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To the Graduate Council:

I am submitting herewith a dissertation written by Janie Elaine Seat entitled "Women engineers : expectations and perceptions." I have examined the final electronic copy of this dissertation for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Doctor of Philosophy, with a major in Education.

Patricia A. Beitel, Major Professor

We have read this dissertation and recommend its acceptance:

Joy DeSensi, William Poppen

Accepted for the Council:

Carolyn R. Hodges

Vice Provost and Dean of the Graduate School

(Original signatures are on file with official student records.)

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We have read this dissertation
and recommend its acceptance:

Joy D. Nelsen

Erin Sundstrom

Faye V. Harrison

William A. Poppen

Accepted for the Council:

Lew Minkel

Associate Vice Chancellor and
Dean of The Graduate School

WOMEN ENGINEERS: EXPECTATIONS AND PERCEPTIONS

A Dissertation

Presented for the

Doctor of Philosophy

Degree

University of Tennessee, Knoxville

Janie Elaine Seat

December 1996

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ABSTRACT

This qualitative study examined the expectations and perceptions of women engineers from the perspective of the engineers themselves and managers of employees in technical jobs. Eight entry and seven mid-career women engineers from a geographic cross-section of the United States were interviewed about their careers. Seven male managers of technical workers were interviewed about what they perceived the women engineers' perceptions to be. The engineers' expectations and perceptions were primarily addressed through a discussion of critical incidents in the form of best and worst experiences. The managers were asked about how they believed the engineers perceived their careers. These two perspectives were subsequently used to develop theories of the career development of women in the engineering profession.

Themes emerged in categories of self-perception, best experiences, worst experiences, expectations, how managers viewed women engineers, opportunity and recognition, and family issues. The women engineers were generally found to be focused on task accomplishment at entry level. At mid-career, they assumed successful task accomplishment and had broadened their perspective to include relationships and interactions with others as important. Depending on their place in the corporate hierarchy, managers were found to have differing views about women engineers. Those managers in direct contact with the workforce were task oriented, while those at highest levels were more relationship oriented.

Two theories and their supporting constructs were suggested from these themes. One theory is based on role conflict between the emerging family, career development of women engineers, and the sponsorship role of lower level engineering managers. The second theory proposes that as women engineers mature, they broaden their task focus to include group achievement. Paradoxically, as they become more holistic in their approach to problem solving with an increased awareness of relationships, they also become alienated in the workplace. The entry level engineer has an individual task focus and feels more included. These theories and their supporting constructs are presented in a fashion that provides insights for change.

PREFACE

I'll start with an apology. I haven't put together a very happy story. This story doesn't have a happy ending. For a good time, don't read this. But, glimpses of the truth aren't promised to be pleasant.

It's odd what you carry away from a project like this. In the process of performing this research, I have eaten Din Sum, and I have decided that a traffic jam is just a traffic jam, regardless of whether it is one lane open because of bridge construction or five lanes jammed on the freeway. I mainly learned to grab my ideas by the horns and test them myself. I discovered that once I got up the courage to grab hold, people came out of the strangest places to shout encouragement. They shouted so loudly that the nay-sayers couldn't be heard.

There is a conclusion or two, or maybe three or four, in every chapter of this dissertation. But, if you asked me the most important conclusion, the thing I would say if allowed only one insight, you wouldn't find it in the text. It's not really a conclusion. It's just a sense, a sense of the real problem. The one thing that has emerged for me is that the only way to change things is to change the business model of who is promoted into low level management positions. The problem isn't the workers or the vice presidents - it's the gatekeepers who control the workplace culture through norms created by selective behavioral reinforcements. I would tell any CEO, "If you want your business to be different, you have to get people with a different view of success in lower level management positions." The system is faulty.

It has been suggested that I have advanced my personal agenda with this project. Believe what you want. The interview techniques and the themes were validated by a committee composed of both genders. The only way around this accusation would have been to publish results that spoke in glowing terms of the women engineers' circumstance in the workplace, or perhaps to have been a male researcher who uncovered problems. I'm unwilling to do the male thing, and the results can't be changed.

Many thanks to all of those who participated in my study. Special thanks to the men who found my participants in far-off places. I know you didn't have to do it. Thanks to all the people in my life who wouldn't let me play. You made me what I am today. Thanks to the person who wouldn't let me be a victim, especially a victim of myself.

The real thanks goes to my committee. Without them, I would have never believed I had a clue. Pat, Bill, Joy, Eric and Faye - Thank you for treating me with respect and making me believe that I was smart enough.

TABLE OF CONTENTS

CHAPTER 1 INTRODUCTION 1
Setting the Stage 2
The Business Perspective 3
The Counting Approach 3
The Intuitive Approach 6
The Individual's Perspective 7
The Puzzle 8
Bias Statement 9
Purpose of Study 10
Definitions 11
Assumptions 11
Scope of the Study 12
Significance of the Study 13
CHAPTER 2 TRUTH IS TRUTH 14
Gender Bias and Performance 14
Demographics and Trend Prediction 17
Socialization and the Workplace 20
Differences of Style 24
Job Satisfaction Surveys 25
CHAPTER 3 PROCEDURES 26
Development of the Investigative Technique 27
Style of Investigation and Analysis 29
Description of the Research Process 30
Pilot Testing 30
Bracketing Interviews and Bias Exploration 31
Participants 32
Interviews 33
Summary of the Data Gathering and Interview Interaction Process 35
Interview Summaries 35
Preparation of Transcripts 36
Data Analysis 36
Prior research 37

THE FACTS

CHAPTER 4 "I AM A COLLECTION" 39
The Groups 39
Marriage and Children 41
Education 42

What Do You Do For Fun? ... 43
On Becoming an Engineer ... 44
Minorities ... 45
The Demographic Characters ... 47
The Rest of the Story ... 47
CHAPTER 5 WHO AM I? ... 50
Who Are You? ... 51
My Best Qualities ... 53
Summary ... 56
CHAPTER 6 BEST AND WORST EXPERIENCES ... 58
Affecting the Outcome ... 60
Look at What *I* Did! ... 60
Look What *We* Did! ... 62
But, I ... 64
Summary ... 66
CHAPTER 7 EXPECTATIONS ... 67
I Expected... ... 67
I Expect... ... 70
Summary ... 73
CHAPTER 8 THE MANAGERS ... 75
Differences in the Managers ... 76
How I Got Here ... 76
I Am... ... 78
Women Engineers' Expectations ... 79
The Difference between Women and Men Engineers ... 84
Between the Sexes ... 87
The Paradoxes ... 88
Summary ... 88

THE INNUENDO

CHAPTER 9 OPPORTUNITY & RECOGNITION ... 92
Engineers' Perception of Opportunity ... 93
How Does that Thing Work? ... 93
Future Opportunity ... 94
Engineers' Perception of Recognition ... 99
Managers' Perception of Opportunity ... 101
Managers' Perception of Recognition ... 103
A Recognized Expert ... 103
Summary ... 104
CHAPTER 10 FAMILY ROLES & ISSUES ... 106
Plans for a Family ... 106
My Career and My Family ... 107
They'd Rather be Moms ... 109
This Isn't OK ... 112
Summary ... 113

THE DYNAMICS

CHAPTER 11 RISKY BUSINESS 117
CHAPTER 12 A SENSE OF VALUE 120
A Sense of Accomplishment 120
A Sense of Belonging 122
A Mismatch 127
CHAPTER 13 TIES TO THE PAST 129
Tokenism & Gender Bias 129
Workplace Socialization 131
Oppression 133
Summary 134
CHAPTER 14 COMMENCEMENT 136
The Study Itself 136
The Results 137
The Theories 137
Strategies for Change 138
The Future 139
REFERENCES 142

APPENDICES

APPENDIX A: INFORMED CONSENT STATEMENTS 148
APPENDIX B: INTERVIEW GUIDE - ENGINEERS 151
APPENDIX C: INTERVIEW GUIDE - MANAGERS 154
APPENDIX D: TRANSCRIBER STATEMENT OF CONFIDENTIALITY 157

INDEX 159
VITA 163

LIST OF TABLES

Table 1: Group Classification and Participant Category 40
Table 2: Family Demographics 41
Table 3: Educational Credentials 42
Table 4: Hobbies and Fun 43
Table 5: Managers and Fun 44
Table 6: Entry-E Influence from Father on Career 45
Table 7: Minority Perception by Women Engineers 46
Table 8: Organization of Results and Theories 49
Table 9: Who Am I? 52
Table 10: Entry-Es' Best Qualities 54
Table 11: Mid-Es' Best Qualities 55
Table 12: Entry-Es' Best Experiences 61
Table 13: Mid-Es' Best Experiences 63
Table 14: Women Engineers' Worst Experiences 65
Table 15: Mid-Es' Initial Expectations 69
Table 16: Entry-Es' Future Expectations 71
Table 17: Mid-Es' Future Expectations 72
Table 18: Lower-Ms and Mentors 77
Table 19: Upper-Ms and Mentors 78
Table 20: Lower-Ms' Personal Qualities 80
Table 21: Upper-Ms' Personal Qualities 81
Table 22: Managers' Perception of Engineers' Expectations 82
Table 23: Lower-Ms' Perception of Women's Ability 83
Table 24: Upper-Ms' Perception of Women's Ability 84
Table 25: Lower-Ms' Perception of Differences 86
Table 26: The Effect of Women Engineers in the Workplace 87
Table 27: The Paradox of Being Away from Home 89
Table 28: Opportunity and Technical Work 95
Table 29: Entry-Es and Opportunity 96
Table 30: Women Engineers and Recognition 100
Table 31: Manager's Perception of Promotion Opportunity 101
Table 32: Upper-Ms' Perception of Women Engineer's Opportunity 102
Table 33: Managers and Recognition 103
Table 34: On Being an Expert 104
Table 35: EntryEs and Plans for Children 108
Table 36: Mid-Es and Their Children 109
Table 37: Mid-Es and the Effect of Children 110
Table 38: Lower-Ms' Perception of the Effect of Children on Career 111
Table 39: Lower-Ms' Perception of Traditional Roles 112
Table 40: Lower-Ms' Personal Projections and Family Roles 113
Table 41: Upper-Ms' Perception of Women Engineers and Family 114

CHAPTER 1

INTRODUCTION

> I think about this often. I never have really seen a woman in her late 50's, early 60's, working as an engineer. I have no idea what I would do if I was in my 50's or early 60's. *Michelle*

This is the story about how it is to be a woman engineer. Now you might wonder why anyone would find this story interesting because at first glance, it's not about a great happening or the autobiography of a heroine. But perhaps it is. These women may look like usual folks, but in becoming engineers, they are professionals in a career chosen by few men and even fewer women.

Outwardly, these women are everyday people with families and dreams. But somehow, they chose a different path than their childhood peers and entered a career that is based on traditionally male skills and stereotypes. They excelled at math and science in their early years. They found their way into engineering school where there were few other women to serve as models. They have survived in a field that is hostile to women, from its overt white male dominance to subtle innuendo from being different. They have lasted in an environment that wasn't created for or by them. They work in an discipline that doesn't make many strides to accommodate, much less embrace, difference.

Careers are usually presented as statistical data of types of jobs, pay scales, and geographic locations. But numbers don't tell the story of personal rewards and trials. How it is to be a women in this career isn't reflected by statistics. The numbers only serve to keep a story such as this impersonal. The real impact lies in engineers' perceptions about who they are and what they expect. The women engineers' experiences become a story when the numbers become a person and their careers are a complex game having culturally based rules. It is a story about individual struggles to play in that game. It is about personal spirit and those who would nurture or crush that spirit. It is about an age old system of dominance that has a certain "prejudice from a consensus of the like-minded" (Rosaldo, 1993, p. 220).

Stories come in two forms -- those that tell of events, and those that describe real human experience. Stories can be about experience or about an experience. This story is about

the experience of a group of women who have become something out of the ordinary. Their story develops from perceptions of their career experience. It isn't a collection of the types of things that have happened to them, rather it is a collection of feelings and impressions and an interpretation of their lives.

The story of women engineers appears simple to the point of boredom. It looks like the story of smart women who go to engineering school and then get good, stable jobs in industry. However, several things don't add up. If engineering is such a good career, why do women comprise less than 15 percent of the total of engineering school graduates in the mid-1990's? Why is there a perception of a high attrition rate among women engineers? Is there a high attrition rate among women engineers? Why do results of surveys indicate that after age 30, women engineers are less satisfied than their men counterparts? Just what kind of career has engineering been for women?

All of these questions have merit. Each one can stand alone, yet together they paint a picture of the health and future of the population of the engineering workforce that is composed by women. Little is known about *how it is* for women engineers once they are in their careers. Now they've been asked. Their story has all the elements of a bestseller - power, oppression, spirit, hopes, and dreams.

Setting the Stage

Understanding *how it is for women engineers* requires the same strategy as solving a 1,000 piece jigsaw puzzle. Solving a jigsaw puzzle isn't a matter of starting at the beginning and heading toward the finish. It requires working several parts individually, and then integrating the parts. In working a puzzle, the pieces are first sorted into piles of similar pieces and boundary pieces. A scene of trees and a lake would have a pile of the edge pieces, a pile of tree pieces, a pile of water pieces, and a pile of those pieces that were both trees and water. Finally, each pile would be put together individually and integrated into a whole.

Just like the puzzle, understanding this problem of *how it is for women engineers* necessitated sorting common pieces into several piles, then building the individual parts, and finally putting the parts together. It has been developed from both an internal and external view. The internal view was that of the women engineers themselves, and the external view was that of those around them in the workplace. In other words, how did the engineers see themselves, and how were they seen by others?

The nature and culture of the technical business environment, general characteristics of the engineering population, and fundamental principles of how people perform compose the different parts of the puzzle. The stories help describe how the puzzle goes together. But, this

puzzle is a little different than most. Since there isn't a box top showing the final picture of the puzzle, there is no one single, right answer.

The Business Perspective

The business community has good reason to be interested in the health of its women engineers. Engineers form the backbone of the technical workplace. They are the creative minds that put new ideas into practice. They have traditionally moved into management roles. Business needs engineers and their problem solving ability.

In this writer's opinion, business has seized on either of two motivations for concern about women engineers - the *counting* approach or the *intuitive* approach. In the *counting approach*, demographic and market predictions insist that in the future, there must be a larger percentage of women technical professionals to have enough technical workers. It is simply a problem of having enough. The *intuitive approach* suggests that future economic survival depends on global interaction, and those uncomfortable with diversity will find it difficult to find a place in the supply chain. Whether a matter of a head count or becoming diverse, women engineers are a critical resource for success in both of these motivations.

To business, the counting approach and the intuitive approach seem to be on opposite ends of a very long continuum having little middle ground. The self-help books for business are either a step-by-step, sure-fire system for solving business problems, or a call to recognize people, relationships, and partnerships in surviving with the workforce today and in the current marketplace. In books such as *Self-Directed Work Teams* (Orsburn, Moran, Musselwhite, & Zenger, 1990), a carefully planned format for implementing teams was presented in a can't miss, one-size-fits-all style that neatly fit in with the counting approach. In an intuitive approach, David Whyte's *The Heart Aroused* (1994) suggested that workplace problems are solved by encouraging people to bring their souls to work.

Just where do women fit in either of these approaches? How does business accommodate the marketplace, the existing workforce, and the workforce of the future? With regard to women, the question in this part of the puzzle then becomes one of *how is business reacting to women engineers?*

The Counting Approach

The counting approach seeks to meet the need for women engineers by simply creating more so that there is a larger number. It's a game of numbers which goes like this: The predictions of the U.S. workforce of the future have created an awareness in the business world of a growing shortage of technical workers. This awareness translates into *there aren't going to be enough.*

Although a casual look at this topic often degenerates into an emotionally-charged discussion of gender equity and affirmative action programs, the reality of the situation is that the potential technical resource of white men is being fully exploited, and it can't supply the demand. Regardless of the social and moral reasons for equity, the bottom line is that there just aren't enough white men with the necessary abilities to fill all of the technical jobs. Untapped groups of people, such as women and minorities, can provide a potential source of talent to meet the growing demand.

Changes suggested by demographic studies indicate that between 1985 and the turn of the century, two-thirds of all entrants into the workforce will be women (Office of Technology Assessment, 1985). Not only will changes in the composition of the workforce involve gender; the careers of the future require a greater mix of science, engineering, and mathematics skills (Hudson Institute, 1987; 1988). After these needed skills were identified in the mid-1980's, society responded with a focus on training new job entrants and improving hiring practices to encourage women to enter technical fields. However, focusing on education and job entry ignores an important part of the problem of fulfilling needed workplace skills.

This focus is understandable - it offers a black and white solution to a volatile subject. Its very simple - to have more engineers, universities should graduate more engineers. This solution is also attractive to the business community. It is low-risk to put the burden on the educational system when compared to the issues of cultural change that accompany accommodating a different mix of workers. The burden has conveniently shifted to the educational system, which gladly embraces a reason to grow larger and justify more financial need. With the focus on new graduates, business does not need to make any changes except to hire differently. This solution is palatable to business because adding new graduates has little risk for the bottom line. Business ignores the total career story while patting themselves on the back for financing new graduates.

This idea of risk and the technical employee is crucial to this matter. In interviews with women engineers (Catalyst, 1992), enthusiasm and passion for their jobs and technical challenge were the primary reasons given for being an engineer. However, women indicated less challenge and less opportunity as their careers progressed. This circumstance is a result of perceived risk. Unfortunately, those jobs perceived by mid-career engineers to be a challenge are often high risk and highly visible. New graduates are a low risk to business because the types of jobs they perform have little likelihood of impacting corporate profits.

The maintenance of total careers appears risky. Maintaining careers requires challenging employees. As engineers mature, a job that presents a challenge also impacts the bottom line. It is difficult escape norms and entrust business to different faces and styles.

This emphasis on education and new hires was demonstrated in the recent headlines of a national newspaper which read *TECHNOWOMEN: Why aren't there more women in technology? Problem begins in schools* (Maney, 1996). Featured articles focused first on the opportunities available to trained technical people, and then discussed how *little girls* are discouraged from the skills necessary for those careers by society and the educational system. No attention was paid to the work climate for women once they entered the technical workplace. This series of articles talked about the workplace environment; and although it was noted that there were only a couple of women in rooms and buildings populated by men, no mention was made of the effect of isolation on these women. No mention was made of understanding what causes women to feel incorporated into the workplace, or what contributes to the possibility of a long career for technical women. No corollary was drawn between how the appearance of the workplace matched that of the computer and science clubs where girls don't feel welcomed or valued. Why should adult women find such an environment any more appealing than young girls do? The *force fit* of women into such a male-appearing environment has not been a recognized concern. Women, not men, voice discomfort due to the predominance of men in an environment that the men have created to their own taste and socialization patterns.

It is limiting to attack the workforce deficit simply by developing new entrants and ignoring the source of experienced workers already present. Along with developing new workers, a strategy must be developed for encouraging and retaining the women already at work in technical careers. Surveys of engineers provide information which indicates that women experience work differently than their men counterparts (SWE, 1993; Baum, 1989). Unfortunately, as the woman's career matures, the data from these studies indicates that her experience is generally not as positive as that of her counterpart. To fill the need for a growing technical workforce, it becomes important to understand how women perceive their environment to enable changes that create an equally satisfying workplace for both genders. To develop a mature and diverse workforce, it is important to examine attitudes about the workplace as the population moves through the career cycles of entry, mid-career, and senior. If the maturing workforce is to be diverse, it is important not only to educate and hire, but to create an environment where technical women remain and become integrated into the entire career cycle.

