

INCREASING THE PARTICIPATION OF WOMEN IN ENGINEERING CAREER: A CORPORATE PERSPECTIVE

Marie McKee

Corporate Director
Strategic Staffing
Corning Incorporated

How many of you have seen the Wizard of Oz?

The Wizard of Oz was written by Frank Baum, not Aesop, so it doesn't have a moral at the end. I think there is one. If you think about the story you realize that the Scarecrow, the Tin Man and the Lion all live in Oz, and could have gone to see the Wizard on their own but they didn't.

They were successful because they went together, more fun, a team, and helped one another out, and cheered one another on. And it also pleased me that they succeeded because they had the leadership of a courageous, talented and wise young woman. The gifts from the Wizard were actually just manifestations of the gifts they had given to one another on the journey to the Emerald City. I've always thought there ought to be another song in that movie - a quartet at the end in which they recognize and celebrate what they had achieved together. I think I'd call it, "We will get where we're going and what we need because we stuck with the task and helped each other", or something equally catchy.

What I thought I would do this morning is give you an industry perspective - - some data and some information - - about women in engineering. I would say it's some of the information you need to have to "get where we are going". I welcome your feedback and your sharing of data after the talk.

We all know industry needs engineers - - I'll talk first a little bit about that data.

We have all read the articles about the differences between men and women in their corporate management styles. I will share with you my own research and observations on that debate. I will describe what these women's future looks like, in terms of their salaries, and in terms of the corporate cultures which they will enter.

We'll talk about corporate initiatives which are in place in a number of companies for the purpose of retaining women. I will tell you, too what the women are saying about their preparation for industry - - in what areas they are prepared and in what areas they are not.

Finally, I'll suggest some things we need to do together to communicate and share the information we need - - including getting these women to stay in the sciences and engineering so they have the best compensated careers they can have.

If I were to write a theme song for WEPAN, it would be very much the same as our friends in "Oz". It would celebrate your working together to bring more women into engineering at your institutions and to collectively expand the number of women in the field of engineering. Your decision to work together to attract and retain women in engineering programs is wise, and it is producing valuable results.

First of all, because women are still a minority in engineering, and because you are the somewhat isolated representatives of that cause on your campuses, you need a network of colleagues. Having been in one of these positions prior to the formation of WEPAN, I know these are challenging jobs. I also know these are isolated jobs. And so I applaud you on the efforts you are making to come together and share your ideas and successes and frustrations, and thereby strengthen your cause (collectively). From where I now sit inside corporate America, the other great need is for industry and education to work together and to communicate frequently and clearly with each other. Education and industry share the unique privilege of helping women to achieve their potential; to develop productive, successful careers; to support themselves well; and, make substantial contributions to their companies and to the economy and to society as a whole. WEPAN facilitates that result and as a representative of industry, I thank you.

Let me just talk with you first about the critical importance of the work you're doing. We are all already keenly aware of the drop in population following the baby boom years. The impact is projected to last for the rest of this decade. Additionally, it appears that the numbers of women and men choosing natural sciences and engineering as baccalaureate majors has dropped significantly, from 21 percent in 1985 down to 18 percent in 1989. Thus in a three-year period when the number of college degrees granted rose by more than 17,000, the number of science and engineering graduates decreased by 31,000.

At the same time that we are producing fewer technical graduates ready to enter the workforce, industry's need for them is increasing.

The advent of the computer and the unique technological capabilities that have spun off and are continuing to spin off from the electronic age mean that we are increasingly dependent upon highly educated, highly skilled individuals who can move us forward in context of high technology.

A 1988 Report issued by the Congressional Task Force on Women predicted that "by the year 2010, we could suffer a shortfall of as many as 560,000 science and engineering professionals". So astute industry leaders have recognized that they must actively encourage women and minorities in engineering simply in order to have the required numbers of technical employees.

The really perceptive industry leaders are also recognizing the other benefits of having women and minorities as part of their teams. For example, in Corning, one of our female process engineers is saving the company \$10 million per year by effecting a hardware performance improvement on a television manufacturing project. Another woman, in her first six months on the job, solved a glass scratch problem that was costing us \$10,000 a day and had been going on for several weeks. She solved it in two days! And there are many more stories just like those, not only in Corning, but in every industry that seeks out and attracts talented women engineers.

As these stories get told, and as the influence of women in engineering and managerial roles becomes felt, the efforts to recruit women into engineering positions will be intensified. That will happen because it is becoming obvious that women bring talents to the workplace that are contributing substantially to the bottom line. Some of these are engineering talents, and some are managerial and other creative abilities.

