Why They Stay:
The Ideal Selves Of Persistent Women Engineers

by

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ABSTRACT

Women remain dramatically underrepresented in the engineering profession – and far fewer women than men persist in the field. In the first study of women who stay (vs. stray) from corporate engineering careers, we interviewed 21 long tenured female engineers and a control group of ten women who opted out of the profession after an average decade of employment to generate a grounded theory about their personal and professional “lived lives.” Women constitute only 11% of the U.S. corporate engineering workforce and remain as engineers for shorter periods of time than men. Several studies have described why women leave engineering careers, but the literature is silent about those that stay. We addressed that gap by focusing uniquely on women with two decades or more of corporate engineering tenure. Our findings should be of interest to universities and government agencies hoping to entice more women into the profession and to corporations in search of women engineers with long tenure potential.

Key words: Women Engineers, Retention, Engineering Career, STEM Women, Ideal Self, Intentional Change Theory, Engagement
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INTRODUCTION

Unlike many professions in which women are well represented, engineering is a field dominated by men. About 22% of all engineering degrees are awarded to women (National Science Foundation, 2008) but they hold only 11% of engineering jobs (Bureau of Labor Statistics, 2009). And only one third of female – but more than 50% of male – engineers remain on the job more than 18 years out of school (Frehill, DiFabio, Hill, Traeger, & Buono, 2008).

Hewlett, Luce, Servon, Sherbin, Shiller, Sosnovich, & Sumberg (2008) contrast the considerable research on women in academic careers involving science, engineering and technology with the dearth of work on women in the same fields in the corporate sector. Their own research on the latter concludes that occupational culture drives women away from these careers. A study by Frehill (2008) for the Society of Women Engineers (SWE) categorized 146 women’s responses to the question “what caused you to leave engineering” into six areas: interest in other careers (47%), advancement opportunities (20%), time/family-related issues (18%), boredom or lack of challenge (16%), other job issues (15%), and negative work climate (14%).

Despite these and other studies on occupational and organizational issues that explain why women leave engineering careers, the literature is silent about what motivates those who persist. We aimed to fill that gap – and, in doing so, contribute not only to the literature, but to practice.

Attracting more women to science, technology, engineering and math (STEM) careers in general and engineering careers specifically will, it is argued, benefit women, industry and society (Margolis, Fisher, & Miller, 1999/2000). For women the gain is high
paying and rewarding work with abundant opportunities (Bureau of Labor Statistics, 2008). The benefit for industry is a reduction in the troublesome shortage of skilled technical workers in the US (NSF, 2006). And society will be the better as a result of the broadened perspective and diversified talent women bring to the field (Margolis et al., 1999/2000).

Recruiting women to the STEM professions and retaining those women are important goals of both the US government and non-profit organizations. The National Science Foundation, between 1993 and 2006 offered 350 grants totaling between $7 and $11 million per year for the production of knowledge to broaden girls’ attitudes and perceptions on STEM careers and to increase the number of women participating in these undergraduate and graduate programs. Another NSF funded program, ADVANCE, focuses on increasing the number of women in academic science and engineering careers. Established in 2001, ADVANCE has invested over $135 million in more than 100 academic and non-profit institutions (NSF, 2008). Other organizations including the Society of Women Engineers (Frehill, 2008) and the Center for Work Life Policy (Hewlett et al., 2008) have focused on the reasons women leave STEM careers. Unaddressed in the literature is a focus on what explains the career longevity of women who enter and remain in the profession – a cadre we call “persistent engineers.” Understanding what motivates women to remain in the profession should offer critical clues about who to recruit to the field and how to retain them.

To address this gap in the literature we designed a qualitative study based on semi-structured interviews with women representing the one-third of US women engineers with on average 20 or more years of engineering practice. Our goal was to generate a grounded theory about their career longevity. Informed by prior research and preliminary interviews with professionals knowledgable about the problem of practice (including academics,
researchers and employers), we conjectured that both institutional and personal factors might influence career sustainment, but we remained purposefully open to discovering if, how and why they did. Our results reflect assessment of the beliefs, attitudes and behaviors not only of persistent engineers but of a second sample of women with an average of 12 years of engineering practice who had left the profession to pursue other career opportunities. Comparing and contrasting evocative personal narratives from both groups enriched our understanding of the research question, “What factors explain the career longevity of women engineers in US corporations?”

**LITERATURE REVIEW**

**Women’s Careers**

Significant changes in women’s employment over the past several decades have been noted by the Bureau of Labor Statistics (2009). More women (including many with children) are participating in the work force and claiming more jobs requiring higher levels of education. In 2008, women comprised more than half (51%) of management, professional and related occupations. But despite almost equal overall participation in the workforce women comprise only 11% of the US engineering (and only 6.3% of all engineering management) positions (Bureau of Labor Statistics, 2009).

Studies on careers and career choices are abundant in the literature with an increasing number focused on the differences in men’s and women’s careers. Mainiero & Sullivan (2005) use the term “kaleidoscope career” to distinguish female work trajectories from, they claim, far more linear male work patterns – noting women are more apt to construct careers that suit their own objectives, needs, and life criteria and more often make choices influenced by relationships and self fulfillment.
Findings from several studies show that women leave their careers at a higher rate than men and suggest that four in ten highly qualified women leave work voluntarily at some point in their careers influenced by both push and pull factors. Push factors include lack of job satisfaction, lack of opportunity and excessive demands, while pull factors include family pressures and personal health. Among highly qualified women off-ramped from their careers, Hewlett and Luce (2005) found 93% intending to return.

It is unclear the extent to which discrimination plays in derailing women’s careers today. Meyerson & Fletcher (2000) argue that laws and heightened organizational knowledge about bias has all but eliminated blatant discrimination, but work practices and cultural norms that appear unbiased still create systemic disadvantage for women – blocking many from career opportunities.

A number of studies on women’s careers have sought to identify factors that distinguish women’s careers from men’s, O’Neill & Bilimoria (2005), for example, discuss women’s careers as different from men’s because of family responsibilities, a woman’s relational emphasis, and under-representation in higher organizational levels.

**Women in Engineering and other STEM Careers**

Engineering is a profession in which the number of jobs will continue to grow (Bureau of Labor Statistics, 2006) and starting salaries are high (Bureau of Labor Statistics, 2009) up to $59,000 per year for bachelor level chemical engineers and $92,500 for PhD computer engineers in 2007. However, women have low representation in engineering and other STEM professions and leave at higher rates than men (Frehill et al., 2008). Empirical studies focused on women in engineering are rare as compared to research on women in other professions (Jorgenson, 2002). Many studies on women engineers are based on
samples of engineering students (Blum, 2001; Chiu, Chiu, Chiu, & Chiu, 2002; Cuny & Aspray, 2002; and Shull & Weiner, 2000) or women in academic engineering roles (Bilimoria, Joy, & Liang, 2008; National Science Foundation, 2007).