Although solid evidence is scarce, it is generally believed that there is a high attrition rate among technical career women (Holloway, 1993; Morris, 1995). Attrition is difficult to substantiate, and is perhaps more a function of demographics and promotion than dissatisfaction. One reason for so few women engineers older than age 40 is because there were very few graduates from engineering schools prior to 1980. For example, in the past 20 years in the engineering disciplines, the percentage of women obtaining engineering degrees increased

from 8% to 15.7%, and then dropped to 12% of the total number of degrees awarded (McIlwee & Robinson, 1992). Although the percentage of engineering degrees is not increasing, the percentage of total technical degrees awarded to women is increasing (Lane, 1994). Just now, significant numbers, albeit not a significant percentage, of women have been in the field long enough to reach mid-career, with only a few in the senior stage of their career cycle.

Another reason why there are so few women engineers older than 40 is the difficulty in tracking the composition of the engineering workforce. In response to concerns about the glass ceiling, many women were promoted into management, and although they are still working in responsible positions, they no longer appear in the technical rolls as engineers. For instance, those who move into management or other non-traditional jobs that take advantage of their problem solving ability may not appear as "engineers" in demographic data. Engineers move through a variety of jobs and job titles which may not be categorized as "engineering."

The scarcity of women engineers over age 40 can be directly related to the small number of women graduating from engineering schools prior to 1980. Between the small number of available women and the flexibility of job types available to skilled problem solvers, suggesting that women leave the profession merely because they are a decreasing population is grasping at straws.

The Intuitive Approach

Beyond the counting approach of simply having enough technical workers are the more subtle issues of diversity. Strong business is built on healthy relationships. Relationships have to do with how people interact with one another. A diverse workforce learns to operate in a diverse world. They learn to communicate across gender and cultural boundaries. They learn to behave in a manner that is respectful of difference.

The reality is that in the technical world, women are treated as tokens in the predominantly white man's environment. Some theorists on tokenism suggest that percentages of non-dominant groups must approach 15-20% of the total population to change behavior of the entire group (Rogers, 1995; Aberdeen & Naisbitt, 1992). If this theory is true, percentage-wise there haven't been enough women engineers to change behavior in the technical workplace, simply from graduation rates of women engineers. Although individuals may win the respect of those who personally know them, acceptance must be won in every new interaction and circumstance. As long as women are tokens in the workforce, stereotypical, sexist perceptions of them will persist. Sexist comments and condescending attitudes that survive because of the dominance of a single group can only be changed by consistent and persistent interactions that

force a shift in the perception of what is acceptable. Diversity must become a way of life in the workforce for acceptance of others to become a norm.

Normalcy in interacting with and understanding women as technical contributors can only be developed in an environment where non-sexist behavior is rewarded and becomes an everyday practice. For the technical community to be able to interact comfortably with a diverse, global community of vendors, potential customers, and employees, accommodation of difference must be natural behavior. The workforce must become diverse to practice, nurture, and learn these new habits. Stereotypical behaviors will only be forgotten when there is no outlet where they are deemed allowable. Businesses that aren't diverse in their every function, both internally and externally, will find it difficult to build networks with a global community.

The Individual's Perspective

Just as the business world has a perspective about its workers, workers have a personal perspective about the business world. Business models seem to define *success* as promotion into management, with the result that the main gender issue has become the glass ceiling, not job satisfaction. Those women who started their careers as engineers have often been moved into management roles in response to this issue. Unfortunately, this focus on the glass ceiling concerning the promotion of women into management has been a distraction from the real problem of providing a satisfying work experience.

Socialization processes have ingrained an image of success based on a male dominated business model, and women do not match this image, either visually or in conduct. Even when women's performance is equal, it is perceived to be less than men's (Goldberg, 1968; Levenson, Burford, Bonno, & Davis, 1975; Weinberg, Reveles, & Jackson, 1984).

Individual satisfaction is an important part of every person's life. Every person's own version of satisfaction is determined by individual needs, some of which are the result of individual experience and some of which originate from our unique socialization into specific cultures. It appears that women are a different worker than their men counterparts. Women and men engineers are different, from their motivation to be engineers (McIlwee & Robinson, 1992) to their perceived natural abilities and participative style (Rosener, 1990).

Women who enter engineering school differ from men engineering students in both intellect and interests (McIlwee & Robinson, 1992). Typically, women have higher math and science scores in the theoretical hard sciences than their men peers. In contrast, men have more applied experience and a sense of technology that comes from working on their computers, cars, and bicycles. Beyond intellectual skills, women in engineering are often found to have a different personality type than men. Men engineers are typically "here and now" people who

are most comfortable with logical thinking and regimentation. Women are often of an opposite personality type, typically intuitive and less governed by rules or *the way things have always been*. It is suggested that to survive in the hostile engineering educational environment, women engineering students must be bright enough to do the mathematics and science theory, but also have an intuitive style that allows them to blend in with the men (McIlwee & Robinson, 1992; Kroeger & Thuesen, 1988).

A common theme of diversity is the difference in style between women and men. In general, women interact with others in a more participatory style than men (Rosener, 1990). It may be no coincidence that the woman's style is one that reflects an intuitive approach to work, with an emphasis on relationships and partnerships. The men's style reflects the counting approach so prevalent in present day business practices - plan, execute, and measure. In her book *The Female Advantage*, Sally Helgesen (1990) interviewed four women corporate executives and compared their style to that of men managers documented in work by Henry Mintzberg (1973). Her work identified a fundamental gender-based difference in the pace of work and focus on relationships with others. Pace of work is closely aligned with relationships because the men worked at a pace that didn't provide time for relationships, while the women valued relationships and set a pace that permitted interaction time during the workday for family, co-workers, and external contacts.

The Puzzle

A lot is known about who is needed in the workforce and what types of people graduate from engineering school. There is also much supposition about why women are less satisfied than their men counterparts. Differences in style, a simple matter of attrition due to the problems associated with being a token, the rigors of balancing job and family, and an assortment of other factors may be the culprits. However, one can only speculate as to what's wrong. Surveys poll engineers about their careers and what should be different, but how can we expect them to know what to change? We have been asking the patient to tell the doctor not only what hurts, but what to do for a cure.

Surveys designed to track satisfaction have asked questions based on the traditional business models of management and career progression. These questions ask about adequate compensation, benefits, promotions, and training. Unless these topics just happen to address the important components of a good career for women, there is no way to tie these responses to satisfaction and a positive perception. To understand the factors contributing to job satisfaction for women engineers, we must ask how they got there, what they expected, and what they received. The number of women who have had a career's worth of experience as an engineer is

small, but the ones who are there can tell about when they most enjoyed their careers and when they didn't. They can tell us what about it made it so. They can express their experience, good and bad, in their own words. We must ask young and mid-career professionals about their experience in order to develop an understanding of the maturing process and how it relates to job satisfaction.

The perceptions about career and job satisfaction cannot be separated from the workplace environment. Opportunity, reimbursement, and personal interaction all play a role in how a person feels about his or her job (Morris, 1995). How these factors combine to create satisfaction is different for every person. The themes of satisfaction for women engineers, compared with management's perceptions of contributors to this attitude, can facilitate development of research-based interventions to bring about positive workplace change.

Bias Statement

Admittedly, I am a woman and an engineer. I practiced my discipline for 13 years, and have supervised engineering work for an additional five. At age 40, I have passed the mid-career group. My experience as a woman engineer caused me to question my career and its relationships to other people and culture in the workplace.

It is difficult to let others have their own experience without applying the filters of projected personal experience. Not only must personal perceptions be consciously recognized, there must be confidence that regardless of the stories of others, every story has merit. Every story is important. I have slowly understood that qualitative research is not the means to validate one person's experience, but a way to understand commonalties and differences in experience. I know my story is important regardless of the stories of other women engineers.

My experience as a woman in the engineering profession prompted this study of the experience of women engineers. As aptly put in a qualitative research handbook, "Experience is, therefore, the starting point and key term for all social inquiry" (Guba & Lincoln, 1994, p. 106). With time and thought, I became more interested in my peers than in myself. I saw myself in the actions of younger engineers around me and wondered what they believed their future to hold. Conversations with engineering managers focused my curiosity on just what the bosses think about us women.

Personal experience demands to be seen. It refuses to be forgotten. It is how we define and justify ourselves and our actions. A private journal was used to capture my own personal impressions and reactions. This exercise provided an outlet to record my experience so that it wouldn't preserve itself by subtly intruding into everyone else's story.

Two experienced qualitative researchers, one woman and one man, conducted bracketing interviews with the researcher in the role as participant to identify personal frames of reference. These interviews aided in identifying personal feelings and thoughts so that my subjects could speak without being led. Pilot interviews with both women engineers and men managers were audiotaped and reviewed by other qualitative researchers to identify closed questions and predisposing influences.

A group of qualitative researchers, including both women and men, were used to validate interpretation of themes. Interaction with this group provided evaluation of the data from different frames of reference and helped to identify personal bias of the researcher in the interviews and subsequent development of themes.

It became important that this work reflect more than my experience. The experience of all my fellow women engineers deserves to be heard. Who knows? Once all of us understand, things might change.

Purpose of Study

The purpose of this research was to develop a broad understanding of perceptions regarding the careers of women engineers. To develop this understanding in a broad sense, women engineers were asked about their careers and technical managers were asked about the women's careers.

The concept of perception deals with how a person recognizes cues and stimuli and interprets that information. In the workplace, cues and stimuli abound from the task, the environment and relationships with others. The interpretation of identical information by the variety of people in the same setting is why there are different perceptions of the same circumstances. In this study, a technical career was explored through the eyes of the women engineers. Then, those who strongly influence what happens to this group were questioned to discover how they believe the women engineers are interpreting the same world.

The study covered perceptions for a range of time from entry level to mid-career, and then added the view from the outside by managers. This look encompasses how two groups of women engineers feel and how technical managers perceive them. As such, this investigation had three guiding questions that can each stand alone.

How do entry level women engineers perceive their careers?

How do mid-career women engineers perceive their careers?

How do managers perceive the careers of women engineers?

Definitions

The following definitions were used to describe concepts pertinent to this study:

Entry-level women engineers (Entry-E) - women engineers who are entering their careers and are approximately between the ages of 25 and 30; and who have a minimum of three years of engineering experience.

Mid-career women engineers (Mid-E) - women engineers who are approximately between the ages of 35 and 39; and who have a minimum of 12 years of engineering experience

Managers - Men, age 50 or older, in a supervisory position at a level at least two steps above the working group of engineers.

Lower level managers (Lower-M) - Men, age 50 or older, in a supervisory position at an approximate level two steps above the working group of engineers, typically in a department head position.

Upper level managers (Upper-M) - Men, age 50 or older, at a high corporate level, typically in a vice president position.

Perception - " ... an essentially integrative function whereby stimuli transmitted to the central nervous system through organs of sensation are sorted and interpreted. Reasoning, problem solving, and thinking ... " are considered to be cognitive processes based on perception (Pargman, 1993, p. 396). Perception is the process of taking in cues and stimuli, sorting them and applying an interpretation to the aggregation of information.

Critical incidents - defined, observable events including reporting of facts regarding behaviors (Flanagan, 1954)

Incomplete occupational socialization - when "...individuals or groups of individuals do not acquire the necessary knowledge, skills, or values to be socialized into an occupation adequately, and consequently are not successful in and eventually drop out of the occupation" (Hart, Hasbrook, & Mathes, 1986, p. 68).

Assumptions

The following assumptions form a basis for interview questions.

Attitudes and perspective differ with maturity from experience and the different circumstances that affect each generation.

An individual's work setting is established by management decisions.

As problem solvers, engineers are most likely field independent learners. As such, they may tend to be content-oriented in awareness and communication. It is likely that the

relaying of the incidents will consist more of facts, schedules, tasks and quantifiable objects than of feelings and subjective responses (Witkin & Goodenough, 1982).

Participants will answer the questions and share their perceptions, opinions, and feelings as openly and honestly as possible. However, it must be acknowledged that a personal experience reconstruction is only one representation of their life, and that the story told depends on their current intent, what they believe the researcher intends, and the relationship between the researcher and participant (Clandinin & Connelly, 1994).

Scope of the Study

This research was a qualitative investigation. The information gleaned from the reflections of the participants was narrow and focused, and cannot be generalized to other professions or other groups. Any generalization will be the product of personal application and interpretation by the reader.

It is important to refrain from considering this study as a predictor of the future for those women engineers just starting their careers. Social circumstances and norms for the mid-career group who entered the workplace about 15 years ago are different than they are for those entering the profession today.

This study examined two groups of women engineers in two different age and experience levels in their careers. This study did not follow the careers of women engineers. Although two different age groups of the same population were interviewed, *how it was* or *how it will be* were not part of the results. Longitudinal studies follow the same group through time and this is a study involving two different groups at the same time. Thus, longitudinal effects cannot be judged from this research.

Experience is complex, and methods of inquiry using personal experience require constant attention throughout the data-gathering and resulting research analysis to focus on the original purpose (Clandinin & Connelly, 1994). As the interviews unfold, the researcher experiences an inevitable urge to re-form and redefine the research question. However important and energetic these new questions might be, the original question still deserves an answer. Thus, this study sifted through the body of data, seeking out the information pertinent to the problem at hand, while still acknowledging that there are valuable insights that serve other questions.

As such, this study did not reflect on the following topics: (a) the perceptions that men engineers have about their careers, (b) similarities and differences between women's and men's engineering experiences and perceptions, (c) similarities and differences between manager's and women engineers' experiences and perceptions, (d) similarities and differences in

experiences and perceptions between engineering and other professions, (e) similarities and differences in experiences and perceptions between the women engineers and other minority groups, and (f) the dynamic of women interviewers versus men interviewers on both the women engineering participants and men managers.

Significance of the Study

This research is about women engineers and their careers. It is not about their technical contributions, but how they see themselves as performers and in relationships to others. It is about what women engineers believe the future holds and how they can influence that future. It is the good and bad about feelings of personal reward and satisfaction.

Women engineers' perceptions are put in a context of not only how they see themselves, but also how they are seen. Persons in positions to influence careers, managers, talk about what they believe contributes to success and how women engineers fit into that picture.

Women are a minority in the technical workplace. Certainly, until equal populations of women and men enter and mature in technical professions, women will continue to be a minority. This research developed an understanding of career perceptions that can aid in maintaining the segment of the workforce composed by women. The themes discovered in this research were used to develop two theories concerning the dynamics which affect the careers of women engineers.

The significance of this study is that the information gleaned can be used to develop a workplace that improves the maintenance and performance of a highly trained and specialized group of individuals. Providing this baseline will provide a framework to measure future change by establishing an initial condition. If the theories are valid, the career of women engineers is not a positive experience. By changing the identified constructs that underlie the theories, it is possible to improve the career experience of women engineers.

CHAPTER 2

TRUTH IS TRUTH

> I want to hear information on all sides. I want to hear as much as I can, and I don't care if it's, but I don't want it all the same. I want to hear everything, so I have an idea, a better idea, of what we are dealing with or are there some, is there a main issue that we've overlooked that we need to really address? Because I'm dumb if I don't. I really am. *That's a healthy perspective.* Yep. Truth is truth. No matter who says it. Truth is truth and that's what we all look for. That's all I have to say. *Harold*

Attitudes of and toward women in the workplace have been examined in a variety of ways, from the financially motivated business and management schools to the social consciousness of sociology and psychology. Research journals, trade magazines and popular bestsellers include discussions of gender issues. But, there is little research on the specific population of women engineers. Analogous research on gender bias and performance, demographics and trend prediction, workplace socialization, style differences, and job satisfaction surveys provided insight on the circumstances of this particular group.

It is obvious from observation that women are a small percentage of the engineering population. Thus, research was reviewed from an individual and business perspective that addresses differences in performance and style because of gender, as well as the effects of being a minority group in a profession with set standards for entry.

Gender Bias and Performance

Gender bias and performance can take three forms: (a) difference in evaluation of performance based on gender, (b) exaggeration of differences attributed to gender, and (c) effects of gender on professional opportunity and position. Studies that addressed evaluation of performance establish that an equal performance was judged to be of less value when the performer was purported to be a women. Studies of token populations suggest that any difference in performance by a token member of a group was exaggerated. Studies of class structures in the engineering profession have found that women may be given equal titles, but are not given the task assignments and responsibilities commensurate with the title.

Early work in evaluation of performance started with a landmark study in which paintings were perceived to be better when the artists were purported to be male (Pheterson, Kiesler, & Goldberg, 1971). In this study, women were asked to rate paintings that had been entered in a contest. Half of the evaluators thought that the artists were men, and the other half thought that the artists were women. The group that believed the artists were men found the same paintings to be significantly better than when the artists were believed to be women.

This study in a context of art was one in a body of work where subjects rated quality of a task based on credentials of the performer. Students were asked to evaluate the quality of writing, with the same results in evaluation as in the art evaluation (Goldberg, 1968; Levenson et al., 1975). In a slightly different twist, the evaluation of performance capability was studied by having men and women athletes evaluate potential new coaches from resumes where the only difference in qualification was in use of a gender specific name for the coach (Weinberg et al., 1984). Just as in the evaluation of a tangible output such as writing or painting, the male coaches were perceived to be more capable than the women, although the resumes were identical except for the name.

These studies established that the perception of both a tangible outcome and anticipated capability was different based on gender of the performer. A sort of *consciousness raising* came out of these studies whereby attention was called to the dynamic that society judges quality of performance and value of output differently based on the gender of the performer. Both actual and anticipated performance were rated better when the performer was purported to be a man, rather than a woman.

Not only was identical output perceived to be of greater value when from a man, in situations where there were men and women performers, the women's differences were exaggerated. In a case study of a national sales force (Kanter, 1977), women reported feeling that their differences from their male peers were exaggerated. Kanter termed this condition *boundary heightening*. This exaggeration of difference was also evident in evaluation of performance. In a study of women engineers, it was reported that any setbacks experienced by women senior engineers and managers were more visible, and the exaggerated attention was attributed to the small number of women in these jobs (Catalyst, 1992).

A subtle, yet devastating, form of gender bias occurs in establishment of a class structure through perception of capabilities. This phenomenon was summarized in the context of power by Ragins and Sundstrom (1989), who suggested that in male-typed occupations, women were found to be put in specialties in that field that didn't lead to positions of power. A hierarchy of power was found to reside with the types of jobs, with supporting positions having less power and prestige than production positions, and disproportionate representation of

women in less prestigious job types (Ragins & Sundstrom). This type of bias was discussed in depth by McIlwee and Robinson (1992), who elaborated on how, in the engineering profession, there is a cultural hierarchy of perceived ability based on the type of work performed. In this class structure, those engineers in research and development (R&D) and design are above those in engineering support roles; and those in support are above those in technical sales, contracts, and procedures.

As an example of this cultural hierarchy, a design engineer is considered to be above a manufacturing engineer, and the manufacturing engineer is above an engineer in a contract administration job. Unconscious bias often causes women to be assigned to jobs in the bottom tier, such as contracts, while their male peers are put on design work. The women are promoted through grades and paid equally to their male peers, but are not perceived as being as talented in an engineering sense to themselves and those around them because of the type of work assigned. Anecdotal evidence suggests that it is common practice on engineering teams for the women members to follow budget and schedule, and make presentations, while the men do the design and testing. The men do the hands-on work with hardware, and the women specify and procure the hardware. The result of stereotyped roles within the discipline serves to put people in a class structure, regardless of potential capability, quality of performance, or pay scale.

In a study by Jagacinski (1987), women engineers were more likely to be found in jobs with lower prestige than were men engineers. This trend was evident not only in the prestige associated with job assignments, but also in comparison of women and men engineering supervisors, where men had more responsibility than women of comparable experience.

The consequences of bias in job assignment may be explained through the concept of entitlement and oppression. The issue of entitlement and oppression was discussed in a presentation by Sheila Tobias (1995) where she defined *Oppression* as *internalizing one's own inequalities through experience of unequal treatment, often subtle, to the point that one doesn't believe they are deserving of equality.* After years having less prestigious job assignments, where the assignments were made simply because of unspoken bias rather than ability, women may not perceive themselves to be as capable as their male counterparts, or to be entitled to equal treatment. Situations created by bias can distort both a woman's or a man's self-perception and the perception that others gain by observing to whom work is assigned. After the early experience of being assigned the less prestigious jobs, the oppressed person may not feel entitled to expert roles, technical leadership roles, or promotions; nor do their peers believe that the person is capable of performing in that role.