There's a lot of talk now about special talents that may or may not be attributable more to women than to men. Every magazine describes leadership talents that women do or don't have!

Many of our Corning female engineers and managers that I talk to relate anecdotes that would seem to support the ideas that women are more empathetic, less hierarchical, more focused on team success and less on individual gain and more attentive to communications.

I would however caution all of us about being too carried away by the popularity of these ideas and with anecdotal evidence as conclusive. As far as we can tell at present, these may be gender-based differences or they may simply be rumors ... rumors which can work to women's advantage or disadvantage according to who's interpreting the traits, and how. (Depends on who is describing the elephant.)

There have been very few studies comparing women and men in comparable managerial roles. But the ones that have been done don't support the kinds of gender-based differences I've just mentioned. The results of a recent carefully designed study was reported in *Breaking The Glass Ceiling*, by Morrison, White, Velsor at The Center for Creative Leadership. They say that this study "makes a compelling argument to support the premise that executive women are more like executive men than they are different in terms of their goals, motives, personalities, and behavior." This study by the Center for Creative Leadership found only a few statistically significant sex differences. The differences they highlight are:

- . Executive men are more likely than executive women to feel equal to the demands for time and energy encountered in their daily lives. Anyone who has read *The Second Shift* by Arlie Hochschild can describe many of the reasons for this difference.
- . Executive men feel more in tune with their surroundings and are more likely than executive women to perceive things as their peers do.
- . Executive men are more comfortable than executive women in an environment where conformity to intellectual authority is desirable and the criteria for excellence are clearly specified (called "achievement via conformance").
- . Executive women are more likely than executive men to move in new and original directions.
- . Executive women are more likely than executive men to behave as individuals and to personalize their experiences.

An observation that I have about these differences is that they are heavily influenced by the lack of women role models in the corporation and the few number of women in the corporation.

But apart from these few differences there were long lists of similarities:

Women were not:

- . More impulsive than men
- . Not better able to reduce interpersonal friction than men
- . Were not more understanding
- . Were not more concerned with presentation of self

- . Were not more suspicious or touchy
- . Not less dominant in leadership situations
- . Not less confident
- . Not less optimistic about success
- . Not less able to cope with stress
- . Not less outgoing and social
- . Not less self-disciplined or rational
- . Not less intellectual
- . Not less insightful
- . Not less flexible, adaptable, and even-tempered

My own experience with managers is that this long list of attributes are required for all managers and are demonstrated by the men and women at Corning. Gender differences are a complicated subject. Lack of role models and experience in a corporate culture which is constantly changing make it complicated. We should continue to observe and study successful people, and continue to re-evaluate what we learn. We must also focus some of our studies on groups of professionals who are successful in a greater variety of contexts and levels and not rely solely on information about the very top layer. These super-high achievers are by definition the exception rather than the norm.

Whatever we learn from future studies, we must use what we learn to help our young students and employees learn how to develop those traits that lead to success. In any case, whether there ultimately prove to be significant gender differences or not, this much is clear: women are fully capable of holding major, responsible leadership positions in industry, and to be outstanding managers. And the good news is that industry (male-dominated industry) is finally beginning to understand that the kinds of contributions women can make to the workplace will make our businesses more profitable.

Let's now examine more closely what it is like for women in industry. Let me share with you just a bit of what your female engineering graduates can expect when they leave the hallowed halls of Kansas and enter the strange and sometimes frightening "Oz" of industry.

First of all - - the good news. On average, starting salaries for women engineers are slightly higher than those for men. The figures for offers to bachelor's engineering graduates for the class of 1990 from the College Placement Council were virtually the same for men and women.

| e.g. | Men | Women |
|------------|----------|-----------|
| Aerospace | \$30,446 | \$30,883 |
| Chemical | \$35,169 | \$35,013 |
| Electrical | \$31,732 | \$32,009 |
| Mechanical | \$31,998 | \$32, 398 |

These salaries reflect the fact that most major corporations are now committed to hiring more women and minorities into the workforce. And despite the recession, women engineers graduating this year are predicted to obtain worthwhile jobs with healthy pay and benefits, as long as their grades and marketable skills are up to standard.

So that's the good news. The bad news is that women's satisfaction with pay in entering industry tends to disappear within about six years, as the gender gap in pay widens over time, according to a recent study by the Society of Women Engineers.

At least that's the case historically. My experience is that this salary data partially reflects the glass ceiling or lack of women in larger responsibilities of leadership/management which tend to pay more. Many industries are working hard to change that. As we discuss corporate salaries we must also discuss corporate culture.