The Society of Women Engineers (SWE) published a study in 2008 on men and women with engineering bachelor’s degree earned between 1985 and 2005 to gauge their reasons for leaving the profession (Frehill, 2008). Men were shown to leave for advancement opportunities at higher rates than women, while women were more likely to leave than men due to negative work climate.

In their study on women in science, engineering, and technology (SET) careers, Hewlett et al. (2008) found that 52% of women leave SET careers because of the workplace culture, isolation, unclear career paths, jobs with long hours and much travel, and lack of career advancement opportunities. Much of the blame for women leaving these careers is discussed in terms of workplace culture, Hewlett et al. (2008) describe it as hostile and macho, marginalizing women and excluding them from promotional opportunities. The concern of women leaving the science, engineering and technology careers is discussed in terms of a labor shortage in the US in these fields.

In her article on the changes worldwide for women in engineering Hersh (2000) reported comparative data on women’s careers by countries. She concludes that the low representation of women is a strong disincentive to other women entering engineering and suggests that measures be taken to ensure women are promoted on the same terms as men.

Jorgenson (2002) studied 15 women engineers ages 29 to 45 to understand how women engineers position themselves within the prevailing discourse on gender and technical work and concluded that the women positioned themselves as career identified and
able to cope in male-dominated workplaces while being good mothers struggling with balance between work and families. Additionally the women were found to be non-feminist because they did not want to organize as women, and were resistant to being perceived as a homogenous group.

An empirical study of women engineer’s mid-career satisfaction conducted by Auster & Ekstein (2005) found organizational, job and stress factors are related to, but not predictive of women mid-career satisfaction. While expecting that organizational characteristics would predict job satisfaction, their findings suggest that the effects of job and stress factors overrode them. The study included individual characteristics of the women such as child care responsibilities, but did not include any measure of personality, motivation, or identity which we believe may be important in achieving job satisfaction.

Career Decisions

While the literature is silent about the specifics of women’s decisions to remain in engineering careers, there are abundant studies about decisions relative to other intentional behavior. The original conceptual model for our work was influenced by Ajzen’s (1991) theory of planned behavior (TPB), a refinement of the Theory of Reasoned Action (TRA) developed by Ajzen & Fishbein (1969, 1970). The original model argued that reasoned action was informed by attitudinal and normative variables. Later Ajzen (1991) adapted the model by adding self efficacy as a predictive factor. TPB, used extensively to explain decisions to engage, is explained in terms of attitude toward the behavior, subjective norms, and perceived behavioral control. We considered these as potentially useful in explaining women engineer’s decisions to persist or opt out of their careers.

As defined by Ajzen (2009), attitude toward the behavior is the valuation of the
behavior, either positive or negative determined by behavioral beliefs or one’s belief about the consequences of the outcome. Subjective norms are the perceived social pressures to perform a behavior and are influenced by an individual’s important referent groups. The influence of these important referents are considered the normative beliefs. Perceived behavioral control in the TPB refers to one’s belief in his/her ability to perform a given behavior – known as self efficacy (Bandura, 1977, 1982).

We conjectured that a woman’s engineering career longevity might be influenced by behavioral beliefs, subjective norms, and self efficacy moderated by the occupational culture of engineering and the organizational culture of the corporation. We then created an interview protocol that might capture beliefs and attitudes about these and other potential influences among a sample of both persistent women engineers as well as women who had opted out of the profession.

**METHODS**

**Methodological Approach**

We considered qualitative research appropriate for this study because as described by Glaser and Strauss (1967) it is most suited to efforts to understand the process by which participants take meaning from their experience. The strengths of qualitative research, according to Maxwell (2005), derive from its inductive approach, its focus on specific situations or people, and its emphasis on words. Among several intellectual goals described by Maxwell as appropriate for qualitative inquiry, one is the identification of unanticipated phenomena and influences on which to generate grounded theory.

Grounded theory, according to Glaser and Strauss (1967), is theory that is inductively developed during a study or studies in constant interaction with the data. Two key
characteristics of grounded theory are theoretical sampling and constant comparison.

Theoretical sampling means decisions about the sample are not conclusively determined a priori, but made as data collection ensues. Constant comparison refers to concomitant data collection and analysis involving a continuous search for similarities and differences in the data.

Use of grounded theory is appropriate when a researcher wants to make knowledge claims about how individuals understand reality (Suddaby, 2006) as in this study that has explored the realities of women in engineering careers.

Sample

Our sample consisted of thirty-one women aged 34 to 60, all with experience as an engineer or as a manager of engineering or manager of any technical area within a corporation located in the US. All of the respondents were identified through the personal network of the primary researcher. All were college graduates. One had a degree in science and thirty had engineering degrees in the following fields: biomedical (1), chemical (12), civil (4), industrial (4), electrical (2) material/metallurgical (2), or mechanical (5). More than half of the women had master’s degrees – nine in engineering, seven MBA’s, one masters of education, and one masters in counseling. Three had doctorate degrees (two in engineering, one in business) and two others were in the process of obtaining doctorate degrees. A little more than half of the women received their degrees from private universities. One woman was educated in the former Soviet Republic.

At the time of the interviews, 21 of the women were working in a technical role and had between 13 and 30 years of experience, averaging about 21 years. The remaining ten women had left an engineering or technical management career prior to the time of the study.
after an average of 12 years of experience in the field. Some exited for non-engineering careers (6); others to be stay-at-home mothers (4).

More than half of the sample lived in the US mid-west in Ohio, Illinois and Michigan. Others were geographically dispersed in southern, east coast, and western states. Employer industries included: chemical, pharmaceutical, electronics, oil, food, metals, fluid technology, communications, electronics, entertainment, consumer products, automobile manufacturers, automobile suppliers, and consulting.

Twenty three women were married, three were divorced, and five had never married. Twenty-one women were mothers. A summary of key personal data on the respondents is given in Table 1 below and in Appendix B.