The engineering culture is one where a person's capability is assumed from the type of job assignment they are given (McIlwee & Robinson, 1992). This concept suggests that a

woman engineer who has performed the bottom level types of work may find it difficult to be respected when promoted to a management job. She may not be perceived as capable, simply because she has not been trusted with what is viewed as the most important work. This phenomenon is an example of *gender appropriate/inappropriate activities* where the social class structure assigns appropriate genders to traditional occupations and professions.

Gender bias is not commutative. Role reversal for negative gender bias did not occur (Dworkin, Chafetz, & Dworkin, 1986). When men were the minority group in jobs thought to more appropriate for women, the same effects of bias did not occur for the men (Dworkin et al.). A social class structure existed in the workplace where men were perceived to be higher in status than women (Yoder, 1991). Negative gender bias only occurred when a member of a lower class was in a role socially assigned to a higher class (Yoder). In the field of nursing, Dworkin et al. found that the higher class male was in a job, nursing, that was perceived to be suitable for the lower class women. Gender bias did not occur because the male was serving in a job for the lower class - obviously, he could do the work since he was from a higher class than the typical worker. When this concept is applied to engineering, lower class women are in a job of the higher class, and the same phenomenon implies that the lower class woman would not have the ability to perform in a higher class man's job, especially in the upper tier roles of that profession.

Demographics and Trend Prediction

One of the primary change agents driving diversity has been the use of demographics and trend prediction. Trend prediction forecasts the future world and the physical and intellectual composition of the workforce. Forecasting and trend prediction, or *futures*, is a business discipline of its own. Writers John Naisbitt and Patricia Aburdene (1990, 1992), in the *Megatrends* series of bestsellers, made trend prediction a friendly advisor for everyone. Today, human resource and business managers both analyze the statistics to make business decisions from this information. During the Reagan administration, the futures market was so alluring that the federal government financed their own bestseller in *Workforce 2000* (Hudson Institute, 1987).

Workforce 2000 was a government sponsored report which predicted trends that would shape America by the end of the twentieth century. It focused on economic factors that would drive the type of resources needed. Demographic predictions were subsequently made forecasting *who* the potential workers would be. These factors of *who* and *what skills* have been used to plan educational programs for training the workforce. The business sector has

speculated on the goods and services needed in the new era. In layperson's terms, *how do we educate, and where will they spend their money?* were addressed by this project.

Workforce 2000 has been quoted and misquoted to further both sides of many sociologic and economic agendas. Opponents and proponents of social issues such as health care reform and affirmative action have used the data to support their partisan agendas. The business sector has likewise used the data to speculate on future strategies such as expansion into service roles and alternative employee benefit plans.

With regard to workforce diversity, the business community initiated several different programs based on this report. A review of research found subsequent publications to *Workforce 2000* that proposed ways to encourage and enable women to enter the workforce. Among the enabling methods were education in non-traditional women's careers in science and math, benefit plans that included extended family care, and discussion of ways to implement women's "leadership and work styles" in the traditional male work arena (Jamieson & O'Mara, 1991). These three topics were reoccurring themes regarding women in the workforce.

In 1988, the Hudson Institute published a second government sponsored work, *Opportunity 2000: Creative Affirmative Action Strategies for a Changing Workforce* (Hudson Institute, 1988). This report addressed creating a workplace that would support the necessary workers in the year 2000. Interestingly enough, the document addressed women's role in the workforce on issues of families, the glass ceiling, sexual harassment, benefits, and recruitment. However, no mention of women's participative style differences was made. Emphasis was placed on allowing women to both work and have a family through flexible work schedules and extended family services plans. This report suggested the usual enhancements of more pay, promotions, and benefits, rather than exploring what the different contributors to job satisfaction might be for different groups of people.

Workforce 2000 was accepted as a positive project in ensuing works with the exception of one document. Follow-up research didn't generate more data, but expanded the key points with action plans and recommendations on how to prepare for the future. However, both the data and the conclusions regarding the workforce demographic profile were challenged by Kucker (1992) from a human resources viewpoint. Kucker stated that the worker/skill shortage was not an issue. His viewpoint appeared to be little more than opinion. He backed his arguments, not with data, but with quotes such as "If the supply does become less, American industry will finally have to learn how to better utilize the talent it has." (Dr. Eric Walker, former President of Pennsylvania State University, Vice President of Technology for ALCOA in Kucker, 1992). Kucker advocated that American industry will meet whatever challenge as it

appears, and reaction to the predicted trends just absorbed energy and served as a distraction from the real problems of the business world.

In 1990, the bestseller *Megatrends 2000* (Naisbitt & Aburdene, 1990) used many of the trends projected by *Workforce 2000* to forecast the future world. This book devoted an entire chapter to women's roles and opportunities during the 1990s. *Megatrends for Women* (Aburdene & Naisbitt, 1992) expanded the trends affecting women from a chapter to a full-length book that discussed women's roles in many aspects of society, predicting a world by the year 2000 that will reflect a more feminine influence.

Together, the demographic predictions, affirmative action programs, and conclusions from tokenism studies create an illusion of progress. The outcomes of these studies are summarized independently as: (a) demographic predictions called for more women in technical jobs just to have enough resources, (b) affirmative action programs called for more opportunity for women and minorities as a social issue, and (c) tokenism studies insisted that by simply getting the numbers up, the playing field would be leveled. These three factors together have painted a picture that has been hard to resist with the suggestion that by getting the numbers up, industry would have their technical workers, and society would right a horrible wrong.

The truth to this matter lies in the real story behind tokenism. Tokens are usually thought to be persons composing a minority percentage of a larger group, with implied negative treatment (Yoder, 1991). A survey of the initial studies on tokenism seemed to indicate that once a minority group became more than 15% of the total group, they would no longer be treated as tokens. Early work by Kanter (1977) and (Rogers, 1962, 1995) gave this notion credibility, and in fact, its influence can still be seen in government contract requirements that reward contractors based on percentages of minorities in specific job roles. Tokenism, when viewed as a numbers game, provided specific actions to be taken to resolve the problem. Researchers suggested that to solve the problem, simply hire more tokens and at a point, there would be enough to form a critical mass and the problem would disappear (Rogers, 1995). However, ensuing work that explored this topic in greater detail with a variety of groups found treatment of tokens to be a function of other factors (Yoder, 1991) such as:

gender appropriateness of the job (nurses are women and men are engineers)
gender hierarchy or class structure (men are above women)
threat of intrusion (just a few won't matter, but when the minority group starts to be noticeable, they become a threat)

Token treatment occurred regardless of the percentage representation of the non-dominant group in the overall group when a person was not perceived to have expected class or gender characteristics (Yoder, 1991). Studies indicated that as the size of the token group substantially increased, subtle forces came into play to sabotage them (Epstein, 1981; Reskin, 1988) as the majority group protected its community, and attempted to retain its place. Although getting the numbers up was a black and white solution, it wasn't a solution that worked. It was suggested that the numbers game has been a diversion from the real problem - sexism (Zimmer, 1988). Simply hiring more might have looked like a definitive step, but it wasn't the answer.

Socialization and the Workplace

It has been stated that an increase in proportion of women in the workforce is the single most important factor influencing change in the workplace (Thornburg, 1991). *Megatrends for Women* (Aburdene, & Naisbitt, 1992) was based on the influence women will have on career choices, the workplace, economic spending and lifestyle. It also predicted that change will happen because of the change in women's social integration. However, most management books addressed the need for workplace change from the usual financial and market perspective without recognizing that the biggest driver might be the composition of the workforce itself. Perhaps this lack of recognition of the influence of token groups in favor of economic factors is further evidence of the intrusion reaction of the dominant group to a growing token population.

This influence of the presence of women is a component of a different workplace paradigm suggested in the New Age category of business self-help books. These writers suggest that the root causes for change are attributed to the evolution of a global economy and the mix of cultures that accompanies the business world of today. Although they talk about a changing world, they focus on the same dollars and cents approach and ignore the difference in the workforce. Nirenberg (1993) and Hanson (1996) used the new global economy as the reason behind the need for organizational change. To these writers, economics is the driver, but they encouraged relationship building and a creation of a workplace that values the uniqueness of each individual to develop a responsive and competitive workforce. David Whyte (1994) spoke to the need for improving the workplace by encouraging people to bring their whole being to the office, not just that part of them that is required by the job description.

However, business needs more than learning to play in a global economy. In the technical field, a global economy wasn't needed to force a shift in the workplace, just introducing women and minorities brought on a cultural imbalance. The challenge is not only in

learning to work with other geographic cultures, but also to develop a workplace that matches the cultural differences of its own workers.

The predictions of the types of necessary skills needed are unfolding with uncanny accuracy, but workers having those skills are not available. The potential resource provided by women and minorities is still relatively untapped (Maney, 1996). The workplace still appears male dominated and hierarchical in roles and lines of authority (Nirenberg, 1993). The untapped resources of the non-dominant groups are remaining in their traditional roles, not entering the technical workforce (Maney).

Business and industry have been male-dominated, particularly in engineering (McIlwee & Robinson, 1992). The definition of career success in the technical world is based on how men perceive success. In interviews and an informal survey of executive women, Morris (1995) identified a predominant theme from women who reached executive positions. These women were interested in *making a difference*, while their male counterparts were focused on *playing a corporate game* . Women in high ranking jobs believed that they had finally reached positions to influence the quality of life for their employees, but often found decisions made on the basis of dominance and posturing (Morris). Although men were often unhappy with their jobs, they felt that quitting wasn't an option because they were their family's support. Women felt more pressure to move to a more fulfilling life role than to stay in a secure job. Morris concluded that this difference in recognition and interpretation of the same cues, the definition of perception, stemmed from socially programmed expectations.

Men created the workplace in an era when women were primarily homemakers. The workplace reflects preferred male methods of interacting, and our social system cooperates by programming its members to value this as the model of success. The workplace model is built on military models of leadership and hierarchy (Nirenberg, 1993; Womack, Jones, & Roos, 1990), and uses a socialization process built on stereotypes, roles and images (Lareau, 1991).

This hierarchy and system of control through established roles is evident in the traditional automotive and aerospace engineering-based industries. This system and its fallacies are described in *The Machine that Changed the World* (Womack et al., 1990). Technical persons start in one aspect of their company, and then spend the remainder of their careers working in just that one area. For instance, an engineer that began on the factory floor might have started as a process troubleshooter and then risen through the management ranks of manufacturing. There is no path for crossover to product tasks, only a career in manufacturing of that product. For example, those who start in R&D, stay in R&D; those who start in analysis of aircraft wings, stay in wing design; and those who start in composites, stay in composites. Promotion occurs in a narrow *stovepipe*. There is no crossover between technical

expertise or product knowledge. Loyalty is to a particular stovepipe, not to the company or the product (Womack et al.).

William Lareau's *American Samurai* (1991) comically portrays the workplace with a description of a caste system, or social categories of workers in a inflexible hierarchy where organizational levels are given names such as Gods, Proto-Humans, Slug Sub-Humans and Egg Sucking Pigs. Unfortunately, his views of the workplace structure have a ring of reality in labeling the social structure of the workplace. These humorous names and descriptions define a hierarchical system where organizational reporting is through a chain of command, and control comes from set roles.

Almost twenty years before Lareau, Henry Mintzberg (1973) identified managerial traits by observing male managers. He found that male managers had a persistent sense of their own importance in the world and reluctantly shared information in an effort to retain power. The scholarly work by Mintzberg would appear dated except for the glut of popular business reading, such as *American Samurai* (1991) and *The Dilbert Principle* (1996) that resonate with the current workforce in their presentation of these managerial styles and corporate structures[1].

It would be much more palatable to lay the blame for the lack of mid-career women on tangible factors such as, they wanted to stay home with the children or even discrimination. It is difficult to understand the difficulty of a mismatch between what women are socialized to expect and their experience of the technical workplace. Benefit packages can address family values, and discrimination can be eased with laws and a growing population of minority groups. Research in other professions has attributed the source of women's declining satisfaction with careers to either discrimination, role conflict in maintaining both personal and professional careers, or incomplete occupational socialization (Hart et al., 1986). In interviews with several corporate managers and directors, role conflict and discrimination were the factors suggested to be the possible causes of job dissatisfaction (Catalyst, 1992). However, Hart et al. identified incomplete occupational socialization as the leading source of dissatisfaction.

Incomplete occupational socialization was defined as "when individuals or groups of individuals do not acquire the necessary knowledge, values, or skills to be socialized into an occupation adequately and are consequently not successful in and eventually drop out of the occupation" (Hart et al., 1986, p. 68). Women engineers may not physically drop out of the

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I had a particularly appropriate Dilbert cartoon at one of our all-hands meetings when my assistant was asking whether I thought that the CEO would find that funny. I said that the CEO might actually find Dilbert funny and also tragic at the same time in the sense that it's illustrative of the fact when we see things that are wrong that are going on around us in a large company the institution resists efforts to change even if you are the CEO. The mechanisms of doing business are such that it's hard to change. *Excerpt from interview with John.*

occupation, but they may become emotionally removed and unmotivated as they approach mid-career. This phenomenon is exhibited through the differences in interaction style between genders, social norms in family roles, and perceptions of aggression. In a review of attitudes of and toward women engineers (Catalyst, 1992), the example of how engineers, referred to as a discipline having male characteristics of power, gain respect through aggressive technical interchanges. This report found that when women behaved in this manner, they were thought to be overly aggressive and penalized, yet when they attempted to participate in a less aggressive style, they were not thought to be competent (Catalyst). From an abilities perspective, engineering can be a very hands-on, take-it-apart career. The women did not feel adequate to do hands-on work, and often doubted their ability to perform in comparison to their male peers (Catalyst). But, engineering managers expressed concern about putting women in shop environments due to the dirty and crude nature of both the work and workers. Women interpreted this reluctance as a reflection of their inability to do hands-on work and didn't realize that they were being *protected* by well-meaning supervisors (Catalyst).

One facet of incomplete occupational socialization theory is the lack of female role models to establish norms for women. Not only do the women engineers themselves suffer from the lack of role models, but coworkers, managers, and other supporting personnel do not have established norms to follow for interacting with women (Mainiero, 1994).

Entry and junior level engineers typically interact as a team member with a limited number of people, performing tasks that are well defined. But, as they mature and reach mid-career, tasks become less-defined and require more individual interpersonal interaction and influence for successful accomplishment. Without established norms for interaction between genders, complete inclusion of the woman engineer into the work environment and career path is seldom accomplished. This potentially contributes to declining job satisfaction. Without benefit of the male based norms for supporting services, women may suffer due to a lack of connection to the workplace structure.

Organizational development theory proposes that social factors have created expectations in the workplace through norms, values, symbols, rituals, stories and myths (Porras & Robertson, 1992). These factors are the informal structure that binds individuals and provides an emotional link throughout the organization (Porras & Robertson). In technical disciplines, women don't have a history that provides them a place in these linking traditions. To the contrary, subtle anomie exists to disfranchise this group.

Social and workplace norms set the model for promotion and advancement. In a summary of gender and power research, it was concluded that women are not recognized as candidates for positions of power because of dissimilarity to those who choose leaders (Ragins

& Sundstrom, 1989). Not only do norms establish an interaction pattern, they also create the model for opportunity and advancement.

Yost (1994) described the sexist nature of common language and metaphors in the engineering workplace that serves to place women in a subservient and demeaning role in relation to their men peers. She discussed how standard language use sexual imagery in words and phrases such as *nipple* and *screw*. Many young women engineers have blushed at their on-the-job training course in front of men technicians to learn that the end with the holes was the female plug and the end with the prongs was the male plug. Yost described how the imagery of the technical workplace reflected a male influence of power with words and phrases such as abort, crash, kill, marshal the troops, and forced takeover. This language is symptomatic of the extent to which the technical workplace has been created by men for men, with control exerted through the use of stereotypes, jargon, and innuendo.

Differences of Style

Although the global economy is the most often cited reason, the leadership, management and communication style differences between men and women have been influential in the implementation of new business structures. The *new* management style of the 1990s is evolving to *flatter* organizations with tasks being performed by work groups or teams (Katzenbach & Smith, 1993). American industry has embraced *teams* as the organizational model of the future and, just now, it is becoming apparent how this participative style of business reflects a feminine model of interaction. These new business models are a better fit to women's working style, and although attributed to a new understanding of a healthy workplace, are perhaps a reflection of the increasing influence of women in the environment.

Women's communication style is not one of directing subordinates, but acting in a team member role for the best interest of the group (Rosener, 1990). The women in *The Female Advantage* (Helgesen, 1990) scheduled time for sharing information, made themselves available to subordinates, and did not consider unscheduled tasks and conversations to be interruptions. They found the quality of relationships in the workplace to be their most important priority.

Communication and management styles are embedded in each other. It is helpful to look at this issue with regard to how women perform their individual tasks, and how they work as a part of the performing unit or group. Women are not thought to naturally communicate within a hierarchical structure, but have a tendency to communicate directly with the appropriate party, regardless of management hierarchy (Mainiero, 1994). Women communicate in a much more "level" sense, with all persons having equal value. Mainiero described how this feminine style of behavior caused problems and ill-feelings in the traditional

pyramiding power structure when the woman didn't always use the proper channels, ignoring the chain of command to go directly to another person. In another reference to style, power, and gender, it was suggested that high performing women who get the work done in a way that is socially attributed to women, rather than the standard male traits, are rated lesser (Ragins & Sundstrom, 1989).

Interaction outside of informal business norms appeared to be a display of disloyalty and manipulation. Paradoxically, this more equal treatment of persons is a fundamental component of teams. But since it is outside a social norm, this interaction style is often interpreted as not being a team player.

Job Satisfaction Surveys

Surveys of attitudes of engineers throughout their careers have been conducted and summarized based on gender and age by the Society of Women Engineers (SWE, 1993) and the Cooper Union (Baum, 1989). In general, these studies reveal that, as their careers progressed, men became more satisfied with their work, opportunities, and salary than their women counterparts.

The SWE study is conducted every three years to track factors contributing to job satisfaction among engineers and identify differences based on gender. This study is conducted through use of a survey that provides demographic data of the general engineering population by discipline, equitable treatment, job satisfaction, challenge and overall career satisfaction. It is important to note that women were generally satisfied, but, starting at approximately age 30 and continuing throughout their careers, were not as satisfied as their male counterparts.

The Cooper Union survey was only distributed to women. It was similar to the SWE survey in that the same levels of satisfaction and areas of concern emerged, but it did not address how these factors related between women engineers and their male counterparts.

More important than how satisfied engineers are with their careers, is the question of why men and women engineers feel differently about their careers. What causes the difference in perception? Are the two groups treated differently, or do they have different expectations?

CHAPTER 3

PROCEDURES

> I find this study interesting because I have participated in surveys and discussions and so forth on a lot of other topics in the past and sometimes on this type of topic. But I haven't experienced one in which the person doing the study took the developmental, psychological, historical indirect approach of coming into the question. Sort of a Jungian, sort of a *surround the problem* method. I find that very interesting because by taking a different approach I suspect that you will uncover some additional things that will be new. At least I haven't experienced this approach, but it probably comes out of your combination psychology and industrial background. *John*

The purpose of this research was to develop a broad understanding of perceptions surrounding the careers of women engineers. To develop this understanding, young and middle-aged women engineers were interviewed regarding their careers, and managers of technical people were interviewed about their personal careers and their perception of the careers of women engineers. These stories of personal experience compose a rich image of the expectations and perceptions of and for women engineers.