At the juncture of salaries and culture we come upon some of the reasons for the "wage gap".

What can women expect from the culture of the industrial workplace? Well, because they are still a minority, they can expect to feel like one. Although the picture is changing it is still not unusual for a woman to be the only one in an all-male organization, especially in manufacturing. This means that, depending on the culture of a company and the sensitivity of the particular individuals she is working with, she can either feel very much a part of things, or slightly distanced from the action. In the past, even the recent past, it has tended to be the latter.

In fact, studies such as the Opinion Research Corporation have indicated that women tend to feel more dissatisfied with their career development opportunities than their male counterparts do.

Women say they are still struggling to prove that they are advancing as rapidly as their male colleagues. Thus they are more prone to changing jobs in search of betterment. The proverbial glass ceiling has prevented women from achieving their full potential.

Part of the issue for these women is that it seems to be harder for them to get into the managerial track. Thus five or six years down the road, when the men who started with them have begun to assume managerial level jobs - - and managerial level salaries - - women remain at the level of individual contributors, with slightly lower salaries. And as time goes on, because they've been passed over early on, it's harder for them to catch up to the men who are advancing through the managerial track.

This picture may be changing. Studies do indicate that the youngest group of women are most satisfied with their work; and, I hope that's in part because they are seeing opportunities for their own advancement. It does seem evident that the glass ceiling is being raised, and in some places removed all together. And I am cautiously optimistic that such progress will continue.

One of the driving reasons for this progress is that industry is recognizing that it is expensive to lose employees. Corporations make a major investment in bringing new employees into the system - - often as much as \$30,000 to \$40,000 in the first year alone. It's sometimes two or three years before employees begin to contribute enough to the company to pay off the investment in their salaries, the time spent in training them, the continuing education programs they are sent to, and so forth.

So companies are looking very seriously at ways to protect their investments in their personnel. At Corning, we have always done a good job at attracting and hiring highly talented people, including women and minorities. We haven't done so well at retaining them, until recently. In order to address our problem, we developed an intensive and extensive top-flight orientation system for newly hired salaried personnel. And through the extensive efforts and advice of a Women's Issues Corrective Action Team, we identified and began implementing a number of initiatives specifically directed not only at new recruits, but in support of women throughout the company. Corning approaches these problems through our quality process. I have been a part of teams to recommend solutions and have led some of the efforts directed at leadership for women in management positions and work/family issues.

Here are some of the things we've done:

- . Formed the Corning Professional Women's Forum, a group which meets regularly and provides an important network among female employees; as well as bringing in speakers, publishing a newsletter, and publishing information of particular benefit to women employees.

- . Established and met targets for improvement in numbers of women in managerial and executive levels.
- . Analyzed the equitability of pay and learned that there is parity.
- . Introduced a part-time work policy for salaried men and women.
- . Established, with the local school district and others, a Parent Resource Center to provide a quality child-care resource and referral for all employees and others in the community.
- . Initiated confidential counseling for women, provided by an outside consultant, with general issues reported back to management for review and possible action.
- . Developed and implemented a new career planning and management system which enables all individuals to exercise more control over their own careers.
- . Developed and implemented a formalized coaching program for women and minorities to help them learn how to become more integrated into the corporate culture.
- . Established a corporate discrimination policy which states that "Corning will not be associated with any organization which allows discrimination based on gender or race" - - and that is having significant impact on our suppliers.
- . Two months ago, we announced plans for major expansion of a local child care center at our Corporate Headquarters.
- . Developed and implemented a company-wide workshop required for all salaried employees called "Men and Women as Colleagues", which addresses the gender-related issues in the workplace.

Do we have a perfect work environment for women? No. But we have one that's a lot better than it was. And as you're no doubt aware from recent articles and books describing good companies for women, these are the kinds of programs that are being implemented in many corporations throughout the country. From all we can tell, they are making a difference.

So what else can your women graduates expect from industry? Apart from the things we are doing to make their lives as women in the workplace smoother and more rewarding, corporate America is also continuing to invest in them in other ways. One way is through the adoption of The Quality Management System by most corporations. Corning has been a leader in this movement. We focus on two things in particular:

- . improving our products and processes through the use of cross-functional teams, and
- . providing a substantial investment in ongoing education and training

Both of these initiatives have dual effects. First, both are contributing to dramatic improvements of our processes and products to better meet our customers needs. Second, our people (men and women) are feeling more capable, stimulated and successful. As they move from roles as individual performers, team members and managers, they are being taught how to manage their new responsibilities. They have the opportunity and the obligation to grow and learn. Case studies have demonstrated time and again that our most successful employees are those who thrive on learning. We try to give them ample opportunities to grow and develop - - to learn from one another, and from top-notch outside sources.