<table>
<thead>
<tr>
<th>TABLE 1</th>
<th>Personal Data on Respondents</th>
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<tbody>
<tr>
<td></td>
<td>Women who Stayed</td>
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<tr>
<td>Interviews</td>
<td>21</td>
</tr>
<tr>
<td>Average Age</td>
<td>44</td>
</tr>
<tr>
<td>Average Years Worked in Engineering</td>
<td>21</td>
</tr>
<tr>
<td>Never Married</td>
<td>4*</td>
</tr>
<tr>
<td>% Never Married</td>
<td>19%*</td>
</tr>
<tr>
<td># Women with Children</td>
<td>13</td>
</tr>
<tr>
<td>% Women with Children</td>
<td>62%</td>
</tr>
<tr>
<td>Average # Children</td>
<td>1.1</td>
</tr>
</tbody>
</table>

* Two women mentioned long term male partners of 16 & 25 years

**Data Collection**

The data was collected during a four month period from May to August 2009. Interviewees were contacted by email inviting their participation in the study. Thirty-one semi-structured interviews of approximately one hour duration were conducted – seven face-to-face and twenty-four by telephone. All but one interview was digitally recorded and transcribed by a professional service. One interviewee declined to be recorded and this interview was reconstructed by the researcher immediately following the event and later
reviewed by the interviewee for accuracy.

The researcher used an interview protocol designed a priori (Appendix A) to guide the interviews but, consistent with the semi-structured approach to interviewing, allowed respondents freedom of expression. The key interview questions focused on personal and career histories, examples of fulfilling and non-fulfilling career experiences, early and current career expectations, and beliefs about the pros and cons of an engineering career for a woman. We used probes to elicit narrative detail and to shed light on behavioral beliefs about engineering, the influence of subjective norm and women’s sense of self efficacy. Women currently employed in engineering were also asked to explain their reasons for staying in the field and women who left engineering were asked why they exited. All respondents were candid and forthcoming. Many expressed their pleasure at being able to share their stories in the hopes that younger women might be influenced by their own positive and negative experiences.

**Data Analysis**

The data analysis began with the researcher repeatedly listening to each audio recording and reviewing each interview transcript numerous times. The transcripts were then coded, relying on the protocol recommended by Corbin and Strauss (2008); open, axial and selective coding.

Corbin & Strauss (2008) discuss open coding as a brainstorming approach to analysis during which the researcher remains open to all possibilities within the data. Open coding involves a rigorous, line by line, reading of each transcript for the identification of “codable moments” – fragments of text with potential significance. We identified almost 1800 such words, phrases or longer segments of text in the thirty one interviews and categorized and
assigned to them 151 labels.

In the second phase of coding, axial coding, the categories were repeatedly reviewed, refined, and re-labeled. In this phase, finer distinctions between categories were noticed and patterns in themes and concepts emerged from the data. These themes directed us back to the literature and prompted iterative interaction between the data and existing theory. In the third coding phase, selective coding, further refinement and reduction of the codes ensued and the key constructs that led to the study’s findings were identified. At the conclusion of this process, 49 codes yielded six observations and three key findings. By moving back and forth between the data, the research materials, the literature, and an original conceptual model, the grounded theory expressed by our final model presented and discussed in the sections below, emerged.

FINDINGS

In contrast with previous research concerned with the retention of women in STEM careers – studies that have exclusively focused on why women leave – our study illuminated why women stay. Our data yielded three findings shown in Table 2 about “persistent engineers” – women who have remained in the profession as an engineer or a technical manager for an average of two decades or more.

<table>
<thead>
<tr>
<th>Finding</th>
<th>Women Who Stayed</th>
<th>Women Who Left</th>
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<tbody>
<tr>
<td>1 Distinguishing characteristic of persistent vs. out-opting engineers</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.1 Self efficacy and confidence</td>
<td>21 of 21</td>
<td>5 of 10</td>
</tr>
<tr>
<td>1.2 &quot;Other&quot; vs. &quot;self&quot; orientation</td>
<td>17 of 20</td>
<td>2 of 8</td>
</tr>
<tr>
<td>1.3 Positive cultural adaptation</td>
<td>16 of 21</td>
<td>2 of 9</td>
</tr>
<tr>
<td>2 Positive opportunity focus</td>
<td>19 of 21</td>
<td>NA</td>
</tr>
<tr>
<td>3 Personal/professional aspiration alignment</td>
<td>21 of 21</td>
<td>0 of 10</td>
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</tbody>
</table>
Finding 1:

Women with sustained engineering careers demonstrate more self efficacy and confidence, greater “other” vs. self orientation, and more purposeful adaptation to the male culture frequently found in engineering organizations than do women who leave the profession.

1.1 Persistent engineers demonstrate more self efficacy and confidence in dealing with work related issues than out-opting engineers.

All twenty one of the respondents still working as engineers or technical managers in careers that spanned thirteen to thirty years, narrated experiences in which they demonstrated initiative and seized control of or manipulated difficult situations, drawing upon what they judged as superior capabilities and/or training to effect personally favorable outcomes. Self efficacy was expressed in relation to finding new assignments, dealing with difficult work situations, or tackling tough technical problems. Often it was associated with the employment of skills developed over the course of a career to maneuver out of an uncomfortable or threatening situation. Examples included managing conflict with superiors or coworkers and effecting formal job changes.

In contrast, nine of the ten engineers who had exited the field, told stories in which uncertainty, confusion, low self esteem or low confidence predominated. The comparative quotes in Figure 1 below exemplify the dramatic difference in self-efficacy expressed by our two groups of respondents. Only one of the twenty one persistent engineers articulated self doubt.
FIGURE 1
Self Efficacy and Confidence

SELF EFFICACY AND CONFIDENCE
Women who stayed in their engineering career are more likely to express self efficacy and confidence.
Those who left are more likely to discuss self doubt.

Women Who Stayed

...my grandfather informed me my dad had started out as a chemical engineer major and found it too difficult and dropped out. So then I had to prove him wrong... It kind of gave me the confidence, or at least the verification, that I knew what I was talking about... and all these complicated systems, and I was able to demonstrate knowledge and ability to present that well.
(Technical Manager with 13 years experience age 35)

...I stand up in front... and say here's what I think the issue is, and here's how I think we go about changing what we're doing to basically, at the end of the day, come up with a better way of lowest lifetime costs for the plant or this piece of equipment... So I basically approached him, told him I was looking for some more opportunities, interested in doing something closer to the customer, and basically, he made a position in his group and hired me.
(Technical Manager with 28 years experience age 50)

I bought a pump, replaced one of the Sundyne pumps... and I spent a lot of time researching it. They just put the pump in last weekend and it's working exactly as I thought it would. It's one thing to get a pump and have it work, but everything that I figured out, what flow rates we need, what pressures we need, what happens while we vapor lock, why sometimes we trip the excess flow valve... Oh, it feels great.
(Process Engineer with 16 years experience age 38)