This understanding is best explained by thinking of it as a three dimensional picture. First, imagine a two dimensional flat picture which represents women engineers' perceptions at two different ages. This view describes how each age group sees their careers today. For instance, suppose young and middle-aged women were both asked to describe what they eat for lunch on workdays, and the younger ones overwhelmingly replied, "I usually grab a sandwich in the cafeteria and eat at my desk and work because I don't have time to fix anything or go out," while the middle-aged ones said, "I try to bring something from home or eat a salad or fruit to be healthy," a picture develops that indicates perhaps the younger ones aren't as concerned about the health aspects as the older ones. Maybe the younger ones have a concern about time that is taken more in stride by the older. It might be hypothesized from these responses that with age and experience, priorities change, or the juggling of personal needs and career crises is different. Regardless of the resulting hypotheses, asking the two groups the same question provides a picture of how they feel, and to promote identification of what is different and what is common for the same population at different ages.

Depth, or a third dimension, is added to the picture by determining what other people believe is the women engineers' experience of this same situation. Suppose that in our imaginary interview, managers said "Women engineers seem to bring their lunch from home instead of eating in the cafeteria. I suppose they do it because women just seem to be better at this food stuff or they just made themselves a lunch when they fixed their children's." This statement broadens our understanding. It becomes clear that the basis for this statement is that the females aren't in the cafeteria, not because of working through lunch or trying to maintain a healthy lifestyle, but from stereotypes of women's traditional roles.

Granted, this example is sexist and used only to illustrate a concept, but it demonstrates how a better understanding comes from a three dimensional perspective, with members of a group having a range of perception and then another view coming from how those around the group see them. Renato Rosaldo (1993) discusses the problems of prejudice resulting from reaching consensus when only like-minded people meet. Using only the views of women engineers doesn't provide any insight into the reality of the engineering workplace - only that group's experience. A more complete picture can be formed by finding consensus and difference of perceptions of a common circumstance by a variety of groups.

The three dimensional view formed by the results of this research were first the 2-D perceptions for a range of time for a particular group, the women engineers. Then the third dimension was added with the independent view of managers from outside. What follows is a description of the rationale for the development and style of investigative technique and the methodology itself.

Development of the Investigative Technique

This study is an investigation into how people interpret their world and their experience of that world. An understanding of this world is then theorized from the identification of both uniqueness and commonalties between experiences. As this study was conceptualized, it was impossible to predict the types and ranges of experiences and perceptions that the participants would mention. The intent of this research was not to verify or falsify a hypothesis, but to study human behavior through the incidents in their lives. The experiences and perceptions are discovered as "Human behavior, unlike that of physical objects, cannot be understood without reference to the meanings and purposes attached by human actors to their activities" (Guba & Lincoln, 1994, p. 106). Thus, a qualitative format was adopted which encouraged personal reflection and stories from simple, open-ended questions. The types and categories of responses which emerged from this research provided a basis for subsequent research that might (a)

explore the effects of altering the proposed constructs or (b) validate the proposed theories of workplace dynamics.

Guiding research questions used to focus attention on perceptions of the careers of women engineers were:

How do entry level women engineers perceive their careers?

How do mid-career women engineers perceive their careers?

How do managers perceive the careers of women engineers?

The basic beliefs of quantifiable research paradigms don't fit these questions. These questions don't have a "right" or true answer, regardless of the application of rigor and bounds. These questions can be confounded because of (a) the family history of the participant, (b) the status associated with the school from which they graduated, (c) perceptions arising from physical traits, or (d) unusual events in life. It is impossible to control confounding conditions, simply because human experience can only be explored, and human experience is unpredictable (Guba & Lincoln, 1994).

In the sense of qualitative paradigms, the interviewer and interviewee were linked through interaction to create the findings, with a final consensus of themes taken from the whole of experience. The purpose of this research was not to control and predict, but in the nature of constructivism, to understand and reconstruct. The question *How do you perceive?* has no quality that can be measured, but attempts to develop an understanding by observing lived experience from those who have lived it. Perception is, after all, about interpretation of cues - not about making decisions or judging the value of decisions. Constructivist thinking embraces the notion that what is thought to be true knowledge, is instead, a result of perspective (Schwandt, 1994). It provides a forum where the examination of perceptions can flourish in an atmosphere of acceptance of the human experience. Expanding the research questions from just one category of women engineers to two age groups, and further to how outsiders view them promotes an understanding of the influence of both perspective and experience.

The original questions about the experience of women engineers was prompted by the sense that women left the profession at middle age and the survey data that indicated women were not as satisfied as their men counterparts. There was a hint of more to this issue than that which was represented by statistical analysis. However, there was no evidence beyond anecdotal stories and a gut feel about the whys behind the data. Thus, this research was not based on a similar previous study, nor does it attempt to validate, falsify or extend previous work. It explores the unknown using the experience of the researcher as the starting point (Clandinin & Connelly, 1994).

There is little prior knowledge, thus making participant prototypicality desirable. A well defined prototype provides a baseline that establishes an initial condition for each of the guiding questions which can then be extended and generalized in subsequent works (Sackett & Larson, 1990). The prototype of the participant in this study was developed by identifying common traits which were characteristic of any woman engineer having a long career. Those traits which were specific to a subset of women engineers were not used as criteria for selection. For instance, marital status and family were not used as criteria because those traits are not a requirement for being a woman engineer. Race and ethnicity were not intended to be used as qualifiers for the same reasons. However, several participants of minority ethnic and racial origins were interviewed, and no differences were found in their responses.

The prototypical women engineers have the common characteristics of being a female, having engineering degrees, will pass through the ages from 25 to 40, and were selected based on their being in a certain age range. These characteristics match most women engineers across their career. For purposes of additional specificity, the participants in this study all worked in defense-related industries for large organizations having a long history of steady employment and product mission. This definition of the prototypical participant allows subsequent extension into other research by changing a single characteristic such as gender, age group, industry, size of business, or professions.

Participants were chosen from a cross section of geographical locations to account for regional effects. Gender role attitudes are becoming more egalitarian across the United States, but are still more traditional in the South (Rice & Coates, 1995). It was also found that when asked about gender role attitudes in categories regarding family, politics, or job function, the most variation occurs between the categories, not between geographic regions (Rice & Coates). Even though the variation across regions is small for each category of question, it is undetermined whether regional effects in the technical segment of the workforce are consistent with those of the general population. The interview questions were open-ended and boundaries between family and job roles were not clearly bounded. Regional effects were unpredictable at the outset and thus were considered by using participants from different locations.

Style of Investigation and Analysis

Key to the purpose of this research was the concept of developing an understanding. Unstructured interviews have understanding as a goal, with elements of successful unstructured interviewing as: (a) accessing the setting, (b) finding a translator, and (c) establishing rapport (Fontana & Frey, 1994). Data gathering was done through such unstructured interviews. To access the setting, industry contacts arranged for females and managers to be interviewed and

provided a private location for the interview session. The contact persons were long-time employees of the particular company and industry. They were able to serve as a translator of cultural influences and company norms. Their introduction of the researcher to the participants established an air of trust and importance for this project. The interviews were arranged in a fashion where the initial questions addressed demographics and family history. Only after the interaction became comfortable did the questions shift to those about career perceptions.

This study utilized a qualitative approach. The results aren't presented in a summary table, nor do they nicely fit in a chapter of conclusions. Understanding doesn't come from a final list of themes or particulars. As Richardson (1994, p. 517) aptly writes, "Qualitative research has to be read, not scanned; its meaning is in the reading." The power of this research is in the words of the participants. The researcher is simply a guide to common threads - the stories and descriptions of real life allow the reader to develop a personal understanding using their own life experience as a basis (Clandinin & Connelly, 1994). Each reader will have a unique personal understanding based on how the stories touch their own experience.

It must be acknowledged that interviewing is an interaction between the researcher and participant, and that unstructured interviewing has no predefined set of allowable questions and responses. Every interview will change given a different interviewer, interviewee, or a different day. It will never be exactly the same. However, concepts grow stronger and understanding is deepened as a variety of persons tell similar stories and recount the same feelings. As this research progressed, much was learned from both uniqueness and commonality.

Description of the Research Process

The theoretical basis and framework for this research were described in the previous sections. The actual steps of conducting this investigation were as follows: (a) pilot testing, (b) bracketing interviews and bias exploration, (c) selection of participants, (d) interviewing of participants, (e) review of interview summaries with participants for consensus of understanding, (f) preparation of transcripts as data, and (g) analysis of data. A detailed description of each of these steps follows.

Pilot Testing

Pilot testing was conducted to develop an interview format that was practical with respect to participant availability and location and also provided meaningful interaction. The pilot testing provided an opportunity to develop unbiased interview questions, practice the interview technique, and note any obvious themes. The interviews conducted in the pilot test were reviewed by another qualitative researcher and discussed.

There was a concern that engineering participants would focus on content, avoiding feeling responses. Field independence/dependence theory suggests that as technical people, these participants tend to have poor interpersonal skills and are uncomfortable with subjective expression of ideas and feelings (Witkin & Goodenough, 1981). The format of the interview and ability of the interviewer to probe beyond content responses without predisposing replies were explored during the pilot interviews.

The women engineers were asked one set of questions and the managers were asked a another set of questions to address the different research questions. The pilot interviews were held with both a woman engineer and man manager to test the questions and allow an opportunity for review of the interaction. Two interview formats were tested, one with the engineer and one with the manager. The first was a separate phone and personal interview combination with demographic information discussed by phone and an in-person, follow-up interview about job experiences. The second format was a single, longer, face-to-face interview which began with asking for personal information and shifted to a discussion of experience. It was determined that the single, longer interview seemed to better suit the participants because of time constraints and scheduling problems. The single interview was also more functional in an interaction sense because the initial conversation about demographics and job roles was a natural lead into feeling type comments and perceptions of their careers. In the two-step interview, it was difficult to establish rapport in the second part without rehashing the same exploratory information that had been gathered as demographic data in the first interview. Therefore, the single interview format was selected.

Bracketing Interviews and Bias Exploration

The type of questions asked and the way in which they are posed develops the frame of reference for responses (Clandinin & Connelly, 1994). Not only can a response be guided, the course of the interview can be controlled by the questions asked. Bracketing interviews were used to help uncover the researcher's personal bias in the types of questions used and to identify personal perceptions regarding this topic. Understanding the researcher's personal frame of reference helped to identify bias that might control the course of the interview or tend to predispose responses.

The bracketing interviews were conducted by having others interview the researcher using the same interview questions as were to be used in the study. The bracketing interviews were held prior to the interviews with participants, and were audiotaped. Participating in this experience and reviewing the taped interviews alerted the interviewer to her own internal responses to this topic. There were two bracketing interviews. One was conducted by a woman

and the other by a man interviewer. Both interviewers had technical backgrounds which facilitated probes for details about feelings associated with specific career related activities. Both interviewers had experience with asking open-ended questions.

These interviews were valuable because they brought to light the level of intensity that the participants might feel about these topics. Although the questions were open-ended and general, they suggested topics that were hypothesized to be stressful to the mid-career group of women engineers. The effect and level of emotion on the topics became apparent, with the effect being that the interview couldn't last much over an hour without a loss of focus simply due to becoming weary. The emotion uncovered in these interviews was a warning to the researcher that participants might become upset, and I prepared myself not to respond by either encouraging or discouraging any emotion that would be exhibited.

Participants

The participants in this study were women engineers and managers from across the United States. There were three groups of participants: (a) entry level women engineers, (b) mid-career women engineers, and (c) technical managers. Participants were from a variety of geographic locations to identify any regional cultural effects. Two participants from each group in each of four geographical locations were interviewed. The geographical locations were the (a) Midwest, (b) industrial Midwest, (c) West Coast, and the (d) Southeast. Thus, an initial total of 24 participants was suggested to have multiple participants in each group in each location. All of the participants worked in defense related fields and were employees of large, traditionally stable organizations that were publicly held corporations or government agencies. However, at the time of this study, defense related budget cuts had forced downsizing and created an unstable employment atmosphere in this industry.

Participants were identified by industry contacts who demonstrated a willingness to arrange both participants and a private place for conducting the interviews. Participants included African-American, Asian-American and Caucasian women engineers. All managers were Caucasian males.

Each individual was informed of his or her rights as a respondent, and asked to sign an informed consent statement (Appendix A). The participants were informed that their interview would be audiotaped and transcribed. Pseudonyms were selected by the participants to protect their identities. At the conclusion of the study, new pseudonyms were assigned by the researcher that were neither the name of any participant or a pseudonym chosen by a participant.

The women engineers were in two groups. The first group included those entering their careers who were between the ages of 25 and 30 with a minimum of three years experience. The second group included engineers who had worked long enough to have developed a sense of experience and feeling about their careers, and who were between the ages of 35 and 40 with a minimum of 12 years experience. These two ranges were chosen for several reasons. First, these age and experience combinations reflected traditional career paths of education soon after high school followed by entering the workforce. Secondly, the entry level group had been in the workplace long enough to have formed some opinions about career and family, but not long enough to have begun career moves. The mid-career group was old enough to have begun a career path and also to have made decisions and acted on them regarding family issues. The group between ages 30 and 34 was in a transition mode where they were beginning to make career moves and to make decisions regarding family. Due to this group's transition mode (Levinson, 1996), they were not considered in this study.

The managers that were interviewed were at a level of technical discipline manager or higher and were Caucasian males. They were not interviewed about any specific woman, but about how they viewed the careers of women engineers. There was concern that immediate managers, or those in close contact with the working group, would express bias due to competition with subordinates for the same jobs and stature in the company. The higher level managers were suspected to be less susceptible to perceptions based on personal competition with the working group. The manager participants were in the latter third of their working careers and were postured to reflect on the workplace from experience. Since there is a strong perception that there is a link between women's careers and "family values," it was important to interview managers with maturity and life experience. However, it was possible that regardless of the manager's maturity, their personal experience with families and spouses would be projected onto the women in the workplace.

Interviews

This research is based on information gained from interviews with women engineers (Appendix B) and engineering managers (Appendix C). The interviews were unstructured, used open-ended questions, and relied on recollection of critical incidents by the engineers. The engineers were interviewed about career expectations and asked to recall when, during their time in the workforce, they were the most satisfied and dissatisfied. They were asked to recall their best and worst experiences. For each of these periods, the circumstances and their feelings were explored. To learn about their private lives, questions were asked to probe for information regarding family matters, marital status, children, outside activities, and relocations. Questions

about the work environment included the type of job assignment, level of interaction with peers, relative number of same sex peers, mentors, and expectations.

The same interview guide was used with both women engineer groups (Appendix B). By asking the same questions to the two groups, it was hoped to find commonalties and identify unique differences.

Critical incident recollections guided the interview. Engineers are content-oriented in awareness and communication, and the tendency was to relay the incidents as facts, schedules, tasks, and quantifiable objects instead of human experience. The interviewer had to probe for emotion in the stories, while avoiding suggesting feelings that seemed to go with the content. These interviews were about the highs and lows of professional careers. A range of emotions and feelings were to be expected as the events and circumstances were recalled, but it was sometimes difficult to get the participant to talk beyond content.

Certain categories of information were expected to be valuable in understanding this phenomenon. The frequently suggested reason that women are dissatisfied in their work is that their values change as they have families, and they lose focus on their careers (Hart et al., 1986). Although this topic was not directly discussed, it was addressed with the engineers by discussing expectations and perceptions about their careers. The mid-career group and managers were asked to speculate on the results of the SWE Survey (SWE, 1993) which suggested that women engineers were less satisfied than their men counterparts after age 30.

Several helpful pieces of information came from previous work. During these stories of personal experience, probes were made to elicit information about the work environment during the incident, group or individual participation, type of work performed, perception of gender bias in evaluation of performance of work, and inclusion into the social structure of the workplace. The interview responses have been compared with the results from the other studies to better refine understanding.

Managers were interviewed differently (Appendix C) to gain insight into their perception of the females' satisfaction. First, they were questioned about how they perceived themselves in the workplace with regard to opportunity, skills, and future expectations. They were questioned about what they believed to be the expectations of women engineers and their perception of when this group was satisfied and dissatisfied. They were asked about any steps they had taken to directly affect these constructs for their employees. Then, they were asked about any global actions that affected engineering employees. This part of the interview was aimed at determining manager's reasons for their actions and what they were doing to contribute to events that formed perceptions of the women engineers.

The managers were also questioned regarding their perception of how women's attitudes and performance changed from entry to mid-career. Once again, they were questioned about managerial or other actions that might have driven these changes.

Summary of the Data Gathering and Interview Interaction Process

The data gathering process was composed of five steps. This process was designed to familiarize the participant with the interviewer and being interviewed, and to build trust so that personal stories could be told. The interview was held in a private setting. When necessary, telephone interviews to discuss summaries were held at prearranged times either during business hours or personal time, at the participant's discretion. Transcripts were prepared by a paid transcriber who signed a statement of confidentiality (Appendix D).

The five steps of the interview process were:

1. A telephone introduction was made in which the purpose of the study was explained and informed consent was discussed. It was determined whether the person met the criteria for one of the participant groups. Dates, places and times were set for the interview. A copy of the informed consent statement was mailed or faxed for review.

2. At the beginning of the interview, the informed consent statement (Appendix A) was signed and archived, and pseudonyms selected. A discussion of the participant's rights were discussed and original signatures were obtained before interviewing began. The intent of the researcher to widely publish the results in a format which uses direct quotes attributed to participants through pseudonyms was plainly stated and discussed.

3. The personal experience interview was conducted in person and audiotaped. It typically lasted from one hour to approximately one and one-half hours.

4. The interview was summarized from a review of the audiotape and discussed with the participant to verify that the information could be used and that it accurately reflected their perceptions and experiences. Opportunity was provided for ideas to be expanded and further probes made for clarification. If possible, this interview was conducted in person. Otherwise, the summary was mailed to the participant and discussed in a telephone conversation.

5. Once transcripts were prepared and edited to remove any reference which could identify the participant, a copy was mailed to the participant's home address. Participants were provided with a means to contact the researcher for additional information through a permanent Internet site and address.

Interview Summaries

After the initial interview, an informal interview summary was prepared for review by the participant. This summary was prepared by listening to the audiotape and recording the key

thoughts as interpreted by the researcher in a written summary. This summary was only intended for use by the interviewee and interviewer as a way of making sure that the participant was heard and interpreted accurately. These summaries offered an opportunity for additional comments and questions. They were prepared and reviewed within 60 days of the initial interview. Upon request, the interview summary was provided to the interviewee.

Preparation of Transcripts

Transcripts were prepared by a professional transcriptionist from the audiotapes. After preparation, each transcript was reviewed for accuracy of preparation and edited by the researcher to remove any reference that might compromise confidentiality. After preparation of the transcripts, each one was reviewed by an independent source who was charged with searching for clues that might identify the participant.

Data Analysis

The data analysis for this research was in the form of identifying the continuities and discontinuities in the personal experience of the participants. Following qualitative research procedures as outlined by Taylor and Bogdan (1984), transcripts were read and reread in depth to identify and note potential themes. From these potential themes, categories were developed, and the themes coded into the categories. Using a constructivist style, the personal experiences were applied to categories, the categories integrated into a contiguous image of perception, concluding in the development of theory (Denzin, 1994).

The three participant groups were treated independently during the data analysis. It was not the task of the data analysis to understand how the groups related to one another, but to determine the themes and categories of each group.

As an external audit, transcripts were read by other qualitative researchers and subsequently discussed in a group setting to validate the researcher's identification and interpretation of emergent themes. A review group consisted of six persons plus the researcher and had both women and men as reviewers to negate any gender effects. Three of the members were not familiar with the engineering environment. To help identify any subtle themes that result from workplace culture, the group also included a man engineer and two women engineers having 6 to 25 years engineering experience in the technical workplace. Each group member had training in research design and was instructed in qualitative research methodology.

This group of reviewers was charged with identifying any repetitive themes, statements, or experiences that could be discovered from reading the transcripts. They were also asked to note any within-group unexpected comments or discontinuities. Although consensus of agreement was hoped for in identifying themes, it was not a requirement. A majority agreement

on a theme was the criteria for acceptance of a theme as emergent or identification of a person's experience as out of the range for that group.