So when you examine what is happening to your women graduates, all in all, I think you will find in 1991 that increasingly they are enjoying stimulating, rewarding careers, and feeling more a part of their organizations than was true in the past. And they also have an opportunity to join forces with other women and men who see the critical importance of having bright, talented women in the workplace, and are making organizational changes in order to attract and keep them.

Those are the things we're learning. But you're in the unique position to learn and share some things that we may not find out about as easily. As you learn from your interns and graduates what we're doing right and wrong, I hope you'll let us know. Most industries today want and need that feedback, and will value your information and perceptions. Put it in writing and send it to us.

Likewise, we can share with you some of the things our women engineers are saying about their college preparation. And I thought this would be a good opportunity to do that.

In general, they're saying that they had excellent preparation in the three most essential areas:

- . They come out with a strong technical base - they are well grounded engineers.
- . They are well schooled in the techniques of problem solving.
- . They have developed the common language which enable them to communicate with their peers.

There are some things that surprise them. Some of these gender related, and others are more general. Let me just talk about the more general ones first:

- . A Cornell University professor noted recently after a sabbatical leave in industry that whereas in a university setting students work primarily as individuals - industry does not allow for that. People must work together in teams. And that's a skill in itself. So the more exposure and opportunities to work in teams that you can give your engineering students, the better prepared they'll be for the transition to industry.
- . Along a similar line, our engineers who advance into management roles find that they are spending only about 25% of their time in technology and 75% in people management. That often comes as a surprise to them, and often they enter these new roles with very little preparation for the people responsibilities.
- . Another issue that our engineers have been conscious of is industry's constant need to communicate, both orally and in writing. This is an area where women often have an edge over their male counterparts. But as we all know, good instincts for technology and language don't always come in the same package, so helping engineers to develop their communications skills would be a real benefit.

Let me focus on several areas where gender differences are really pronounced and entry level employees are surprised.

- . One of our women managers told me that her gut feeling was that men have more access to information from the time they are born. Just as boys are often given toys and tasks that require manipulative skills, they seem to grow up in a world where they have opportunities to understand the applications and implications of those skills. Our women think it would be helpful to get more exposure to these various types of engineering at the college level.

- . Your female engineering students may need some help in learning how to search for the right company to pursue a rewarding career. They need to understand what to look for as they interview with a broad spectrum of companies which may or may not be in that small circle of well-known companies that are good employers of women. They need to hear discussion about issues such as child care and elder care, flex time and part time, percentages of women in management roles, mentoring and coaching programs, company's leadership commitment to diversity, and the many other policies, programs, and influences on whether a company treats its women professionals well. They need to know what the right questions are and how to ask the right questions when they get into interviews to elicit the information they need. And they need to understand the importance of looking beyond the starting salary to the potential for a rewarding career.
- . Finally, women engineering students need forums in which they can think through and deal with issues that relate to balancing their careers and personal lives. We're finding in many marriages, it's still primarily the woman who attends to the needs of the household and children and elderly parents - - all those nurturing and caregiving roles that have traditionally belonged to women. Obviously there is a tremendous amount of stress created when one individual assumes all of these responsibilities at the same time she is trying to develop a career. The younger women that I talk to often ask about my balancing act of work and family with my husband, 6 yr. old, and 1 1/2 yr. old.

So along with teaching calculus and strength of materials and circuitry and CAD-CAM, would you please also teach women how to negotiate effectively with their prospective partners and teach the men to share responsibilities and be supportive of their partners' careers. And when you have that song orchestrated, get back to me, and I'll be sure that you win a grammy!...or a Nobel Peace Prize!

Cultural change is tough, and unfortunately romance and rational decisions are not always well-connected in personal life and corporate life. We know that life outside of work or school is not going smoothly, the job or the studying is bound to be negatively affected. So although I was kidding about adding Marital Relations 101 to your curriculum, I do think that a forum is needed for introducing your professionals to values considerations about relationships that they are forming and will form. Finally, I think there are some things that education and industry must do together, if we are to continue to attract talented young women into engineering.

- . First we've got to tell our success stories. We need to communicate internally within our institutions and externally with one another and the world about the successes of our women engineering students and professional engineers. Your undergraduate and graduate students need role models, and so do your faculty members and our managers
- . Second, we need to develop a greater awareness and excitement about science and technology in our communities generally, and among women in particular. Recent studies have pointed out that many students who are attracted to science don't wind up pursuing it.