I purposefully progressively changed my voice to create more of a louder voice, an aggressive voice with an aggressive position. Not that I was being angry, but I was doing this very purposely. And at the end, it's like, "That's what he wanted." Not that he knew to tell me that or not that he knew to change himself because I was a different type of personality. He wanted somebody who could be as aggressive and in-your-face as he was.
(Consultant with 21 years experience age 45)

...after a volleyball game - everybody went out for a beverage, and there must have been, like, 20 people at the table, and I just stood up and said, "Excuse me, Excuse me. Everyone? Question. I have a degree in engineering from Purdue University, and I need a job." ... Somebody called me the next day. He was sitting at the table. He called me the next day. He was sitting at the table. He called me the next day.
(Manufacturing Engineer with 19 years experience age 40)

Women Who Left

You know, when I graduated from (college), I had a tough time finding a job. I really was low on confidence even though I had this great engineering degree and all this stuff, it was still tough for me to have the confidence to go and interview.
(12 years in engineering career now a stay at home Mom age 43)

I think I had very little confidence, and I kind of waited for the other shoe to drop that somebody was gonna find out that I really didn't know what was going on, and so if I had a boss who wasn't confident in me, who treated me with no respect, then I got into that completely.
(11 year engineering career now a college professor age 52)

...it was a tough year for me because it was - I had to learn just on-the-job basically, and it was frustrating because I didn't know so much. And I think people expected me to know things, and I didn't. So it was kind of humbling because you had to basically to acknowledge, "I don't know anything."
(11 year engineering career now working in purchasing age 35)

I didn't think I was qualified for, but since I had quality engineering experience... they interviewed me... So hiring me was great because they didn't have to pay for a quality manager... but I actually had more knowledge than I realized for them.
(13 year engineering career now a stay at home Mom age 35)

I wasn't competent. My ego wasn't being built, and it was difficult. I just found it incredibly difficult. I felt worthless.
(10 year engineering career now a non profit director age 48)
1.2 Long-tenured women engineers are more likely than out-opting engineers to be “other” vs. “self” oriented.

Persistent engineers were more likely to describe career fulfillment in terms of reciprocal engagement with others, including collaboration and providing support, counsel and advice. In many cases the women talked about the effects or consequences of their professional efforts on customers, co-workers, direct reports and sometimes individuals or more remote constituents. Satisfaction derived from helping customers solve problems or assisting fellow workers to succeed were often cited. Exemplifying the broader societal effects of her work one engineer, for example, provided a dramatic narrative of how software developed by her team saved the lives of US military operatives in a foreign country. Other examples included assisting others to become successful and helping customers solve problems.

In contrast, as demonstrated in Figure 2 below, women who left their engineering careers discussed fulfillment in terms of returns to themselves – frequently associating fulfillment with recognition by others, usually a higher level manager. These women focused on what they personally learned, felt, experienced or contributed to the job.
FIGURE 2
Other Orientation vs. Self Orientation

OTHER ORIENTATION VS. SELF ORIENTATION
Women who stayed discussed fulfilling times in their career in relation to helping others. Those who left were more likely to discuss fulfillment in relation to themselves.

Women Who Stayed

So I think working with the client areas, for me, is really fulfilling, particularly when you can see that you're really helping them to understand how their processes work, how they can improve it, and then you help them actually implement those processes, that you get to see those changes. (Senior Engineer with 15 years experience age 37)

I would actually sit down with them to explain what we were trying to measure and what were our goals and what our targets and work with them to get there. Now, we had that potluck and the rah rah, you know and when you call you do the rah rah, cheer, cheer thing to keep people going. (Senior Engineer with 28 years experience age 52)

So they had integrated our situation awareness with their targeting capability, and one of the things that hey had noticed was there was a flight - there was a squadron of gunships that were flying missions into Afghanistan. And my brother flew gunships and he was in Afghanistan and there's only one active duty gunship squadron. So they vectored either my brother or somebody close to him. His - it was all his squadron. (Consultant with 28 years experience age 50)

So just working with people, I think, and getting them ready to do that and then seeing them go out and be very successful is something that I kind of take great pride in actually. (Technical Manager with 22 years experience age 44)

And it was just really fulfilling because you felt that at the end of the day, after you had all these meetings and you were able to come back and say, Okay, we discussed this. Let's look at all the data. Here's the best way to do it. I'll solve the problem. Let's talk about if this is the way we want to go, and get everybody to buy into it. (Consulting Engineer with 21 years experience age 45)

Women Who Left

I was working hard. I believed you had to work hard to do good work. That was being recognized, and I was being rewarded. So that was a pattern that I was in, and I have an ego, so I also was getting that fed by being rewarded, and I needed that. I needed that in some way, shape, or form. (10 years in engineering career now a director of a non-profit age 48)

So if I would suggest something, like, cut costs, change procedure, or do design better, you only have to talk to my boss who was the Vice President of the company, and if he found it reasonable and valuable, we would do it the next day. (15 year engineering career now a homemaker age 52)

I think that's the best - the most fulfilled, and it really is because I've got this ability to make an impact. Certainly, in the other jobs, there were the times when we'd have big meetings with lots of customers and stuff, and I'd be in front of that group. That was - I loved that. If I did that all day, I would never do anything else because that part was just so cool. (11 year engineering career now a college professor age 52)

I just felt like I was learning so much and growing so much. (8 year engineering career now a counselor age 40)

So the next time I came into work, one of my coworkers said, oh my gosh, she brought your report to the meeting and she said how wonderful it was. Then she came and told me I'm bringing this up to the plant manager and I'll go to one of the manager meetings, they'll hopefully listen to you and they'll start doing some other things. (14 year engineering career now a stay-at-home mom age 43)
1.3 Persistent engineers are more likely to adapt to workplace culture than are out-opting engineers.

Persistent engineers and those that left the profession alike acknowledged the male-dominated culture of their workplaces and both groups noted challenges associated with it. Seventeen of twenty women who remained in engineering and seven of ten women who exited discussed gender associated cultural issues including, in some cases, discrimination and/or harassment. What distinguished the two groups was the way these experiences were framed and addressed. Sixteen of twenty one of our persistent engineers discussed purposeful ways they adapted to the culture, while only two of ten women who left the field discussed adaptation. While those who exited were much more likely to “complain” about the culture, those who remained talked about “sizing up” the situation and addressing it. Adaptation in some cases was subtle – for example, “dressing down,” “pulling my hair back” or “changing the tone of my voice” to be successful. But more often, persistent engineers reported actively manipulating circumstances in an effort to mitigate personal discomfort caused by gender bias – bettering their own situations and, sometimes, affecting the attitudes and behaviors of others. As the quotes in Figure 3 demonstrate, the manner in which persistent engineers managed culture-related challenges provides further support of their relatively higher self-efficacy.
FIGURE 3
Recognition and Adaptation to Culture

RECOGNITION AND ADAPTATION TO CULTURE
Women who stayed have recognized the male-dominated culture and purposefully adapted to it to be successful. Those who left discuss the culture but were passive in dealing with it.