Prior research

Understanding the prototypical participant groups helped to develop an interview that was unbiased, but questioned in a fashion that encouraged more than a casual response. Work was done with engineering students and women engineers in a range of ages to develop a sense of their styles.

A study was conducted (Seat, Poppen, Boone, & Parsons, 1996) in which research-based interventions were used to affect engineering design team interactions. In this study, training was developed to teach interaction skills and facilitation was provided to improve performance. This research afforded an opportunity to interact with the students to understand their thoughts on equality and satisfaction. Within this study, students were interviewed regarding their perceptions of their career potential, integration with their fellow classmates, and thoughts about entering the workplace. These interviews were valuable because the language of this age group is similar to that of the entry level group. This research formally addressed the effects of enhancing communication skills on personal satisfaction and group cohesion for women and men engineering students. Issues of team orientation, performance and communication were examined to understand how the working environment and interpersonal skills affect individual satisfaction.

A self-help group was started by the researcher with women engineers and maintained for nine months to further explore breaking through content into feeling expressions about the workplace and others. This group provided a long-term setting for the researcher to practice asking questions, listening, and gaining trust with women engineers.

THE FACTS

Demographics, Qualities, Experiences, Expectations

The participants were asked direct questions about their demographics, personal qualities, experiences, and expectations. The Demographics tell a story that is on the surface. The Qualities, Experiences, and Expectations unravel the surface and tell about the person inside.

Chapter 4 relates the demographics. Chapters 5, 6 and 7 are the women engineers' answers to direct questions. Chapter 8 is the managers' answers to direct questions.

The questions may be direct, but the answers aren't.

CHAPTER 4

"I AM A COLLECTION"

> I am a collection of all the things I do and all the people that I care about and that care about me... But is there any me in there? I haven't the foggiest! *John*

People are indeed a collection of their physical characteristics, experiences, the places they've been, and the people around them. Before delving into the experience and perception of the participants, a sense of who they are is developed from those things that are readily observable about them - the things most people have in common. Once the participants become familiar through these everyday, graspable facts, the characters are further developed by examining their experience and perception of life.

The individual participants in this study are not the characters in this story. The group of which they are a member becomes the character. The stories told by each group develop characters of a typical young woman engineer, a 40-ish woman engineer, and two men managers. Let the character development begin.

The Groups

Introduction of the characters begins with their definition. In Table 1, the participant's pseudonyms are associated with their respective group. The participants were first categorized into two groups, women engineers and managers. The women engineers were subdivided into the two groups of entry level and mid-career, based on age and experience. The managers were subdivided into lower level and upper level manager groups based on position in the corporate hierarchy. The final four groups are:

1. **Entry-E** - entry level women engineers, age 25-29
2. **Mid-E** - mid-career level women engineers, age 35-39
3. **Lower-M** - lower level technical managers, age 50 or older, at a level of department head or division head
4. **Upper-M** - upper level managers, age 50 or older, at a level of corporate director or vice president of technical divisions

Table 1: Group Classification and Participant Category

Group	Classification	Acronym	Participant's Pseudonym
Engineer	Entry Women Engineer	Entry-E	Dana, Faye, Judith, Lucy, Maria, Meredith, Michelle, Rachel
	Mid-Career Women Engineer	Mid-E	Donna, Emily, Joy, Julia, Laura, Mary, Sharon
Manager	Lower Level Manager	Lower-M	Charles, Harold, Peter, Steve
	Upper Level Manager	Upper-M	John, , Sam, Tom

Two of the participants in the Entry-E group were under age 25 because of a scarcity of women engineers in this exact range at the participating companies. A careful comparison of the responses of these two participants with the others in their group didn't reveal any differences, other than if in graduate school, they were beginning their post baccalaureate work rather than completing it. The remainder of the Entry-E group were distributed throughout the age range. The participants in the Mid-E group were distributed throughout their age range.

The managers were initially considered to be a single group. However, when the interviews were conducted, two distinct sets of responses emerged, associated with the person's managerial position. Through coincidence, the managers who were interviewed were either a lower level manager (Lower-M) or an upper level manager (Upper-M). The Lower-Ms were more task-oriented and the Upper-Ms were more people-oriented in responding about both themselves and the women engineers.

The Lower-Ms were organizationally one or two levels above the working group of engineers and had responsibility for the timely completion of tasks by those who worked for them. However, the working group of engineers was not in competition for the same jobs and promotions as the Lower-Ms due to seniority or because there was at least one level of management separating them. When speaking about their futures, most of these managers anticipated either lateral opportunities or a step into higher management positions. A key element for the Lower-M group was that they had direct responsibility for specific task completion. The task might be a large project with many sub-tasks, but their role was clearly bounded and had an expected, measurable output.

The Upper-M group was organizationally at the highest levels of their companies in positions of director or vice president. In all cases, they managed technical parts of their companies such as research, product development, or technology - not business sectors such as marketing and finance. In comparison to the Lower-Ms, this group had responsibility for

representing their company to outside interests and recommending future plans for growth and associated technologies. These upper level managers had no specific tasks or responsibilities that were directly related to accomplishment of a specific engineering task.

Marriage and Children

The interview guiding questions specifically did not mention marriage, children, or family roles. However, without exception, a discussion of family issues was raised by the participants during the course of the interview. Categories for marital status were single, living with significant other (SO), divorced, and married (Table 2).

The engineers that were married tended to have engineers as spouses, with 80% of them being married to someone in a technical field. All of the married Entry-E group mentioned specific future plans for children, and the unmarried ones spoke of expecting to be married and have children. The married Mid-Es all had small children ages 5 or younger, or mentioned that they had planned for children, but had been unable to have them. The Entry-Es talked of starting their families in their early thirties, and the Mid-Es had done just that, as evidenced by having young children at the time of the interview who would have been born during the women engineers' early thirties. The two single Mid-Es mentioned that they had thought they would marry and have children, but that it just didn't happen for them.

With one exception, all of the managers had children or step-children who were college age or older. The men managers did not mention the occupations of their spouses, while the women engineers typically mentioned their spouse's occupation.

Table 2: Family Demographics

Group	Marital Status	Children	Spouse/SO Occupation
Entry-E	2 single	none	
	1 SO	none	engineer
	5 married	none	4 engineers, 1 attorney
Mid-E	2 single	none	
	1 SO	none	marketing
	4 married	all have children or have tried	1 chemist, 3 engineers
Lower-M	1 divorced	all have children or step-children	spouse occupations not mentioned
	3 married		
Upper-M	3 married	2 have children, 1 no children	

Education

Education and the educational experience establish credentials in engineering and the technical community. A Bachelor's degree in engineering is a prerequisite to being an engineer, and references to college days and the rigors of an engineering education are a common ground for discussion among all engineers. The participants reflected both their intellectual ability and their commitment to education as evidenced by their pursuit of advanced degrees (Table 3).

Eleven of the 15 engineers had either completed or were finishing advanced degrees. Another had plans to return to school. Of the engineers, the primary reason to get an additional degree was to be better postured for career advancement. However, several in both women engineer groups felt that they had needed the additional engineering education in order to be prepared enough to do engineering work and to gain the respect of others. The Entry-Es indicated that with just a BS in engineering, they did not feel equally equipped in skill with their men peers, but after finishing their Master's, "Yes, I do feel more equal now. I do." (Judith, Entry-E). Similarly, Sharon, a Mid-E, also felt inadequate and said, "I really didn't feel like I was prepared enough at the end of my undergraduate degree to go out and get a job and work as an engineer. Somehow I didn't feel like I had prepared enough." Mary elaborated further when she said:

> I would want a Ph.D. to feel like I accomplished something. Sometimes I feel like I haven't succeeded and I don't know if that's me putting things in my sock or an outside influence... I think people would perceive me differently if I had a Ph.D. I think they might. They would have to. Just because of the fact that I had achieved this. The respect, the acknowledgment of success you would get by being that person. (Mary, Mid-E)

Table 3: Educational Credentials

Group	BS	MS/MBA	Ph.D.
Entry-E	8 BS Engineering	2 - MS in progress 3 - MS completed 1 - MBA in progress 1 - beginning optometry	
Mid-E	7 BS Engineering	3 MS, 1 MBA	
Lower-M	4 BS Engineering	1 MS, 1 MBA	
Upper-M	1 BS Engineering 2 BS Physics		2 Ph.D. Physics related

A general theme of not being the same and the resulting consequences of those feelings begins to be developed with their reflections on educational credentials and knowledge. It is important to these women to do what they can to be capable performers and professionals, and they take action about it.

What Do You Do For Fun?

During the initial part of getting to know the participants, they were asked about what they did for fun. Several recurring topics appeared in the answers to this question that can be associated with the respective groups (Table 4). At least one member of all of the groups mentioned hiking and camping as activities. The Entry-E and Lower-M groups expressed similar interests in participation in physical activities with a sport activity flavor. The Mid-E and Upper-M groups were similar in the absence of sport participation, with the women's prime activity concerning children and the men's focus being on their work. In a sense, the Entry-E and Lower-M groups expressed activities that focused on themselves, and the Mid-E and Upper-M groups talked more of activities of which they were a part, but had a context of group maintenance and care. This sense of either *I* or *us* follows these groups in a similar manner throughout most of their themes.

The Mid-Es had a predominant theme of reading as a hobby. They primarily read science fiction, autobiographies, and novels, and specifically mentioned reading as one of life's joys. Two of them read about other women, and Emily talked of writing her own autobiography so that young women could read about being a woman engineer when she said, "It would be nice for younger women and girls to read about how it is to become an engineer because I'm sure a lot of them think it's a man's job."

Neither the Entry-Es or the managers mentioned reading. In addition to reading, the Mid-Es talked about attending sports events, working with community and church, and being with their children. Generally, they did not talk about being active in sports or daily physical

Table 4: Hobbies and Fun

Group	Hobbies
Entry-E	Piano, rollerblading, tennis, rowing, walking, working out, hiking, school
Mid-E	Reading, children, hiking, piano, attend sports events
Lower-M	Photography, hiking, camping, tennis, golf, summer home
Upper-M	Not much time for fun, work is fun, music, camping, photography

activity. On the other hand, the Entry-Es and Lower-Ms talked about participating in physical sport activities. There was a sense that the idea of fun of the Entry-E and the Lower-M groups was perceived similarly, especially when contrasted to the perspective of the Mid-Es.

Although all of the managers spoke of physical activities in having fun, there was a difference in how the Lower-M and Upper-M groups referred to having fun (Table 5). The Lower-Ms all spoke of specific activities, with the activity typically being physical as in sport participation or hiking. The Upper-Ms commented that they didn't seem to have much time for fun because of work. The Upper-Ms talked about how they had enjoyed their jobs over the years, having only brief periods when they were not in a good situation. Sam didn't specifically describe what he did for fun, but emphasized that the work itself was fun (Table 5).

On Becoming an Engineer

Although the engineers were not asked about how they chose engineering as a career, most of them talked about it during their interview. Regardless of the reason each of these women became an engineer, it was not because she wanted to do engineering work. Not a single one talked about wanting to do the kind of work that engineers do. None of them named an engineering discipline that fascinated them, or talked about an experience they had as a youngster that made them want to do engineering work. The usual reason they became an engineer was that they had a family member who was an engineer or who worked in a related field and encouraged them.

Table 5: Managers and Fun

I played tennis for a number of years and have given up golf because it's too time consuming and just recently over the last few years, my wife and I have taken up square dancing. (Lower-M)
For fun I do sports. I love racquetball, volleyball. (Lower-M)
I jog. 35 minutes to go three miles. And I golf. In fact, yesterday I got drenched golfing. (Lower-M)
I don't have time to have as much fun as I'd like. Too busy here too. I really have to schedule my fun in and it would be nice if there were more times so that it could be, so that it could come serendipitous... (Upper-M)
The last year, due to the job, I haven't done too much. I work 12-15 hour days on the average, plus weekends. (Upper-M)
With the exception of about six weeks on a couple of jobs, I have been having fun for 30 years... and when you stop having fun, you should seriously consider doing something else. (Upper-M)

All of the eight Entry-Es chose engineering because of an immediate family member. In six instances, the family member was an engineer, with five of the six being their father, and the other an older sister. In the other two cases, the family member worked in a technical environment and encouraged them. None of the Entry-Es ever mentioned that engineering was chosen because they wanted to do engineering work or that they had an interest in the profession. The influence of their fathers was not always in encouraging them to be an engineer. Instead, it the women admired their fathers and wanted to copy them (Table 6).

Of the seven Mid-Es, two went into engineering as a way to have the credentials and educational background to become an astronaut. Another saw engineering as a route to medical school and had a father who, as an engineer, thought that all roads passed through an engineering college. Three others entered because they excelled at math and science and were told by high school counselors and older siblings in technical fields that engineering was a good career. The two that entered engineering to get into the space program never intended to be engineers, but after abandoning their dreams of being an astronaut, they liked working as engineers in space affiliated industries.

Minorities

Several of the women engineers were members of minority groups. Two of the Mid-E

Table 6: Entry-E Influence from Father on Career

My father was an engineer, which is kind of what steered me in this direction. (Meredith, Entry-E)
I'd probably have to say it was my father. He was a business owner with a very, very high work ethic, very devoted, very dependable. He was an engineer. Growing up, I always wanted to be an engineer. It was no question. I saw my father and saw what he did and I wanted to be just like him and... (Maria, Entry-E)
He's also an electrical engineer. He's an extremely smart man; he came up out of a poor background. He put himself through college. He's kind of a self-made man. And he had a really great career in the military. He's just absolutely brilliant. Whenever I would have any trouble with anything, I could go to him and he would know the answer. He knows everything about everything pretty much. And I admired that knowledge. (Rachel, Entry-E)
My dad was an engineer so he probably had a big influence on me choosing engineering. That was the career I heard about and I knew about. He's a mechanical engineer. He also worked for a large company When you make your decision about your career, you are 17 or 18 and you don't know all the other careers are out there. My mom was a teacher and I saw teachers every day, so I knew what they did, and my dad was an engineer and so I knew what he did and that's about it. So that's how you chose engineering as a career? Yes. (Lucy, Entry-E)

group were African American, and one Mid-E and one Entry-E were of self-described *oriental* descent. Although each of these participants made a reference to her minority status and felt that it caused special problems in the workplace, the themes in this particular study were not affected by minority status. The effects they blamed on racial or ethnic status were also described by the other women participants.

The participants of oriental descent felt that they were prejudged to be quiet and passive as a race, and being a woman made this effect worse. The African American participants felt that others accused them of only getting their jobs because they were a minority. They described being taunted with comments that black women have an even greater advantage over just being *black* or a woman (Table 7).

Table 7: Minority Perception by Women Engineers

If people think a certain way about a certain group of people, they are going to think that no matter what you are or who you are. I don't want to think that, but I heard it so much from the guys, all white guys I worked with who said it to me over and over. Repeatedly, when I was a project manager, a guy came to my office every other week and said to me, "You got it made because you're two-in-one." I know others think that also because I heard two-in-one so many times that I knew he wasn't alone. The minorities say I have an advantage over them because I'm female. But, I really didn't control either one of those things. When they say those things to me, I have to point out that I went to school just like they did. Same degree - just like theirs. I have experience too. I told them, "I'll throw my credentials up against yours any day. Now you tell me that the reason I was given this job is because I happen to be a certain color - I don't buy that, because my experience speaks for itself and I will compare mine to yours if that's what you want to do. Your allegation is that the only reason that I'm here is because of my color and gender and I don't believe that it's the case." I really think that I have worked smart enough and done the things I should have done to put me where ever I am. People view women differently, maybe minorities differently, and the combination makes some people view it differently, and they treat you differently. (African American, Mid-E)
Management's perception, they have this prejudged idea of what you can do or what you know and they start off little because they think that's what you can handle; the little things. They don't think you can really handle the big jobs. *Do they do that with everyone, you believe?* Oh no, because everyone wasn't given the small jobs. I came in as a minority. I'm a black female, so they think, for one thing, that I probably came into the system on not by what I know, but basically because they needed to increase the minority positions around here and they take it from there. I think that is their perception. They take it from there. And you're just not challenged as much. I don't think they have that much concern also for me as an individual who wants to learn and take my career and move with it. I don't think they have that much concern. They are more concerned about - we have this black female here and I'm doing my job as far as bringing in minorities. I think their purpose is more on that than on actually helping that person to learn and to train that person. So you don't have that focus to help train a person. (African American, Mid-E)

The Demographic Characters

Four characters emerge from the women engineers and the men manager groups. Among the engineers, there were some commonalties and among the managers there were some commonalties. There were also some differences between the engineer groups, as well as the manager groups.

The first character developed is the Entry-E woman engineer. She is a woman engineer under age 30, who has a BS in engineering and either has or is pursuing a post baccalaureate degree to be better prepared skill-wise and to be better postured for career advancement. If married, she is most likely to be married to an engineer and plans to start a family in her early thirties. If unmarried, she expects to marry and start a family. She is primarily active through physical activity. She became an engineer due to a family influence, usually because of an engineering father. She didn't become an engineer because of an interest in what engineers do in their professions.

The second character is the Mid-E woman engineer. She is between the ages of 35 and 39. She pursued a post baccalaureate degree to be better prepared for engineering work. She may or may not be married. If married, she is most likely married to an engineer or some other technical professional. She either has children under the age of 6 or had planned to have children. She started her family before age 35. She enjoys reading and raising her children, and is not particularly involved in physical activity. She became an engineer for reasons other than wanting to do engineering work.

The third character developed is the Lower-M white man manager. He is over age 50 and has a BS in an engineering field and often a MS or MBA. His role is to manage a group of technical people to complete a task and he has a measure of responsibility for the successful performance of that task. He is married and has children. His idea of fun is usually some sort of physical activity.

The fourth character is the Upper-M white man manager, who usually has an advanced degree. His role is to interact among the company leaders and with outside contacts. Although he may not have direct responsibility for task accomplishment, he interacts with others to make judgments regarding strategic plans and opportunities for his branch of the business. He is married with children, and pleasure is often scheduled around work.

The Rest of the Story

This chapter describes the characters as they are seen by most people. Some personal insights were added with a discussion of how the women engineers chose the engineering profession and why they pursued additional degrees. The next chapters expand the perspective

of the characters by developing their respective perceptions and expectations into *Facts*, *Innuendo*, and *Dynamics* (Table 8).

This further definition comes from the information in the interviews that presented itself in two forms: (a) direct responses to questions, (Table 8, Facts), and (b) indirect references to topics not suggested by the interviewer (Table 8, Innuendo) An example of information from direct responses is the chapter on best and worst experiences, where the women engineers were specifically asked to recall and describe both of these instances. Their responses to a direct question are used to identify common themes on this topic. An example of an indirect response is the chapter on family issues. Family and family issues were not a guiding question in any interview. However, without exception, a discussion of family issues was initiated by each interviewee. Thus, it became a predominant theme of this research.

The themes from direct questions are the basis of Chapters 5, 6, 7, and 8. Chapters 5, 6, and 7 discuss direct responses of the women engineers. Chapter 8 discusses the managers' direct responses about themselves and about the women engineers.

The themes from indirect responses are the basis of Chapters 9 and 10. These chapters combine the indirect responses from the women engineers and the managers on the topics of Opportunity & Recognition and Family Issues.

Chapters 11 and 12 combine the direct responses, indirect responses and observation to suggest two theories about the dynamics of being a woman engineer. The first theory is termed the theory of Risky Business, and the second is termed A Sense of Value.

Chapter 13 discusses how these findings match those found in previous studies, and the implications on women engineers of the concepts of family roles and oppression. Chapter 14 summarizes this study and proposes recommendations and future directions.

