatively impact my career.	4	3	2	1	0
d. I was/have been reluctant to use the flexible work arrangements because my manager, or his/her manager, was not supportive.	4	3	2	1	0
e. I was unable to/have been reluctant to use the flexible work arrangements because I could not financially afford to do so.	4	3	2	1	0

MODULE 4:
Opinions based on your experiences at *[your company name]*.

	Agree	Tend to agree	Tend to disagree	Disagree	Not applicable
a. Family-care demands have made me more productive at work.	4	3	2	1	0
b. Family-care demands have negatively affected my professional development/career.	4	3	2	1	0
c. Work demands have negatively affected the time I would prefer to spend with my family.	4	3	2	1	0
d. I missed some of my children's important events that I wanted to go to due to work.	4	3	2	1	0
e. To achieve success in my career, I had fewer children than I wanted to have.	4	3	2	1	0
f. I postponed having kids because I felt it would negatively affect my career track.	4	3	2	1	0
g. I stayed single because I did not have time for a partner and a successful career.	4	3	2	1	0
h. I turned down assignments for personal reasons (e.g., family, other).	4	3	2	1	0
i. I took a job with less travel for personal reasons (e.g., family, other).	4	3	2	1	0
j. I came back to work sooner than I would have liked after having a new child.	4	3	2	1	0
k. Family-care pressures have made me consider leaving *[your company name]*.	4	3	2	1	0
l. My work affects my social relationships in a negative way.	4	3	2	1	0

The following questions are from other large-scale surveys used to understand how employees in work organizations manage work/life balance. Managers have been found to be key to assisting employees with this balance.

My manager:	Strongly agree	Agree	Disagree	Strongly disagree
a. Listens to my problems.	4	3	2	1
b. Shares ideas and advice.	4	3	2	1
c. Is understanding or sympathetic.	4	3	2	1
d. Helps me figure out how to solve problems.	4	3	2	1
e. Is not supportive of staff needs to combine work and family.	4	3	2	1
f. Schedules meetings to accommodate employees' family needs.	4	3	2	1
g. Juggles his/her own duties to help employees meet their family needs.	4	3	2	1
h. Does not allow the use of flexible work arrangements.	4	3	2	1
The general climate in my work group for employees with caregiving responsibilities:				
a. There is an unwritten rule that you cannot take care of family needs during working hours.	4	3	2	1
b. Employees who must balance their family or personal needs and their jobs are not looked upon favorably by my co-workers.	4	3	2	1
c. If you have problems managing your work and family responsibilities, the attitude is: "You've made your bed, now lie in it!"	4	3	2	1
d. An environment that equally supports all team members' flexible work arrangements is important to me.	4	3	2	1

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