Women Who Stayed

I can get the guys in the shop to do anything for me if I go to them and say, “I could really use your help.” They'll help me because I’m some young girl. If I go in and tell them to do something, I'm not going to get what I want. I either use my womanly ways. I used what I thought would work in the situation to get what I wanted.
(Technical Manager with 24 years experience age 45)

So I figured out fairly early on that I had to not disguise that I was female 'cause there was no obvious way to do that, but I wore sort of the severe suits. I mean, severe in terms of didn’t call attention to myself. And I had long hair, and I would put that - I would pull that back so it wasn’t like flying all over the place. And I would wear glasses, so I looked sort of studious.
(Consultant with 28 years experience age 50)

as a woman in engineering … I feel free to ask lots of questions. I don't walk in with the attitude that I have to know everything, and I think a lot of men who started as managers, feel that they have to come up with all the answers, or they're the big authority and they have to tell the people how to do things.
(Process Engineer with 16 years experience age 37)

And the other thing I'd advise a woman is it is a little bit of a boys' club. And it's not always, but - like the firm I'm at now is not, but some of the ones in the past you've got to figure out how to work in that environment and be okay.
(Consultant with 13 years experience age 35)

I took the exam and then I was told that I didn’t get the job, but I had gotten the highest score. So, I petitioned the city and went in and sat- I can't remember what his title was, but I made him tell me why he thought I wasn't qualified for the job. And it ended up that they had to reverse it and give me the job. And I, of course, then had to prove that I was gonna be just as good as the guy that was, you know, had been kind of tabbed to take the job.
(Technical Manager with 30 years experience age 60)

Women Who Left

... it's mostly men - and a lot of older men - in there. But it was funny; I was thinking they totally viewed me as their granddaughter, there. ... you just assume catcalls, and people thinking you're stupid because you're a girl...
(13 years in engineering career now a stay at home Mom age 35)

... there was a competition with it and at the end when they were going to give the prize, they wouldn't give it to me. They pulled me aside and they said, “These guys will be mortified if you get this prize.” … They're like, “You did the best, but we can't give it to you.”
(12 year engineering career now a stay-at-home mom age 43)

I think you eventually get to lenses where you wonder is it male/female, but I think all of us, and I did as well, experience occasions along the way, where you are not included, and inclusion is an incredibly powerful thing.
(10 year engineering career now a director of a non-profit age 48)

all men; I was the only woman and I was, by far, the youngest person in the room…. No matter what you think, they were just men in suits and it was intimidating.
(14 year engineering career now a stay at home mom age 42)

But I was not even in charge of anything. I was, let’s say, average … work girl, you know, I was told to do this, to do that. They did not let me use my knowledge, brain, or they didn’t want me to speak up. … Despite what anybody says in terms of equal opportunity for everyone, there is a clear discrimination for women in manufacturing in terms of giving them promotion, pay, and treatment. Like, they're not treated equally.
(15 year engineering career now a homemaker age 50)
Finding 2: Women who remain in engineering or technical management careers reveal undiminished stimulation, challenges, and personal growth associated with the job.

In response to our question about why they stayed in their engineering career, nineteen out of twenty one persistent engineers discussed their careers in terms of novelty, match of interests and continuous learning opportunities. Many of the women explained that within the scope of their careers they were able to find opportunities to work on new technologies, new projects, or new products. The novelty coupled with the ability to continuously learn provided the motivation for them to continue to work in technical careers. We found that these women were stimulated by the challenges associated with the new technologies. They sought out these challenges, some within the scope of their organization, others moving into different industries in their quest for challenges, novelty, and the ability to continue to learn. The quote tree supporting this finding is in Figure 4.
FIGURE 4
Unrelenting Opportunity

UNRELENTING OPPORTUNITY
Women who stayed believe that an engineering career will continue to provide unrelenting opportunities for novel, challenging, and interesting work.

they were giving me assignments that were brand new. You know, Greenfield, nobody had done before. ... it was the carrot from the job. I always got to do something. And my whole career has been that. I mean the water supply to the hazardous waste site worked, I mean I just kept cutting edge stuff, brand new. So, that's-yay, I think it's finding out what the carrot is for the stay, 'cause as I hear myself talk about it, I think it was the new stuff that kept me.
(Technical Manager with more than 30 years experience)

I also get to learn continuously. I've worked in so many different industries and businesses, everything from children's hospitals... utility companies, telecommunication companies. It's just been - it's really interesting to me to get to learn what's similar about all those different businesses and then what makes them different.
(Project Manager with 13 years experience)

And I'm big on life-long learning. If you're not being challenged in a job, if you're just putting time in then it's time to go someplace else. I mean, life's too short. ... be with a team that you love, in a job that stimulates you intellectually, that gets your creative juices flowing. It's got to be something that gives you energy. ... (Research Manager with 28 years experience)

...having had the opportunity to do a number of different things kind of keeps you from getting bored with it because I'm just having the growth, being able to come in every day, and I'd learn something every day.
(Technical Manager with 22 years experience)

I really like what I do. So this is the thing: there's just always been those really interesting aspects to it. I think it's always been really interesting. There's been very few periods in my career where I thought oh, I just don't look forward to going to work in the morning.
(Consultant with more than 30 years experience)

...that it's always - it's going to be different and interesting.
(Consultant with more than 30 years experience)

(Stay) ... as long as the work is interesting and as long as things are happening. So far, it's definitely been that way.
(Research Manager with 15 years experience)

...next year, I will be very busy with integrating that facility into our capital process... So think that'll be one of my big challenges next year.
(Technical Manager with 17 years experience)

It's still fun. It's still rewarding and challenging to me.
(Systems Engineer with 15 years experience)

You can do so many different things. You do not have to work in this field or that field or this field or that field. You can be an engineer in just about every field. Every field needs an engineer somehow, someway, whether it's medical or manufacturing or aeronautical or whatever. So there's variety. There's - it opens doors.
(Manufacturing Manager with 19 years experience)

I like the type of work that I do right now because it changes all the time... I enjoy the challenges. I enjoy the people. I like the fact I can travel and see something new. By working with the government, it's opened up a completely different situation for me... I can't imagine anything else that would be this much fun on a regular basis.
(Technical Manager with 18 years experience)
Finding 3: Persistent engineers are more likely than their colleagues who leave the field to express alignment between their personal and career aspirations.