Table 8: Organization of Results and Theories

The Facts	
Chapter 4	Demographics
Chapter 5	Women engineers, *Who are you? What is your best/worst quality? How do you compare to your peers?*
Chapter 6	Women engineers, *What was your best/worst experience? What about it made it best/worst?*
Chapter 7	Women engineers, *What were your expectations when you entered the workplace? What are your expectations for the future?*
Chapter 8	Managers, *Did you have role models or mentors? Who are you? What kind of expectations do you believe women engineers have? How are they different that their men peers?*
The Innuendo	
Chapter 9	Opportunity and Recognition
Chapter 10	Family Roles and Issues
The Dynamics	
Chapter 11	Theory: Risky Business
Chapter 12	Theory: A Sense of Value
Chapter 13	Ties to the Past: Discussion of the Results
Chapter 14	Commencement: Recommendations and Future Directions

CHAPTER 5

WHO AM I?

I'm just a person. *Lucy*

Each of us is one person to those around us, and another person to ourselves. Sometimes these two perspectives match, but in the case of the women engineers, how they see themselves and how they are seen by the rest of us isn't the same. It is a paradox that centers on a difference in perception of their abilities. To us, they are a talented group of individuals based on performance and credentials, contrasted with their personal perception that they are just average, hard working, and persistent.

To understand who these women thought they were, they were asked questions such as *Beyond your family and degrees, who are you?* and *Which of your qualities has contributed most to your success?* Their responses to direct questions about who they were and their best qualities revealed what was below the surface.

In some ways, the Entry-E and the Mid-E groups were the same, but there are some subtle differences. These commonalties and differences became evident in the responses to the questions of *Who are you?* and *What is your best quality?* The Entry-E group had the same response to both questions, and talked of their ability to perform tasks. The Mid-E group answered the former question in words that reflected their interactions with people and the latter in terms of task performance.

Generally, the women engineers tended to describe themselves in terms related to tasks, and found it difficult to use subjective descriptions. Many of them were taken aback at the questions and found it difficult to respond. "I don't know. That's a good question. I've never thought about that..." (Maria, Entry-E). "That's really hard, who am I..." (Joy, Mid-E). Engineering is a profession that is based on rational and logical application of the laws of physics, and as engineers, these women took pride in being an engineering professional. The questions about their personal characteristics were unexpected, and they didn't have ready words to describe themselves.

Task performance is measurable and tangible results cannot be challenged, while subjective descriptions are a matter of perception and can be judgmental. This tendency to shy away from subjective description was evident, even in the engineers speaking of task

performance. They spoke of working hard to complete a task and getting the job done. They did not put a value judgment on their performance with adjectives such as doing a *good* job or finding *exceptional* solutions.

There is an overall theme as to how the engineers see themselves. The general picture is one of women who see themselves as successful, but because of their hard work and perseverance, not as a result of their engineering ability. They comment that their men peers are superior in ability, but they, the engineers, get the job done. The Entry-E and Mid-E groups are different in the tone of their responses, but both believe that they are just average in the technical skills of their profession.

As this theme is developed, remember that one of these women is a graduate of a premier engineering college, another made it to the final cut of 100 persons in the space program, all of them have a BS in engineering and most of them also have a Master of Science or MBA degree. By any standard, these are intelligent women who have every right to be proud, not only of their accomplishments, but also of their ability.

Who Are You?

The women engineers were asked the question "Who are you?" early in the interview, before discussing their jobs and the types of work they had done. The responses between the two groups differed, with the Entry-Es' replies being more task-oriented by talking about doing a job, and the responses from the Mid-E reflecting an awareness of personal qualities.

In describing *who they are*, the Entry-E group talked about wanting to do well, working hard and persevering. They talked about being competitive, but this competition wasn't with others, it was with themselves in accomplishing their work. Their words suggested that much of their personal identity was around their success in becoming an engineer. They answered this question in a context of their ability do their work. Their ability to do the work wasn't in their *smarts*, but in something they could control - how hard they worked. They didn't speak of accomplishment or specific expertise, but of applying themselves. Even though they didn't talk of specific accomplishments, they felt positively about their ability to get the job done.

The Mid-E group answered the question of *Who are you?* with a more feeling type of response, not based on their identity as an engineer. Not a single Mid-E responded to this question with the words *hard work* and *persevering*, or even mentioned being an engineer. Hard work and perseverance were a part of their perception of themselves, but those descriptors came out when discussing their best quality. *Who are you?* was thought of in terms of their personal style, not of being an engineer.

Mid-Es Julia and Sharon talked about having a broad range of interests and being level headed, and Emily and Laura talked about liking to stay busy and active. However, none of them mentioned work related tasks and interests in response to the question of *who are you?* They answered it in terms of interacting with others, either staying busy, being even-tempered, volunteering at their churches, or working with children. Their identity was not as an engineer, and their personal value was not in accomplishing engineering tasks.

The Entry-Es' and Mid-Es' perception of *who they are* reflected an approach to life (Table 9). The Entry-Es' task focus indicated a belief that they could perform their jobs in a way that would make them valuable. They could influence who they were by sheer determination and hard work. The Mid-E group may have believed that hard work was their best quality, but they were who they were and weren't trying to be anything different.

Table 9: Who Am I?

My best quality is basically stick to it; not to give up on something until it's done and over with. That probably comes from a very competitive nature. The best thing to do is fight it through till the end. (Lucy, Entry-E)
I think I'm someone who really wants to do well, but doesn't always come across that way. I think to me it means to do the best that I can. It's not necessarily gonna be the top of everybody's list, but what I know my full potential could allow me to do. (Meredith, Entry-E)
Who am I? Very insecure... I guess just in my ability. I want people to like me and respect me that I can do a job and do it well. (Maria, Entry-E)
Who am I... I don't know where to start. *Laughter* I think that I am a very competitive person. I think I'm pretty successful. One of my favorite sayings is "Be careful what you wish for because it might come true." I need to look for more goals to pursue because I am really doing great and needing expectations. (Judith, Entry-E)
I guess I think of myself as a mother as probably my number one role right now. I don't know. Gosh, who am I? Pretty average. I know if you look at statistics and stuff there are very few women who have engineering degrees, very few who have Master's, but you know I never really... I just think of myself as pretty average. Just the general population.... Yeah, average. I don't think of myself any different than anyone else. But I think sometimes they think differently... *long pause* (Mary, Mid-E)
Oh dear! An introverted dreamer with high expectations for myself. (Donna, Mid-E)
If you really wanted to know who I was, I would say that I'm somebody... *long pause* I'm a worrier. (Joy, Mid-E)

My Best Qualities

After describing their work experiences, the engineers were asked to describe their best qualities. They expanded on this topic by comparing themselves with their peers and others in the workplace.

For the Entry-E group, a task focus continued with responses about not giving up, getting things done and persevering as their best qualities. When asked how they compared to their peers, without exception they responded that their peers were better technically, but that they, the Entry-E, stuck with the task until it was completed. Even though most of these women had an advanced degree or were working on one, they still insisted that intelligence wasn't their best quality, but it was their perseverance and hard work (Table 10). Just like their idea of who they were, their best quality was something they had in their personal control.

The Mid-Es' responses to *who they are* were different in tone and context from the Entry-Es, but their idea of their best quality was the same. When asked, they responded that they were a determined, hard working, persevering, average group of women. Similarly to the Entry-Es, they worked harder than their men peers to get the job done, and felt that they were not as capable in natural technical ability.

The Mid-Es not only described their best quality, but expanded the discussion to describe their style. The Mid-Es have matured and not only recognize that producing a product is important, but that their qualities in interacting with others play a part in their success. The Entry-Es focused on *what I can do* as a quality, and were defined by their individual performance. The Mid-Es understood that they must have a product to be successful, but part of their success came from who they are - not just what they can do. The Entry-Es were trying to influence who they are by what they can do. The Mid-Es did their work by using all of their skills - both technical and interpersonal (Table 11).

The influence of maturity and years of interacting with others began to show in this discussion. The Entry-E and Mid-E groups recognized the same quality. The Entry-Es, not having experience, believed that their quality would bring them success. The Mid-Es, with the benefit of experience, reflected on the consequences of their best quality. For instance, both Dana, an Entry-E (Table 10), and Donna, a Mid-E (Table 11), used the word stubborn in describing their discipline of hard work. Dana saw stubbornness as a good quality that got her to the end of the job. Being driven and not letting go was an asset to her. However, Donna had experience with being stubborn and suggested it was her both her best and worst quality. She recognized that it drove her to not give up, but that many people were put off when she was stubborn. Stubbornness may have made her successful, but she paid a price because of it.

Table 10: Entry-Es' Best Qualities

I think I don't give up very easy and if something doesn't work, some people say, "Oh, we can't do it that way." I'll stay late and I make it work. I'm gonna figure out how to get it to work and figure out why it's not working. I'll persevere when other people may not. I think it's my perseverance because I don't think my technical background is that strong. I think there's a lot of more technically smart people here, who have looked into the same stuff, but maybe just dropped it because they didn't feel it was gonna' work. I think the technical background is there, but I think it's more perseverance. (Meredith, Entry-E)
Probably stubbornness. It's just that when I get it stuck in my head that I want to do something, I'll keep trying and trying until I do it and dedication. Getting to the end. Hard work versus being very smart. Hard work more, anybody can be book smart, I've seen a lot of people that are very intelligent, more intelligent than me and they don't do anything practical. Even though I may be lacking in experience, I work very hard to make up for that very quickly. I work very hard to get things done and accomplished. I'm very driven to do something; to do a job, do it well, do it quickly. (Dana, Entry-E)
I think my ability to get things done even when there's not very good data. But other tasks I've been given, I'll get jobs done. I'm a worker. I think a lot of people around here kind of float through. I think I'm a much more down to earth person than some people. I'd say I'm somewhere in the middle smarts wise. I know there's guys over there who blow me away with their smarts. But, book wise, a lot of them got the hands-on experience wise too. That's something I don't have but I wish I had. (Judith, Entry-E)
Where I work there are several problems and a lot of my peers are good at identifying the problem and sometimes identifying solutions, but they don't always push and I push. I think that's the main difference, I just push. I mean I don't try to nag people, I try to do things when they don't know what to do next. Because I'm good. I'm very positive. I like to do a good job. I hit the ground rolling. I'm not afraid to ask questions, I'm not afraid to be shocked; I'm not afraid to work hard at things. (Michelle, Entry-E)
I guess I'm diligent, I'm confident in my skills, I'm a quick learner, I like what I do. I guess maybe I try harder. I try to listen and when I'm told something, active listening, and then I try to understand it before I go out and do it. I don't know, I just... A lot of people have maybe been here for a while, they just don't put as much effort into things. That's what I see. I think maybe, it's seems like a lot of people don't care really, really care. (Faye, Entry-E)

Table 11: Mid-Es' Best Qualities

My best quality, in general, is that I will get the job done. I will do it. Not taking things personally, not having to have it my way, not having a close personal thing built on whether the design is my way or not. Knowing things aren't going to last like they are. It was perseverance. I think that a lot of the people around me doing the same type of work are a lot more knowledgeable... But, I also have a way of going about my work. I'm not very organized, but yet I can keep track of a lot of things. I can think about a lot of things at the same time. I think that's a benefit too. (Joy, Mid-E)
Probably my flexibility and adaptability. I've adjusted and become more flexible in order to be able to work with people....more tolerant. I make sure that when I do something, I do it to the best possible effort that I have. I always follow through. I always return calls. I make a list of everybody that calls. When my manager asks me for something, I always turn it in. A lot of people take that for granted. I think it's made me successful. I think a lot of it is born in us. Completeness; aside from that, I always pay a lot of attention to quality in my work. No matter what it is, it has to be worded just right, even if it's just a memo to somebody. Technically, I'm not where I'd like to be. (Emily, Mid-E)
My being stubborn has contributed both to my success and both the good and the bad parts. My being stubborn and persistent. A lot of people are really put off by stubborn and persistent women or stubborn and persistent people. They're certainly put off by me when I am stubborn and persistent... I am one of the very few engineers you will ever meet who has the capability to communicate and to explain, to define a problem, find the people who have the talent to fix the problem, bring that team together and get that problem solved in a timely and cost efficient fashion. (Donna, Mid-E)
Perseverance, I guess. *laughter* I don't give up. I continue on. Try, try, try. *So you don't think it's your technical intelligence?* No, I don't think so. I don't think that has anything to do with it actually. I think you can teach anybody the technical stuff; I think it's more... I really don't think that technical smarts; I don't think that that is what makes your career.... Because I am a hard worker. I think that's it. You continue doing it and you do it and you do what it takes to get the job done. I can go and find out the technical answer from anybody. I can research it out and if I'm the number one expert on some subject in the world - that doesn't matter. But if I'm willing to find out the answer and research it and get it done and get it done on time, that's what counts. I'm more easy going than most. I tend to see people get wild and upset about things that I don't see as being important. Maybe now that's because I've been around longer and realize that it isn't important. (Mary, Mid-E)
Determination and very strong work ethic. Having parents who worked very hard, I figured "Hard work is going to get me there." I really thought that hard work was going to get me there. *Laughter* Stupid me. I really believed that. If you work hard, that's what my parents always said, work hard. I believe it can. I don't believe that it always does. My experience has been working hard does not necessarily mean that you will get to where you want to, it means you will probably be looked at as a hard worker, productive as far as the work, you'll continue to get more work, but it may be a disadvantage because as you continue to get more, it becomes difficult.... The other thing that was a given is that I was going to have integrity. I was going to be trustworthy. Those are things that are just there - don't deviate from those things that I learned growing up. Always tell the truth, don't abuse anyone, mistreat anyone, so those kind of things. So maybe pie in the sky, yes, I'm going to be a good person. ...it's just a matter of applying it all and digging in and doing and making sure I always do a little bit extra to make sure that I'm doing everything you need to. (Julia, Mid-E)

The Entry-E group was proud of their discipline of working hard, and saw this discipline as a quality that positively set them apart. However, the Mid-E group believed that hard work had gotten them where they were, but that it may not have been a strategy for success. Julia, a Mid-E, in contrast to the Entry-Es, comments that "hard work just gets you more work" and has begun to question whether or not her strategy of "Hard work is going to get me there" really works. Time and experience provide the maturity that allowed the Mid-Es to reflect on how they fit into the workplace.

Summary

There are similarities and differences in how the women engineers see themselves between the Entry-E and Mid-E groups. The similarity is in both group's belief that their best quality is their ability to work hard and get the job done. It is debatable whether being able to work hard is an ability or a discipline, since a person can control how hard they work, and an ability is a natural talent. These women are smart by virtue of finishing engineering degrees, and have demonstrated above average ability in mathematics and science. Yet, they feel that they have average ability in technical areas. They make positive remarks about themselves only with descriptors of learned skills or non-technical qualities. They say that they have the disciplines of determination, hard work, and perseverance, and the soft skills of flexibility, tolerance, communication and integrity. Without exception, they don't consider themselves to be highly regarded technical contributors, and in fact, go out of their way to point out their inadequacy with regard to engineering knowledge.

The difference between the two engineer groups is expressed when they describe who they are. The Entry-Es refer to themselves out of their engineering identity and use terms such as competitive and hard working. The Mid-Es refer to themselves in terms of relationships with others and personal qualities that have nothing to do with being a professional, using words such as a mom, a dreamer, and a worrier. The younger women believe they can influence who they are through more discipline in accomplishing things, and the older women have a more mature perspective that talks of life in qualities having nothing to do with engineering. The Mid-Es understand that their personal perspective influences how they are engineers, but they are who they are and no amount of discipline can change that.

When asked about their best quality, all of the women engineers consider themselves to be hard working, with perseverance as their best quality. They are quick to point out that they are average in technical ability when compared with their peers, and they don't see themselves as particularly different than the rest of the population. The Entry-E sees this quality as a

positive key to their future success, but the Mid-E reflects on both the positive and negative consequences of their best quality.

These are the same women who didn't become engineers because they wanted to be engineers. The same group that needed advanced degrees to feel adequately trained, and now express that they are just average. They believe that technical ability is a natural talent. They make up for their technical inadequacy, a natural ability, with a learned discipline of hard work and determination. The more mature women have an identity outside of being an engineer, but after 15 years of believing that they are not as capable in engineering skills, it is only reasonable that they would find another picture of themselves.

CHAPTER 6

BEST AND WORST EXPERIENCES

How does that make you feel right now, remembering? I still have a copy of that proposal. It feels wonderful. *Donna*

One way to find out something about a person is to just ask them. We do this all the time. For instance, in everyday conversation, a simple "How are you?" is used to check in with our acquaintances. But direct questions don't always get the real answer. Even if a friend won the lottery yesterday, the response to a "How are you?" might be "terrible" if their bad tooth is acting up, or "great" because they were able to get an appointment to get their tooth pulled and are anticipating relief. Asking someone directly to tell about what is happening to them may not be the best way to gain an understanding of the situation. Asking someone to tell about when they are happy doesn't get at good experiences, and asking someone to tell about when they are unhappy doesn't necessarily provide information about bad experiences.

This research asked about critical incidents to explore women engineers' careers. Instead of asking them what was positive or negative about their careers and why it was that way, they were asked to recount both their best and worst experiences. For each case, they were probed as to what about the experience made it best or worst. If they had been asked to talk about their perception of the experience of women engineers, they might have described experiences that weren't their own. For instance, if asked what would make a best experience, someone who wanted to be doing computer analysis, but hadn't gotten the opportunity, might name that job. When asked why, the answer would have been speculation and perception of what the job entails, instead of actual experience. By asking people to talk about their actual experiences, the feelings and circumstances were real, not speculation. Instead of hearing speculation on good or bad jobs, the real experience associated with their careers was revealed. As will become evident, the actual task or job didn't make the experience best or worst, the circumstances associated with it were what was important.

A fundamental assumption in talking with these women was that a best experience will be associated with a positive feeling about their job. Likewise, an unhappy career will have numerous experiences similar to their worst experience. An understanding of what contributes to a positive career perception was developed by asking them to tell about their best experience,

and then asking what about that experience made it a best experience. The same approach was used in learning about their worst experiences.

Positive careers are made not from duplicating an enjoyable task, but instead are a result of an environment that has the qualities expressed in the answer to the question of *What about it made it a best experience?* In the working world, we are paid to do tasks. All tasks can't be good, nor should they all be bad. Even if the task is good or bad, it must still be done. In creating a positive work experience, the task or the actual experience isn't the key element - the quality that made it best or worst is what is important.

Mary's description of a best experience shows how the very parts of a task that might make it appear unbearable can actually be a key ingredient of satisfaction. She described how she would get calls at 2:30 in the morning to work on problems with test equipment, and then how, during the actual test, she worked eight days straight, almost 24 hours a day. Those working conditions don't sound positive. But for her, this was a best experience. She described being a member of a team that was charged to create a space experiment. Her role was to design and get a particular part of the mechanism working. With space experiments, there is only one chance to get things right since the equipment is launched, does its thing, and sends back information on its way to another galaxy. If a door that covers a camera lens doesn't open as the satellite hurls past Jupiter, there's no maintenance mechanic to fix it for tomorrow's try. She was called in the middle of the night because she was needed. She believed that her performance made a difference to the entire task and to other people.

> I worked in a very diverse group. We had all kinds of engineers; ChemE's, Electricals, Mechanicals. They were just really unique people. Very talented people. Very aggressive people, basically. Charge on, nothing can stop them from producing what they want to produce. No road block was going to get in their way. They just mowed it down, went around, whatever. They got the job done. And they did what it took to get the job done. If that meant being there until midnight, that was fine; or working weekends, or whatever. If it meant doing something a little bit on the sly, they did it. Whatever, they did what had to be done to produce the end product. I would get phone calls at 2:30 in the morning. Hey - this didn't work, why don't you get in there and figure out why? I felt important and needed. It just was great. I really was sad when the group broke up. Oh, we had our fights, not that we didn't. There were internal fights and someone would think that their way was better than this guy's. I don't know if it was the way the leadership ran it, the management. It was pretty open forum, we had meetings every morning. Went around the room and everybody spoke, and had equal opportunity to speak what was going on, to speak their mind. I was part of the group. Maybe it was the work. The work was exciting and challenging and you felt that it was important work at the time. It was exciting. It was a lot of fun. I spent five years there before they sold that part of the company. (Mary, Mid-E)

Since most of us don't think in terms of qualities of an experience, the way to get at these qualities is to first ask someone to tell about their best experience. Remind them of the circumstance. *"Tell me about your best/worst experience."* Then, the follow-up question that gets at the critical qualities is *What about that experience made it best/worst?*

Affecting the Outcome

Life changes. What was exciting yesterday is boring today. Things that once were hard to do become old hat. The actual best and worst experiences themselves were different for the Entry-E and Mid-E groups, but the qualities that made their experiences be a best or worst were the same. In fact, there weren't even best qualities and worst qualities. There was one overwhelming theme of the quality of experience. That theme is *the level to which the person could affect the outcome of their task, not the task itself, was directly tied to their perception of the experience*. These women were happy when they felt that their participation and skills made a difference, and were unhappy and frustrated when they felt that they couldn't make a difference. The whys of the best and worst experiences revealed this subtle theme.