We need to get to the bottom of why students (girls and boys) steer away from science and engineering or sometimes leave the area once started, and to understand how we can perpetuate and encourage their interest. This needs to be done in many ways and at all levels, not just university.

We need to be reaching elementary and high school aged students and turning them on. And we especially need to reach their parents and their teachers and their next door neighbors, and help them to believe that it's perfectly fine for girls to like math or chemistry or - - God forbid - - even physics!

There are some wonderful programs going on all around us that help that cause. MIT's annual Two-Seventy Design Contest, where mechanical engineering students in an Introduction to Design course create imaginative contraptions with the goal of meeting certain established objectives. The televised competition allows us to see women among the cream of the engineering crop. In Corning, our local SWE chapter sponsors an egg-drop competition from the roof of our Engineering Building. Also in Corning, our company and many individual scientists and engineers within it are heavily involved in helping to sponsor and to advise individual students for an annual community-wide science fair. As the mother of 2 girls I see the excitement that kind of activity can achieve. Every technological company I know of encourages its scientists and engineers to volunteer in the schools and help to encourage students and explore the ideas and processes of science.

These are the kinds of activities that we need to encourage, perpetuate and grow. You students and faculty can help the cause, and so can our professionals, and wherever possible, we should be doing it together.

Third, and related to this, we need to continue to do everything we can to address the retention problems that engineering programs everywhere are facing and have faced for a long time. Losing nearly half of the students who enter your doors intending to be engineers is a blow to you and a blow to industry. And I know that most of you are finding that you lose a few percentage points more women than you do men in your programs.

These young people, and the young women in particular, need to understand the harsh realities of life that await them. Today, six out of ten American women are in the labor force. Four out of five are full-time, year-round employees.

Divorced women comprise the largest numbers of employed women. And unfortunately, these days, over half of the marriages end in divorce. An unknown number of marriages are also dissolved through desertion and separation.

What many of our young women don't realize is that the economic impact of divorce will be far greater for them than for their future ex-husbands. Lenore Weitzman's 10-year study of California divorces shows that, on average, women's incomes decline about 70 percent as a result of divorce, whereas men's increase about 42 percent. So divorce is a quick road to near-poverty for too many women, including professional ones.

The story that needs to get told over and over again, is that a career in the technologies can help to provide a buffer between women and economic hardship. A career in engineering will give them a better wage and more secure employment.

I know you are working hard to deliver these messages to your students, and I hope you are calling on role models from industry to help you get your point across. Students need to know that the hard work they're putting in, even with lower grades than they are used to getting, do pay off, and that they can be successful. We, too, have a vested interest in keeping those excellent science and math students in your engineering programs, and I hope you will call on us as partners in that process.

I know right now that you're concerned with funding cuts which may jeopardize the needed expansions of your programs, and in some cases perhaps even jeopardize their existence. I think you will find industry to be an eager champion in lobbying along side you in your quest to preserve and increase funding, and in some cases, even to be receptive to grant proposals to help support your efforts.

Every industry handles funding differently, so what I say will not be universally applicable. But the pattern I see is that industries generally tend to work most closely with two areas. First, they have close ties to the communities where they reside. Secondly, they select a few key institutions with whom they work most closely in recruiting, research, consulting, or some other capacity. When those well-established, close relationships exist, industries tend to be receptive to proposals to help fund programs which are mutually beneficial to the company and the institution or community. So my advice to you would be that you encourage your faculty and administration to develop a genuinely close relationship with a few industries based on mutual needs and advantages. One way of doing this is through the advisory committees that many of you already have. These should bring together your engineering faculty and some of the firms who will be most likely to hire your graduates. Not only can these provide you with an entry to the corporation, but they should be providing a forum for a healthy, honest exchange of information.

The opportunities for exchange of information require time on everybody's part, but the potential benefits are great ... as are the pitfalls of our lack of communications. We are dealing with the professional preparation and careers of our best resource. The future economy rests on them.

As Daniel Webster once wrote, "Men (which I will freely edit to say Women and Men) can do jointly what they cannot do singly; and the union of minds and hands, the concentration of their power, becomes almost omnipotent." So keep up the wonderful work you are doing ... and stay in touch. Because "We will get where we're going and what we need because we stuck with the task and helped each other".

Dorothy and her pals got where they were going and what they needed because they all reinforced each other, shared information, and were not afraid to ask for help along the way. Thanks to each of you for doing your very important part in the mission to help bright young women become satisfied, well-compensated, and successful engineers.