Women who remained as engineers for thirteen to thirty years conflated career and personal achievement, revealing that career accomplishments provided personal fulfillment. Contrarily, women who left the field after eight to seventeen years articulated a tension between work-related and personal goals, often citing the need to fulfill personal aspirations not satisfied by work as the motivation for leaving their jobs.

As demonstrated in Figure 5 below, our persistent engineers, even after many years on the job, exude enthusiasm, energy and commitment to their work. The women who left, quoted in the right hand column, however, described their experience as engineers as “not happy,” “didn’t feel I was giving back,” “had accomplished nothing,” and felt “detached.”

Persistent engineers not only felt fulfilled in their professional roles but did not evidence conflict between their personal and professional lives as the majority of our respondents who had left the field. In fact, persistent engineers were just as likely as out opting engineers to be married or in long-term relationships as did the women who left the field and were almost as likely to have children.
FIGURE 5
Alignment between Personal and Professional Aspirations

ALIGNMENT BETWEEN PERSONAL AND PROFESSIONAL ASPIRATIONS
Women who stayed discuss alignment between personal and professional aspirations. Those who left discuss tension between work related and personal goals.

Women Who Stayed

I’m one of these people that I won’t quit. I really like what I do. There was just something about these industrial gas plants I just really like and enjoy. I don’t know how to explain it. I just have a passion for the plants.

(Technical Manager with 28 years experience age 50)

I’m a hopeless geek. I can really love solving problems. I love working with users. My husband tells me that it’s like I am so analytical about everything that he just wants to run from the room screaming sometimes. I love to solve problems; I actually have the toolset now, where the technology generally is easy for me. And I’m actually really, really good with people and facilitating communications among disparate groups.

(Consultant with 28 years experience age 50)

I feel needed, I feel like if I didn’t show up to work - maybe not one day; maybe not a week, but if I was gone for a month, I would be missed. There are a lot of things that I can do that I’m the only person who can do those things.

(Process Engineer with 16 years experience age 37)

I can feel like I did something that made a difference. Now, we can say that making XX that goes in paints and plastic is only so exciting, but it’s something that I can look around and go, yeah, I impacted the world a little bit. So I think that’s it. There’s a very wide variety of things you can do with engineering. I chose to stay on the manufacturing side.

(Technical Manager with 17 years experience age 38)

I’m entirely fulfilled. And part of that is personality, it’s this idea that, all right, let’s find connections, and it’s interesting because I work with some brilliant brilliant people that never considered the idea of collaborating outside of the organization because it was never something they were allowed to do. So in a lot of ways, I feel that, all right, my role here is to break down barriers, and I do a lot of that.

(Research Director with 15 years experience age 42)

Women Who Left

And now I have a baby I was like I have to breast feed exclusively no formula, make my own baby food and everything. So I remember like missing work and thinking how could I possibly juggle. There’s no way I could have juggled them.

(8 year engineering career now an office manager in family business age 43 years old)

I never saw myself working full time… So despite being pregnant and all the stuff that comes with that - maternity leave and everything - they hired me. At the time, I was hoping that I could possibly go part time. I worked so hard. I worked overtime every day. My goal was to make them want me part time - make them not want to lose me at all. I first broached the subject, and it came back with a probably not. I was just so upset because that was part of my whole master plan. So I sat down and I realized I had accomplished nothing because of the constant roadblocks.

(13 years engineering career now a stay-at-home mom age 35)

I was thinking engineering could be more creative than it turned out to be. I thought I could be a mechanical engineer and design cars or buildings. I thought it’d be much more creative than it was. I just came to a point where I had to decide do I want to keep doing this. If I’m not happy here, would I be happy doing it there? No. I really wasn’t. I wanted a change.

(8 year engineering career now a counselor age 40)

There are certain things that kind of trigger it in like I think you reflect upon really doing what you should be doing, and my dad passed away suddenly in May of 2005. What am I doing with my kids?... what do I want to be, and I really didn’t feel like I was giving back enough because so much of your time is spent at work and not really concerned in serving the community. I realized I wasn’t happy anymore.

(17 years engineering career now a grade school teacher age 42)

And he holds it up, and there’s a list of maybe 15 names, each one has a date next to it that goes back at least one name per year on this list - maybe two names in one year or something. I can’t remember very well. And I said, “What’s this a list of?” And he goes, “This is the list of the suicides in this company.”... I wanted to leave a legacy, and all I saw was stock prices going up and down, but because I was so detached from how what I did was affecting the world in any way, it just - that’s why my soul hurt. (Now) I’ve got this ability to make an impact.

(11 years engineering career now a college professor age 52)
DISCUSSION

Our study of the career longevity of women in engineering was motivated by a gap in the literature on women in science, technology, engineering and math (STEM) careers. The literature has riveted on women who opt out of STEM careers – many of them discouraged by an inhospitable, (sometimes hostile) macho culture reported to prevail in many engineering and other STEM environments. Little is known, however, about what we call “persistent engineers” – women with decades of tenure in engineering and technical management roles. We sought, in in-depth interviews with 21 of them as well as 10 out-opting women engineers, an explanation for sustained commitment to the profession – and found striking differences between those who stay and those who don’t.

A plethora of studies have explored the notion of “persistence,” examining perseverance, tenacity, and the ability to stubbornly adhere to a course of action. Several in particular have looked at persistence in the engineering field, shedding light on why some students persist against odds to earn an engineering (or other STEM) degree. McCain, Fleming, Williams, & Engerman (2007), for example, distinguished between three types of engineering degree “persisters” – “unyielding persisters”, “intense goal setters”, and “economic rationalizers. Similar to their unyielding student persisters, our persistent engineers faced down potentially disruptive challenges to maintain their careers. Unlike McCain et al.’s students they did not do so, however, by single mindedly rationalizing that they must do so because it was something they had “started and needed to finish” or had “invested too much into” to stop. Rather, our persistent engineers maintained their careers because they provided self fulfillment.

Persistent engineers, but not those that had voluntarily exited the profession, seem to
realize in their careers what Boyatzis & Akrivou (2006) have described as one’s “ideal self.” The concept of an ideal self is rooted in the psychology literature – specifically in work on motivation. Higgins (1987) promoting self discrepancy theory, distinguished between two guiding end states, the ideal self and the ought self — the former guided by the individual’s hopes, wishes, and aspirations, and the latter by demands regarding duties, obligations, and responsibilities. Building on self discrepancy theory, Higgins, Roney, Crowe, & Hymes (1994) showed that some people are motivated to move as closely as possible to a desired end state while others avoid anything unaligned with it.