The best and worst experiences of the women engineers are presented in three parts. First, the best experiences of the Entry-E group are discussed, then, the best experiences of the Mid-E group, and finally the worst experience of the engineers. There was a subtle difference in the best experiences of the two groups. The Entry-Es were more task oriented and acted as individuals, while the Mid-Es talked more about other people. Both groups talked of accomplishment, but the Entry-Es focused on individual accomplishment and the Mid-Es talked more of being part of a group that accomplished something. For both groups, accomplishments needed to be observable for personal satisfaction, and recognized by others around them.

In describing their worst experience, the circumstances might have differed, but the theme behind what made a worst experience was the same for both groups. Worst experiences often mentioned a lack of *hands-on* background, lack of credentials, or false accusations from those above them in the workplace structure. Either way, something happened that was out of their control.

Look at What *I* Did!

The best experience of the Entry-E group was having a challenging task to do and getting it done (Table 12). *Getting it done* also came out in their expression of who they are - a persevering, hard worker. At this point in their careers, who they believe they are and their job experience are a close match.

Three of the engineers had jobs where they were responsible for the actual material or manufacturing process and associated equipment. The others performed engineering tasks such

Table 12: Entry-Es' Best Experiences

What immediately comes to mind is, I guess it was about two years after I started working. I got sent to work on a piece of equipment that had been sitting idle for several years and I actually tried to bring it on-line, start testing it, and start introducing material into it. That was what I enjoyed the most. Accomplishing something for a change. There's a lot of planning, work, and you plan and then you plan some more and the plan takes two years and then they go off and order equipment and that may take another year to come and then actually getting moved into the facility can take another year for one piece of equipment Getting it ready to work in three months time for all the different processes they wanted and thoroughly tested, that makes it fun. (Lucy, Entry-E)
I've got to say it was my summer back in college when I was handed a job. My boss said, "This project has been sitting on my desk for months; here, take it." I thought, "Okay, you know, now what." I went and talked to the senior engineer there. I had these ideas and had to take something from an idea to making this little prototype. That was totally cool. It was on my own and it was from nothing to something. It was instant satisfaction. I saw things happen. And now it's just a bunch of document writing; it's a slow process; management stuff that has to go through a lot of rickets and lots of evaluation. And you kind of lose yourself in it. *If they offered you a job that paid 10 percent less than your job, but it was a job like your summer job, would you take it?* Yes, I think I would. Because the money isn't all that big a deal. If it was 10 percent less I would still be fine with it. Money just isn't an issue. It's exciting. It's fun. I saved a bunch of stuff from it. Still got it. I've got my little connectors. Yes it was really a blast. I honestly think the job was a big part of it. The whole summer was great, and the job was just too cool. It was the first time I ever had computer drafting experience and I sat down and played with it to learn it and, WOW, I did something. I made drawings that they sent to the shop and they made something out of it. (Judith, Entry-E)
Being the first to do something and having it work out okay, so far. There's a lot of improvements to be made, but so far it's working out okay. It was something challenging and I was able to work through some of the, just figuring it out and making it work.... I've been asked repeatedly to show different groups of people what I've been working on. And that's where I sometimes interact with people that are higher grade levels than me. (Dana, Entry-E)
long pause What has been my best experience. I guess I was on a special project and really it was a good experience due to the fact that it was so different and diverse from what I had been doing on a day-to-day basis and it was the development of videotape that would be used on a CD-ROM at an award ceremony. We all had a group set up and I was in charge of preparing the organization's video on our services and products. It was actually kind of fun because I had never done anything like this. Didn't know from day one what I was supposed to do. It was fun. It was something different. It wasn't routine. Just because of the challenge. Never having done this before. It was just - It really was a challenge to myself that I could pull it off and I could do it. I think it turned out quite well. I had people approach me that were surprised at how it had turned out. But not knowing what I was doing, I kind of impressed myself a little bit too. I probably could look at it now and say why did I do this. I could probably improve on it ten fold if I was to redo it now. But, at the time I thought it was a pretty good end product for what I had to work with. (Maria, Entry-E)

as contract administration and software implementation. Contract administration and implementation jobs have no inherent opportunity for work on hardware and actual equipment. However, one of these engineers, who is currently in an administrative type job, did prototype design and manufacture as a student, and recalled that incident as a best experience.

The role of equipment and hardware in their perception of a best experience is subtle. Of the eight Entry-Es, four of them had the opportunity to work with hardware. The other four did not, due to the nature of their jobs. In every case with the Entry-Es, if the person had worked with actual equipment, it was mentioned as a best experience. They talked of learning about the equipment, the challenge of figuring it out, and then finally getting it to work. They took pride in having a tangible accomplishment that obviously worked - it did something.

Even though four of the Entry-Es never had the opportunity to do hardware work, they talked about how their best experience involved solving a problem that was a challenge to them, and after working on it, they had a solution and had done something new for their company. In the case of the hardware experiences, those engineers, along with everybody else, could step back and see their contribution as an actual working piece of equipment. They all commented that those above them noticed their contribution. Their contribution was recognized. They had proof that they accomplished something, and were valuable.

The theme of what about this made it a best experience was that they were challenged, figured it out, and made it work. The accomplishment was personally and individually theirs, and was tangible. Their ability to perform and having their contribution recognized were parts of what made it best (Table 12).

Look What *We* Did!

Similarly to the Entry-Es, the Mid-E group talked about accomplishing something in their best experiences. In their descriptions, the experience may have centered around a task such as proposal preparation or completing a large project, but they talked about their best experience having to do with being part of a group that accomplished the task. As in Mary's comments, they admired their team members, and felt that they were a vital part of a larger context. The relationships and personal dynamics, instead of individual accomplishment, became important (Table 13).

This theme of group versus individual must be considered in context. Engineering and the politics of doing business are complex from both technical and the social aspects. It takes years of experience for engineers to have a broad enough perspective of technical topics to make decisions and recommendations at a project level. Young engineers are parceled out small bits of large projects, usually tasks that are well bounded and should have just one right answer.

Table 13: Mid-Es' Best Experiences

I was the president of the local chapter of a national organization, and the personal achievement, it wasn't my career thing as far as engineering, but I had worked hard to make things happen for other women at my site. We worked extremely hard, and my leadership in that position and having two VP's who were unbelievable - that combination, we did a good piece of work. They were determined to do their best no matter what it was they were asked to do. They showed no fear. These women showed no fear when it came to trying to get company management to buy into things we were doing.... We did a lot of projects and activities and we tried to make sure we catered to everyone. But my program chair and membership chair were just phenomenal in getting the point across that this was an effort for all employees. Not just women. We tried to get the men to understand that and we did get some support. The more things we had with a wide appeal, the more participated, and we had a really good year. I had always been opposed to being in organizations that excluded people, and when I was asked to do that, I really to think because from the time I can remember, I had always shied away from those kinds of groups. I am not going to do that, I am not going to participate in something that excludes someone else. But, I figured out what it was about, it wasn't about women - that just happened to be the title. I had to get over that hurdle, once I realized that they had male members and contractors, it was smooth sailing from there. It was probably a very good experience. It was really positive because I actually felt that I had contributed and that I had changed some things. *long pause* I guess that interaction with my fellow chapter members is what I miss because it was good. (Julia, Mid-E)
It's just the idea of putting together this procurement package that I did have a part in. And there was this deadline - everybody was working together trying to complete it. I think being able to complete your part of it and say here's my part, I did this, and it's okay; I think that was an exciting time too. The group worked pretty good because everybody was starting at square one. Nobody knew the actual product system that well and you didn't have someone that had been there working on this for years. And there here you come, the new person. But it started out as this office just getting together to start the new proposal package. And also when I served on the review team. Evaluating a procurement package for the proposals that came in. That was exciting too. Because it was something that was important. Being on the team; it was something that's important. So I think the more important my job, is the more happier I am to get up and come to work. I think that's the answer I want to say. The more important the job is. The more I feel that I have an important part in it and I'm playing an important part in it, the more happier I am to come to work. I have no problems with that. I felt good because it was something you were accomplishing. And it was something people recognized that were higher up. You have the higher positions watching and you can't really be dragging your feet on it. If you are really doing something and you are accomplishing something that other people can see, then that is important. (Laura, Mid-E)

The Entry-E group may have an individual focus because they tend to do individual tasks as they figure out the technical business of being an engineer. The Mid-E group indicated that during their early years, they had clearly bounded tasks without mentioning team roles and responsibilities. Most likely, they also spent their early years developing technical expertise.

As engineers mature, they work at a more global level, either integrating groups of technologies or advanced ranges of techniques on a specific technology. Most engineers of both genders, at the midpoint of their career, have a specific expertise that was developed during the early years on these small, clearly defined tasks. At mid-career, their work also includes integration - requiring interaction with others. Tasks are not clearly defined or bounded, and there are often many answers to the same question. The best answer is determined through group interaction and creativity in how the problem is solved.

Although most mid-career engineers work in a team or group setting, it cannot be inferred that they like being a part of the group, much less find that to be the best part of their work experience. The Mid-E group didn't recall the good old days of when they had individual tasks. They clearly found working as a vital member of a group to be the best. The previous discussion of Mary's best experience, and description by Julia and Laura exemplified that best experiences aren't the task itself. The task is the simply the setting or context. The interactions with others, being able to contribute, and having accomplishments recognized were the qualities that are important.

But, I...

When asked about their worst experience, there was one common theme among all of the engineers. This theme of their worst experience was when they were *penalized for something out of their control*. The experience of five of the seven Mid-Es concerned their being different in style, appearance, emotions or gender - all characteristics over which they had no control. The other two talked about not being accepted as part of the group for no reason other than credentials and politics. The Entry-Es talked about being asked to perform work for which they didn't have the background and didn't feel that they had performed to a high standard. In every case, the worst experience had a component of personal attack or deficiency about a circumstance that was out of their control (Table 14). The difference was that the younger engineers' response again tended to be more task oriented and the older engineers' was more people oriented.

Recall that the engineers felt that their best quality was their ability to work hard and persevere. They took pride in sticking with a job until they got it done. Plugging away and keeping after a problem until it is solved is a discipline. They chose to persevere.

Table 14: Women Engineers' Worst Experiences

One was when I had to give a briefing that I just did not feel prepared for at all and it was like I just didn't want to do it... I felt like there was so much I needed to say, and I didn't feel capable. I wasn't contributing anything I felt comfortable with. (Judith, Entry-E)
I think that he took personal attack at me and, later he apologized, but he was saying that he had a bad day. So he was yelling at me and there was just one other person in the room. But, I mean, if it's something that I was responsible for - but this wasn't my job. In a way that's coming back to, he doesn't listen to everything. And then he just kind of goes off. (Faye, Entry-E)
One of them was, when I first got here, there was a procedure that had to be out by a certain date and I did what I could. But, I didn't know enough about the system to really do anything and now looking back at the procedure, and it has my name on it, I feel bad about it because there were things wrong with it that are technically wrong and I feel bad because I didn't take the time to make certain it was right.... I was doing the best I could. *Could you go back and redo it now?* Yes, I'm getting ready to actually. But I feel bad. I feel like I've let them down on what I should have known, but... (Michelle, Entry-E)
I was working with a gentleman and we were coming up with a tool so that we could go inspect something. And I had worked with the engineer who was working on the part and he came up with a... he told me what he needed and I put the drawing in and I had him to look at it. He said it was okay, so we went off and made the tool and then it wasn't really working and I brought it to him and I said, "I don't think this is working. Why don't you take a look at it." And he said, "why did you do this?" And I said, "Well, we agreed to it. We talked about it and then you looked at the drawing." I said, "You agreed to this," and he said, "I don't really listen to you and I don't listen to my wife either." And I went, "WHAT!?" He said, "I don't listen to women," and went on to this big tirade about his wife was spending his money and it was better when he was a bachelor and; I'm like, you know, we've got a job to do and we just wasted time and money on something that didn't work. (Donna, Mid-E)
He just went off and started saying about how if things didn't get out of my group, that he would have to lay people off in the manufacturing area. He said that we should care more about people getting laid off. That really just got to me. Yea, it was like I didn't care. I stay up at nights wondering which one of my group is going to be laid off because I don't have that much work. I got so emotional, I think, in that meeting that I started to cry. *Were you the only female in the meeting?* Yes, I was the only one. And when I started to cry, he made it worse by saying that if he had done that to the other guy, who was another supervisor, you could do worse to him and didn't get that kind of reaction. Afterwards, he did apologize. He called me into a room and apologized. You know, I said, "Just because you don't ask us how we feel about laying people off don't assume that you know, that we don't feel anything"... I didn't want to do that. I didn't want to show my weakness. *So the show of the tears, it wasn't the false accusations, it was the tears?* Well, I wanted to react to what he said. I wanted people to realize that he was wrong. I don't know. I think that when I couldn't express myself then, then I just started getting emotional. (Emily, Mid-E)

Circumstances such as those described as worst experiences all had an element of taking away what they perceived they did best. Judith couldn't work hard enough to get a briefing together. Donna couldn't persevere long enough to not be a female when she ran up against a man who proclaimed that he didn't listen to any women. Emily was scoffed at and told that the guys didn't respond that way because she cried. In their worst experiences, the women engineers couldn't do what they perceived was their best quality, nor did they have the genetics or experience - things out of their control - to perform quality work (Table 14).

Summary

Once again, a general theme that was first mentioned in the demographics and continued in how the engineers saw themselves persisted in the best and worst experiences. The Entry-E group was task-oriented and the Mid-E group was oriented more toward people and relationships. The Entry-Es described their best and worst experiences around tasks. They had best experiences in performing a clearly bounded task, and they found a sense of accomplishment in having an observable and recognized contribution. They spoke of themselves and their individual contribution. The Mid-Es talked about working on a task, but the important quality was how the group functioned in accomplishing the task. They felt a sense of accomplishment in doing their part, not solving a particular problem.

Even though the theme of worst experiences is generally a feeling of powerlessness because of a circumstance perceived to be out of their control, the Entry-Es talked of not having the background or being prepared, circumstances that could be potentially fixed with better preparation and work experience. The Mid-Es talked about not being part of the group and being accepted because of qualities out of their control, i.e., being female and not being like others in their behaviors. They have identified a circumstance that they can't change.

CHAPTER 7

EXPECTATIONS

> My expectations were that I could make a difference. That I could make things better and that I would get to use my skills. *Michelle*

These women came to play. They didn't start working because they wanted to make lots of money, because they needed a job, or because everyone else was doing it. They might not have become engineers because of what engineers do, but when they entered the workplace, they all intended to do well and perform at a high level.

They were asked three questions about their expectations. Early in the interview, they were asked about what they had expected when they entered the workplace. Most of them eventually found an answer, but few could identify specific goals or a planned career path. With the exception of those who became engineers en route to other professions, they didn't talk about wanting to work on airplanes, a love for cars, or a desire to do analysis or design. They talked about expecting to work hard, do exciting things, and do well. To them, *doing well* seemed to suggest that they would follow the normal career progression of engineers who were thought of as successful. They anticipated opportunity. The Entry-Es were living their initial expectations and the Mid-Es saw their initial expectation through hindsight.

The interview closed with the questions, *What are your future expectations* and *What can you do to affect reaching those expectations*. The Entry-E and the Mid-E groups had different responses to this question due to family issues and, in the case of the Mid-Es, an experience-based perspective on the reality of their expectations being met.

I Expected...

When asked about what they expected when they entered the workplace, the Entry-Es and the Mid-Es gave the same answer. They expected to work hard on interesting things, learn, and use their skills. They were task oriented and talked about doing things, even though they didn't have the words to describe what those things were. Words like creativity, analysis, troubleshooting and design, the cornerstones of engineering work, were strikingly absent from all of their expectations. However, none of them described themselves as being talented in these skills. They believed they were best at working diligently. They matched their perceived strengths to their jobs by expecting to work hard - something they knew they could do.

This initial lack of understanding of what engineers actually do was evident in the responses of the Entry-Es. Still young and without a variety of exposure to their profession, they could only talk about expecting to do challenging work, and doing lots of work. When the Mid-Es reflected on what they expected as young engineers, they added descriptions of actual engineering work and the type of things they wanted to work on. However, these descriptions reflected what they actually did in their early in their careers. The descriptions may not have necessarily been what they wanted, but instead, what they did or observed others doing.

This theme of not being engineers because of what engineers actually do was best explained by the Entry-Es' own words. Meredith said, "I expected something that I would really love, continuing to learn a lot... being interested in what I'm doing and having plenty to do." Dana said, "I expected to be challenged every day." Maria had started in a program that set her career path for several years. She knew so little about engineering work that she could only talk about moving along the program path and how she just expected good things to happen as she said, "...coming in, I guess my expectations were to be successful." Faye recognized that she didn't really know much about her profession and wondered if she was in the right field.

> I think I'm a competent person. I have been able to learn a lot. I don't know if I want to really be... I don't know if two years is enough time to actually see what a career in chemical engineering or process engineering is or if it's different in commercial and other than aerospace. But I don't know if I can see myself doing this until I retire. So, it's kept me busy for now, but I'm always searching for something else and I, maybe I went into the wrong major. (Faye, Entry-E)

The Mid-Es added specifics to their recollections of what they expected (Table 15). Just like the Entry-Es, they had expected to be challenged, work hard, and do well as young engineers. They also added comments about wanting to become a manager, doing research, and doing technical work. The Mid-Es were beyond the Entry-Es who only thought in terms of showing up and doing engineering. Julia, a Mid-E, said, "...really design some innovative things that would change structural or civil engineering." Laura, another Mid-E, said, "I was excited and thought I was going to be learning a lot of technical things and be given projects to get experience." Donna expected to be "working on research to make access to space cheaper and easier." However, when they talked about these expectations, they didn't stop with just describing a task. The conversation immediately expanded to why their expectations did or didn't happen. During the interview, the Entry-Es talked about their expectations and then waited for the next question. This question became a launching pad for the Mid-E to reflect on what had happened to her (Table 15). The 10 years later version of initial expectations

Table 15: Mid-Es' Initial Expectations

I thought I would get out of school, get a job doing design, work my way up through there, design some innovative things and do some things that would really change structural or civil engineering. Do something that - oh, wow - something innovative. I'd continue to work in design and I'd move on to managing a group and then after I got enough experience, met enough people, made enough connections, then I'd start my own consulting firm and then from there sort of help to nurture other engineers. And do that for the rest of my career. Be in a consulting management position. I had no idea of the dynamics of the workplace. That other things were controlled by others. So I really, in my naive way, thought that I would have pretty much total control over things that happened to me. Again, naive just not knowing any better, I thought, yes, I'll go in, I'll do this, I'll progress to here, from here I'll go do this. Having parents who worked very hard, I figured "hard work is going to get me there." All I had to do was work hard. I had to work hard in school, I knew I could do the work, it was a matter of demonstrating I was tough enough and determined enough to stay in there and make whatever it was I wanted to happen. I really thought that hard work was going to get me there. *laughter* Stupid me. I really believed that. (Julia, Mid-E)
Well, my expectations were, I was going to come and there was going to be... I think my perception has totally changed. At first, I was very excited. I thought I was going to be learning a lot of technical things and it really didn't turn out that way. It didn't turn out that way. I expected to come into the work force and actually be given projects to learn more about engineering through experience. I guess that changed because I had to learn that the work force is not like that. You just don't come in and there's this pile of work that they give you. *Do you feel like it's that way for everybody, or just you? Or a group?* I think maybe a group. Maybe a group of people. *What puts them in those groups?* Management's perception puts them in that group. The people's perception. *Tell me about what managers perceive to cause them to put people in those groups.* Culture. If you are male or female; your race; and basically sometimes your personal feelings about the individual. Not that you really know that person, but that, oh I really don't like you personally anyway. I don't know if a lot of them really do that, but it's like I don't have any interest in you anyway; they just did not give you that nurturing. The thing about management is you have a lot of older... *long pause* ... men that are in management and these are the ones that have never, I'm talking here, had that interest in going back to school to further their education and so I think that has a lot to do with it too. I think they are comfortable in their position and they don't really want to work themselves. So, they have to kind of keep you at a level that doesn't cause a conflict when there is promotions or whatever. Something that's going to move them out of their position.... I think that they have been here so long that they just kind of lay back in their position and they don't want to be bothered. I think they just don't want to be bothered. If you want to go to school, they tend to agree with that. But when you get back, they don't give you anything challenging to apply it to. Go to school; you come back; nothing is challenging enough to where you can use your knowledge which you have gone to school for. And you come back and they give you the same position basically. (Laura, Mid-E)

of the Mid-Es was colored by what might have been and why it wasn't, and the expectations of the Entry-Es were still to just be a success.