Since the ideal self engages in behavior consistent with one’s desired end state, sacrifices are sometimes made in the short term to accomplish more important longer-term goals (Boyatzis & Akrivou, 2006). According to Boyatzis, hope, a desired future state, and a person’s core identity influence one’s ability to achieve the ideal self. We found positive evidence of all three factors in the beliefs and behaviors of persistent women engineers.

Hope, defined as the feeling that something desirable is likely to happen, is proposed by Boyatzis as constituted by self efficacy and optimism. Self efficacy determines how much effort will be expended and how long one will persist when facing difficult circumstances (Bandura 1982). Those with a strong sense of self efficacy will exert greater effort to master challenges and overcome obstacles. We found clear evidence of strong self efficacy in the narratives of our persistent engineers – but not in those of their out-opting peers.

Persistent engineers were more likely to demonstrate self efficacy in work related situations than were women who exited the profession. We found evidence of self efficacy in engineering careerists’ stories about proactively identifying specific jobs characterized by novelty, challenge and learning opportunities and in accounts of overcoming difficult
situations (such as job loss, bad bosses, and workplace discrimination).

Both persistent and out-opting engineers acknowledged the male dominated culture of many engineering environments as an obstacle to career longevity. Boyatzis (2006) argues that people who produce alternative routes when facing obstacles to goals are said to have high hope. We found references to hope abundant in stories persistent engineers told about dealing with male dominated organizational cultures – but notably absent in the stories proffered by our exited engineers. Persistent women engineers not only recognized that they needed to be creative in handling situations in the context of their work culture but were able to cleverly manipulate situations to ensure positive outcomes for themselves.

Evidence of self efficacy also emerged in descriptions about how long tenured women engineers balanced work and family. While out-opting engineers viewed family and work as antagonistic commitments, persistent engineers saw them as competing but compatible goals. For many of the former they were a stark “either/or choice” – the women left their engineering careers because they understood them to compete with personal life goals. But women who stayed in engineering, skillfully manipulated work environments or circumstances to accommodate both goals, often assuming new or different responsibilities, changing jobs altogether or finding new employers. Excerpts from our data supporting this are found in Appendix C.

Our persistent engineers saw unrelenting opportunity in their professional futures, assured, despite decades in the field, that they would continue to find novelty in their work. We did not find the same level of optimism or preoccupation with novelty (fascination, for example, with new technologies or new product development or work that they had never before done) in the out-opting group. Persistent engineers also described on-going
challenges and the desire to learn continuously.

The image of the desired future is explained by Boyatzis & Akrivou (2006) to be influenced by one’s values and philosophy, life stage, and calling in life. Important identity groups such as the family, as well as one’s history and enduring dispositions create and nurture values and philosophy. Awareness of one’s passion according to Boyatzis, makes one feel as if life is worth living by fulfilling a calling in life. The sustained passion for their jobs expressed by women engineers more than 20 years into their careers surprised us – as did their certainty about the fit between their careers, values and callings in life.

The third component of Boyatzis’ notion of the ideal self is core identity, or one’s strengths, context and resources. Core identity is relatively stable and is a compilation of a person’s enduring dispositions, involving a set of individual characteristics. Motives and roles taken in group settings are described by Boyatzis and Akrivou (2006) as part of core identity and related to one’s social identity groups. Our persistent engineers (but not those who had left the field) consistently and repeatedly self-identified as engineers, demonstrating an embracement of the profession as part of their core identity.

We found that persistent women engineers are strikingly other-oriented — i.e. the relational aspect of their core identity is strongly emphasized. The importance of work relationships with peers, superiors and subordinates is central to these women. They take pleasure in and are sustained by their interactions with and ability to support others.

O’Neill and Bilimoria (2005) and Mainiero & Sullivan (2005) discuss women’s careers as relational – women, they argue, make career decisions considering the impact of them on others. We found ample evidence of consideration of others – linked to expressions of career fulfillment – in the narratives of persistent engineers.
Persistent women engineer’s personal and professional aspirations, contrasted with those of their out-opting peers, appear to be strongly aligned and we interpret this alignment between who they are and what they want to be as the manifestation of the ideal self (Boyatzis, 2006). Many of these women expressed strong emotion when describing why they chose to stay in engineering and Boyatzis & Akrivou (2006) note that positive emotion has a foundational role in the model of the ideal self. The ideal self provides the motivational function – guiding actions and decisions to ensure deeper satisfaction in life and work.

The strong evidence of persistent engineers’ alignment of professional and personal aspirations surprised us. These women are highly connected to their occupations and strongly engaged in their work. Kahn (1990), credited with first defining the term engagement in a work role, states that personal engagement is the degree to which people bring in their own selves while performing work tasks. While engaged at work, employees express themselves physically, cognitively, and emotionally while performing work roles.

Kahn defined three dimensions of engagement: meaningfulness (including task and role characteristics as well as work interactions), safety (a sense of being able to show one’s self without fear of negative consequences), and availability (the sense of possessing the resources necessary for investing in role performance. We found Kahn’s descriptions of these characteristics a close fit with how our persistent engineers discussed themselves. Kahn’s description of meaningfulness is similar to how our persistent engineers described unrelenting opportunities and the alignment between personal and professional aspirations. The self efficacy described by our persistent engineers in many ways implies they exhibit what Kahn described as the psychological safety and availability job engagement.

Persistent engineers desire and expect to maintain their professional status in the
future. Boyatzis (2006) notes that the intent to sustain a current state (in our case a career) can be explained by intentional change theory (ICT). Because a career may drift into a less desired state and be susceptible to external or internal forces of change, intentions to sustain it require investment of energy. Using complexity theory to illustrate the discontinuous nature of change, Boyatzis argues that discontinuities may jolt one out of equilibrium. Gladwell (2000) described this jolt as a tipping point.

All of the women in our sample who had left engineering described a tipping point that forced a realization that their engineering careers were not aligned with their personal and/or professional aspirations (see Appendix C). These tipping points included – the birth of a child, the death of a parent, a new manager, a company-wide reorganization, or the effects of a hostile work environment. In each case the tipping point resulted in an exit from the profession to pursue another, presumably more “ideal” self. Contrarily, although there is evidence of personal and professional discontinuities in the narratives of our persistent engineers, these did not jolt incumbents to reconsider their careers. The experience of one woman who had twice lost her engineering job but persistently pursued another (see Appendix C) demonstrates that the desire to maintain a current state requires investing energy to countermand unwanted, externally motivated change (Boyatzis, 2006).

In summary, consistent with Boyatzis theory of the ideal self, our findings show that women with sustained engineering careers exude hope, have a clear image of how their career fits their future state, and view engineering as part of their core identity. As suggested in the conceptual model presented as Figure 6 below, how these factors influence their alignment of personal and professional aspirations (i.e., an ideal self), may, the findings suggest, be moderated by the occupational and organizational culture of engineering.
Our study contrasts with previous work on STEM career retention by focusing not on why women leave the profession – but why they stay. It is, to our knowledge, the first research to concentrate on identifying differences between women who purposefully sustain vs. revoke their engineering roles and identities in response to well documented inhibitors of professional success in the field. The application of the theory of the ideal self as a key in understanding career longevity is also a unique contribution of the study.

**LIMITATIONS**

Several limitations to this study should be noted. Our sample is small and non-random and thus may not broadly represent all women in engineering. We focused only on women engineers with corporate experience and our results may not be generalizable to women engineers in government, academia or other non-corporate engineering venues. While the sample included women from a wide variety of US firms, we advise caution in the generalization of our results to all industries.
As Corbin & Strauss (2008) discuss, researchers must be self-reflective about how the research process is influenced by the researcher. The principle researcher in this study has worked both as an engineer and a technical manager in several US corporations for more than 26 years. While every effort was made to remain self-reflective and to avoid the imposition of personal values on the data, we acknowledge the potential effect on them of our experience and knowledge.

**IMPLICATIONS FOR PRACTICE AND FUTURE RESEARCH**

Our findings have implications for both practice and for future research. In practice, managers of women engineers may find our results useful in improving retention of women in engineering careers. We recommend that managers provide early career opportunities to increase the self efficacy of women engineers and ensure continued opportunities for novel and challenging work, and learning. Our work confirms the findings of earlier researchers about the deleterious effect of engineering’s male dominated culture on retention and we advocate for increased mindfulness on the part of managers to mitigate it.

Our findings suggest many opportunities for future research. Discerning how women STEM careerists manage the alignment of personal and professional aspirations would be a welcome contribution to the STEM retention literature as would further inquiry about the role of factors constituting the ideal self in sustaining professional identity. Our small sample size, while yielding quite unambiguous results, nevertheless implies that future research should involve more women engineers – and engineers in other than corporate roles. We also recommend similar studies involving women in other STEM careers including science and technology.
APPENDIX A
Interview Protocol

1. Tell me about yourself and your career in engineering.
   - Degree/Year/School
   - Spouse/kids/other outside responsibilities
   - How long in engineering/technology career?
   - Which companies/how many/time at each?
   - Current position, organization and culture
   - Why engineering? (added after about 1/3 of interviews completed)

2. Thinking about the first 10 or so years of your career, tell me about your beliefs or your career expectations in the first years after graduating.
   - Did you believe you would have an on-going technical career?
   - Expectation on promotions?
   - Type of work environment?
   - Important - Co-workers? Mentors?
   - Have your beliefs changed over time?

3. Tell me about a time in your career where you were especially fulfilled in your work.
   - What were you working on?
   - Who were you working with?
   - What did you expect vs what you got out of this work?
   - What did you think about yourself at that time?
   - Career choice and expectations?
   - Anyone else influence your choice?

4. Was there a time when things changed? When there were not so good?
   - When?
   - Why?
   - Organizational issues?
   - Occupational issues?
   - Who do you seek career advice from?
   - Who helped in the decision making?
   - Did you express your concerns within your organization?
5. How do you explain your career longevity? Or why have you stayed? 
   Or 
   Why did you leave your engineering career?

6. During your time in engineering you must have seen many other women leave. Why do you believe they have left?

7. What would you tell a young woman who is just starting an engineering career? Changed to:
   What do you believe the pros of an engineering career are?
   And what do you believe are the cons of engineering?
## APPENDIX B
### Summary of Respondents

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<th>Interview</th>
<th>Engineering Degree</th>
<th>Graduate Degree</th>
<th>Years Exp</th>
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<th>Industry Type</th>
<th>Married</th>
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APPENDIX C
Additional Quotes Supporting Discussion

Quotes on how persistent women engineers were able to balance work and family.

“One of the things that I wanted to do was to get more of a research job because I wanted to be able to balance my work life and my home life. I think by switching companies and finding a company that allowed me, in the type of position I have, to balance the things that are important to me, it made it much easier for me to stay in this career.” (Technical Manager with two children)

“From the corporate engineering group to the (current job), one of the things that drove me was less traveling because we were traveling three, four days a week. In fact, at (my current job) I'll probably have to work longer hours, but even if I worked 7 to 5, at 5:00 pm I go home and I'm with my family, so that was a big plus. Even though you're working more hours, I'm still getting more time with my family.” (Chemical engineer with three children)

Quote on how a desired future state includes persistence in staying in an engineering career

“In '83 there was a mini-oil crisis, and I lost my job. So I came back home ...to look for another job and I ended up entering an ad. And the job turned out to be in Akron, Ohio. The job was (with X company)...they decided to close...so I lost my job... So about four weeks later, I got a call from a recruiter and that took me to (company Y)... And I spent 17 years (at company Y) doing development work, pilot work, scaling products from lab to production and production support work that went along with it. ...You learn the skills and figure out what you're good at and what you're not, because I ended up in manufacturing where everything is about your ability to communicate.” (Technical Manager)

Quotes on tipping points or wake up calls leading to their exit from engineering are vividly described in the following two narratives.

“I think you reflect upon really doing what you should be doing, and my dad passed away suddenly in May of 2005...what am I doing with my kids? What do I want to be and I really didn't feel like I was giving back enough because so much of your time is spent at work and not really concerned in serving the community. ..I realized I wasn't happy anymore.” (Chemical engineer now a grade school teacher)

“I was just getting really sick of it... but it felt my soul was being sucked out of me.... (Company X) is the most competitive environment I've ever, ever experienced... and there's a list of maybe 15 names, each one has a date next to it that goes back at least one name per year on this list - maybe two names in one year or something..."This is the list of the suicides in this company.” ... “There's been one a year,” ...and I thought, “This is tough. It's really hard. ..The culture of the organization is just brutally ambitious, just the total brutality. ...I really had a difficult time figuring out how I fit into - how I was leaving a legacy, and that's really the answer (to why I left engineering)..... I wanted to leave a legacy, and all I saw was stock prices going up and down, but because I was so detached from how what I did was affecting the world in any way, it just - that's why my soul hurt.”  (Mechanical engineer now a college professor)

And then finding fulfillment in another career.

“...and every day, I see what I do at (college) and how it is helping someone... and every day, I go in, and I go in with that in my mind, and that's what I was looking for. That's what I personally needed, and I couldn't find in the corporate engineering world.” (Mechanical engineer now a college professor)
REFERENCES