I Expect...

The future expectations of the two groups were different. The Entry-E group had two themes in their future expectations, one professional and one personal (Table 16). In their careers, they expected to continue doing what they did best and were currently doing - working hard and doing good work - so that they could move to the next level of responsibility and challenge. In their personal lives, they all expected to start families in their early 30's. These two expectations of hard work and future family are intertwined. Although all of them expected to advance, some admitted that they might need to stay in technical roles because advancement into management and leadership positions wouldn't leave them enough time for their children. However, all of them believed that they were on their way up, either on a technical or managerial career ladder. They expected good things to be coming their way. They believed that their performance would serve them well (Table 16). They also believed that having a family sacrificed their career potential. It is possible that this is the beginning of a rationalization for a future lack of opportunity.

The Mid-Es who had children mentioned them, and also mentioned that they didn't believe their family roles would allow them the time investment required by management roles. However, when questioned whether children would have prevented her from taking positions, Emily reflected that she would have found a way to juggle both. It is possible that family responsibilities were a rationalization for not being moved into leadership positions.

Mid-Es' future expectations were that they would just keep working and being engineers (Table 17). They seemed to be more specific in what their next possible career step might be, and with the exception of Emily, all intended to remain in the engineering field. They used expressions that indicated their experience as an engineer hadn't been what they planned. Laura said, "I'll never give up on engineering... I like technical things and I think I'll always have that desire as far as technical things go." Similarly, Mary said, "I used to want to be... ." Experience has tempered their expectations.

The Mid-Es answered yes when asked if they could affect their futures, but when asked to describe what they could do, they often became emotional. They would talk about how things out of their control, such as their gender, race, or style would prevent them from really reaching their expectations. The Entry-E group believed that they could be successful and that they would get that opportunity because of their ability to get the job done. The Mid-E

Table 16: Entry-Es' Future Expectations

I expect to, hope to, train people. A lot of different people and learn more about the system and then also do other things to get experience and learn how to do different things, not just use a computer. And, that's pretty short term. That will happen through me expressing desire to do that, partially timing of when a job should become available, meeting the people. *If you expressed an interest, you would get that opportunity when jobs became available?* Yes. *Why would you be chosen instead of other people? Why do you expect that?* That's kind of a hard question because if you're talking about doing design work, there's a lot of design opportunities everywhere for designers, so it's not really. *So there should be plenty of opportunity for that?* Right. *What do you expect long term?* I think I've been here long enough to consider some different options of which career path I would like to take and as far as it being technical or managerial and... I still feel like I need some more experience to really make that decision but I am leaning more towards managerial. I like organizing things, making things happen; completing projects. *Do you think you will have that opportunity?* Maybe so. *How come?* I don't know. (Dana, Entry-E)
I have hopes of taking the team that I'm currently working with to a much better standing within the company. I'm hoping to be successful as a team leader. I'm hoping that through my success with the team I'm currently working with, it will open other opportunities as far as advancement, perhaps positions. It's really hard to predict these days with the way things are changing and the way jobs are being outsourced and what not. I would like to see myself in a role where I have the opportunity to make decisions more so than just within my little team maybe on a wider arena. (Maria, Entry-E)
They've changed a little bit. Before I was really working to climb up the ladder because it's where the job's going and I was going to go and be this program manager. Now I'm pretty content with what I am doing. I'm totally pulling back the reins. I may move into a supervisory position later in my career. I don't know, I think my focus is now kind of shifted more towards home life than what I'm going to be as far as being... I want to start a family and stuff. I'm real content with where I am right now. *Do you feel like if you wanted to move into management, supervision, that you could do that?* Yes. I do. I'm going to have to go for some training in it. Just in handling, I think some of the personal aspects. They do a lot more than budget stuff, so I'm going to have to learn more on that end. But, I think they are all within my reach. I think I could do OK. *What about you would allow that to happen?* I think I am a fast learner. I won't get intimidated by any of it and I will just take it all in stride and feel like I can accomplish it. I have accomplished so much in the past, I feel like it won't be that big of a deal to move in that direction if I wanted to. (Judith, Entry-E)
What kind of expectations do you have for the future? Expectations is a hard one. I have trouble when you asked a similar question before. *What do you think you're going to be?* That's easy. Actually it doesn't have as much to do with my career as my life has to do with my career right now. Somewhere, like three years from now, I want to have a couple kids. And I was talking to a lady this morning about how to work and have kids in a technical field; and it's pretty difficult, it's not like sales where you can make your own appointments. And so, I've given a lot of thought to, I don't want to go into management because I'd just get too busy to have a family. I don't want to quit all together because I'd miss it terribly. It's difficult to work part time as an engineer because you end up working more than full time anyway. So I'm thinking of maybe going into teaching part time at a community college. Right now I'm concentrating a lot more on my career. This is kind of my time for me to get what I want out of life. But in the next five years, that will change more to focus on my personal life rather than my career. (Rachel, Entry-E)

Table 17: Mid-Es' Future Expectations

I really am working now to move back into the technical arena. I really don't know why, but I feel that I need to do that. Having talked to other women who have migrated toward the administrative, I feel as though I was forced into this and it really wasn't what I wanted to do. I don't want it to appear that the reason I was put in administrative was that I couldn't cut it in the technical because I know that's not the case. It just appears from here that it seems to be what happened. I don't know if its fear that a woman couldn't handle it, or the staff. And I don't know what it is. But you look around and you see a lot of the technical females who have moved up and obviously have done a good job or they wouldn't have continued to grow. But when they get so far, then they move them over into something else. And I guess I don't know if that will change or not, but that is still sort of gnawing at me because that's where I was supposed to be. That's where I had planned to be and I still haven't gotten over that. I still have that in mind. (Julia, Mid-E)
Hope. I would hope to be in a position within the next five years where I could have some sense of leadership of a group rather than being, one of the worker bees so that I would have a little more ability to influence how things are done. I've always thought that the advantage of being at a grade level in this company is that people ask your opinions and they allow you to express your opinion. I don't necessarily want to reach a grade level so that I make more money or that I have a bigger cubicle or a nicer desk, you know. But I've been in situations where I feel that my opinion is of value and because of my grade level I'm not even invited to the meeting. So, my aspirations as far as being promoted, are to gain a little better ability to be heard, maybe to influence how things are done. I think that we don't, as a company, focus on the quality of our work as much as we could. We do things as though it's the only time we're gonna do this. I'm fairly methodical in how I organize things and how I approach things and I would like the ability to spread that influence a bit. *What steps are you taking to reach those expectations?* What can I do? Probably what I should do, what I could do is be more visible to people, people at a higher grade level, people who might have some influence over my career future, my department head, my boss on the.... *How would you do this? How would you physically do this?* I guess in terms of people in the program, strike up a conversation. I don't drink coffee. I don't use the men's room which seem to be which seem to be where a lot of the information comes from. *laughter* I don't know... My functional line is pretty loose and I don't know, even now, I don't know who has the bigger voice in terms of people's careers. It changes from year to year. You don't know who is going to make the next decision, whether it's going to be a program person or a functional person. But... *long pause* I don't know if there's a lot, I'm sure there is, a lot that could be done, but I'm not sure it's in line with my personality and what I want. I'm not willing to do things that make me either uncomfortable or things that I don't admire as the way to get ahead. It's just not that important to me to be promoted or lead a group. I mean it would be nice. I think I would enjoy it, but hey, if this is where it is, then that's O.K. too. I guess I'm not that ambitious. (Sharon, Mid-E)

group wasn't so sure that they could affect their futures, although they hoped to move to more responsible positions. When children were discussed, both groups felt that they would have difficulty fulfilling family responsibilities and keeping the long work hours that they observed their management working. However, no one indicated that they would turn down a move because of potential impact on their family.

Summary

This chapter further develops the characters of the Entry-E and Mid-E by examining their initial career expectations and their expectations for the future. Once again, the Mid-Es' responses indicated the benefit of their maturity by not only answering the question, but adding their opinion about whys and hows. The Entry-E group was not specific about anything except that they came to do work, and doing work would help them be successful. The Mid-E group expressed that there were other dynamics at play than doing good work.

The Entry-E group wasn't able to verbalize what they expected to be doing as engineers. This is not unexpected, since none of them went into engineering because of a specific attraction to an engineering role or discipline. The Mid-E group commented on their initial expectations, but they described jobs that they either had or saw others have. They had the benefit of understanding what some engineers do, and used those words in their descriptions. Still, several of them said that they had no expectations when they started other than to work hard and do good work.

In speaking about future expectations, the Entry-E group had both career and personal expectations. They expected to have successful careers, and then expected that opportunities would become available to them because of their performance. They were getting the educational credentials needed for advancement, and felt that they would be moved into jobs of more responsibility as they learned more about the technical and business side of their companies. They felt that they could affect their future. Their personal expectations were that they would be married and start a family in their early thirties.

Their career and personal expectations are on a collision course. The Entry-Es wanted and expected to be promoted to positions of more responsibility, but they also acknowledged that those responsibilities appeared to require more time than they could spend if they had children. They mentioned changing careers while their children were young, but also said that they couldn't imagine giving up a career. They have a dilemma, because their notion of how they will raise their children doesn't fit with their desire for more responsible work roles.

The Mid-E group only spoke about future career expectations. They had already moved through the time period when they considered or did have children. Those with children

also commented that, although they had previously wanted to be in more responsible roles, they weren't sure that they could spend the amount of time required by such a job and also care for their children. However, upon questioning, none of the Mid-Es indicated that they would have turned down a career move because of this concern. Their expectations for the future were much the same as those of the Entry-Es, that they would continue to improve and move to more responsible roles. However, when questioned about how they could affect a move, the Mid-Es admitted that they didn't believe that there was anything they could do.

Several previous themes have ties to this topic of expectations. The engineers' best quality was hard work and perseverance. They believed that they could affect their futures through their best quality. Their hope for reaching their future expectations came from having the qualities they perceived to be required for advancement. However, the perspective of maturity broadened the view of the Mid-E. Being penalized for something out of their control was a theme of what made a worst experience. As the Mid-Es talked of affecting their futures, they recognized that there were factors out of their control. They weren't sure that the promises of performance were the truth.

> Engineering was a wise choice, has been a good choice, and there are some positive things that have come about by being an engineer. I have no regrets about that. And no regrets about the decisions that I've made with respect to engineering. Regrets about the things I couldn't control, but after this talk, I have some things to reconsider. Some of the questions you've asked, now I have to go back and think. (Julia, Mid-E)

CHAPTER 8

THE MANAGERS

> We've purposely tried to push the promotions along for several of them because they were very worthy folks. But, also because I felt that they, the ones that we promoted, were not going to be out there blowing their horn themselves. We had to take account of the individual differences in those people of wanting to be quieter, sort of more team players, rather than individual stars. *John*

Managers of technical groups were interviewed to find out how they viewed women engineers and what they believed women engineers thought about their careers. The interview started with general conversation about the manager and his own career. After talking about themselves, the questions turned to women engineers and how the manager perceived the circumstances around that group.

The themes presented in this chapter are in categories of (a) how the managers responded about themselves, (b) how they perceived the women engineers, and (c) how the managers responded about interacting with the women engineers. How the managers viewed themselves was probed using similar questions as those asked the engineers: *How do you see yourself?*, and *What is your best quality?* Their view of the engineers was explored with the questions: *What are the expectations of women engineers?*, *How are those expectations different than those of their men counterparts?*, and *Do you treat women engineers the same or differently than men engineers?*

This chapter is divided into three main sections: (a) what the managers perceived about themselves, (b) what the managers believed about the women engineers, and (c) the paradoxes between the perceptions of the Lower-M and Upper-M groups. The managers view of themselves is presented through their discussion of mentors and role models, and a discussion of their personal qualities. Their view of the women engineers is presented through their discussion of the women engineers' expectations, abilities, and differences from their men peers. The chapter concludes with a presentation of the paradoxes in perception of the same situations and behaviors.

About the Managers...

Differences in the Managers

The original intent was to simply interview men technical managers over age 50 and at job levels that weren't direct supervision of or in competition with the engineers. These criteria were met, but the responses were different and fell into two categories that aligned with the manager's position in the corporate hierarchy. The lower level managers were in positions that were typically two steps above the working group as department heads. The higher level managers were in positions, such a vice president, that were removed from the working group . Due to the difference in the themes of their responses to every question, the managers could not be considered as a single group. Thus, themes are presented for both groups independently.

Similarly to the Entry-E group being more task oriented and having an individual focus on themselves, and the Mid-E group having tasks as a setting and relationships and people as the focus, the managers responded with a similar pattern. The Lower-M group was task oriented and individually focused on themselves, and the Upper-M group had a more global view of the company mission and a focus on relationships with others. The Upper-Ms talked about accomplishing tasks, but in a framework of interacting with others for success. In contrast, the Lower-Ms talked more about their personal influence on successful accomplishment of a goal.

How I Got Here

The responses about mentors in their careers illustrate the difference in focus between the two manager groups. The Lower-Ms responded that they had been given good assignments, but that they had no formal mentor, or were not conscious of a mentor. They believed that through their performance, they had made their own opportunities. Even though commenting that they were *given* good assignments, they didn't acknowledge that something out of their control had helped them. The Upper-Ms were convinced that although they had done good work, they reached their positions because of other people's influence.

Peter talked about getting good ratings and being assigned to choice jobs. He recognized that someone had mentioned his name, but still believed that his success was a result of his effort. He needed to believe that he had done it himself. Steve referred to current industry practice of having managers *coach* their people. He facetiously talked about how it was more important to coach instead of to do the work. His displeasure with coaching most likely came from his view that getting the work done was what made him successful, and now he is supposed to be coaching people instead of doing work. He didn't admit that he benefited

from a coach or mentor, and exhibited resentment about being in that role for others. He was being asked to spend his time in an activity that wasn't what he believed had made him successful (Table 18).

The Upper-M group talked about mentors in a much different fashion. They freely admitted that they had mentors. They talked about how important their mentors had been to them both personally and professionally. They felt good about these mentoring relationships and didn't need to have made it on their own. The Upper-Ms were sure that these mentoring relationships were responsible for their success. They believed in the significance of those personal relationships (Table 19).

This focus by the Lower-Ms on personal performance and ability, in contrast to the Upper-M's focus on interactions with others follows these two groups on every topic. It is speculation whether this difference in focus is a function of the job role of the group, or whether having a different focus has been a factor in the level of job stature to which these men have

Table 18: Lower-Ms and Mentors

Of course, those people were in direct positions to promote me. By promote, I don't mean through the grades - although that helps, but good performance ratings pointed me to supervision and various management steps. Selecting me for more visible assignments on certain occasions, although I think some of those are more self-generated than they were by somebody looking after me. But there were instances, like the first technical lead role I had, that a supervisor had to think highly enough of me to decide I was the right person to do that job. *Sounds like these people were there and maybe made some opportunities available. What do you consider to be the real driving force behind what has allowed you to be where you are?* You can always debate whether they're making the opportunities, or you're making your own opportunities by what you do that they observe. I'd like to think the latter was the case. (Peter, Lower-M)
I've always felt that, hey, you do the best than you can and then, you know, we can say all we want to about a career. About career development and career plans and that is basically you're given a job to do. If you get it done right, you're gonna be recognized. If you don't get it done right, you'll probably be recognized too. There's a lot to it. *Have you ever had any mentors?* As such, not really. *No one took you under their wing?* For maybe short periods of time, but not for a long term career. They used to have a formal mentoring program set up for new hires and as far as I know, right now there is no formal mentoring. As a supervisor, I am supposed to be coaching, we're all taught that that's our job instead of actually doing work, but we're getting our work done. But we have also got to be improving our people, which is the coaching part of it. (Steve, Lower-M)
There's some things I can do that management has visibility of me and now, what they're planning, you never know. As long as I can make those types of contributions, I feel like I can move forward, and then I'll continue to do what I'm doing. (Harold, Lower-M)

Table 19: Upper-Ms and Mentors

Did you have any mentors or role models? Absolutely. It has been one mentor after another. The jobs that have been the most fun have always had a mentor. In fact, I can go back and say the jobs that have been the least fun may be in part because there was no mentor.... I think that is really my main job right now is to train other people so that they can continue to do the mission that we are here to do. I think that's what some of the mentors that I had, I think that's what they had in mind all along with me and they did give me some good opportunities to do that. Internationally, here at work, and in regulations and engineering programs, spending time with the customer, and on special projects. I was fortunate because they gave me a lot of opportunities. I'd like to get in that mode where I am giving more people more opportunities to gain experience, to show what they can do, to create some options so that we can hire and promote good people in the future. (Tom, Upper-M)
In my professional career, I have been very fortunate in having a number of mentors who were... I guess, just about every person I have directly reported to was a role model in some way or other. Not just modeling it, but also actively teaching me. Not necessarily aware of it themselves, but I would seek them out to get guidance. There are some people that thought they were mentoring me because I was sort of a fast-track person and there were other people that I looked to as a mentor because I just had a tremendous amount of respect for them. I guess I felt that I was getting recognition from them that I didn't deserve. It really imprinted me with those people. It's very much an informal kind of process and something that I have had to go seeking out to find. *long pause* I have really followed many mentors. I kept being drawn to things that I was good at. (John, Upper-M)
How important have your relationships been in your career? I think they have been sort of the pivotal points that have been determined by people who are sort of in that category. I don't think there's any question about that. You are in a group to be considered for a school. Somebody makes that decision. Why do you stand out relative to the other 30 people that are being considered? Some of it is what is on paper and some of it's not. I think it very much depends on the relationships that you have with the people who turn out to be the decision makers. I think that there's a tendency for the really very good senior people to operate with huge depth in their organization.... Those people, I think that if you can somehow make a connection with them, they remember it, they act on it, and they'll do a deep draw to put you into a position of responsibility. (Sam, Upper-M)

risen. Either way, those responsible for the everyday execution of engineering tasks were task oriented and believed that they themselves were responsible for their personal success, and those who directed corporations believed that relationships had been the key to their personal success and were the key to corporate success.

I Am...

The managers were asked how they saw themselves and what qualities had contributed to their success. Their responses again followed the themes of individual or relationship focus being related to position in the management hierarchy.

The Lower-Ms talked about themselves with terms that described their technical ability or other abilities that allowed them to directly contribute to the accomplishment of the task. This task focus was not having personally solved a problem, but more of an *I get the job (task) done* theme of who they are. They talked of how *I* knew who to ask, *I* put together the team, and *I* did these things which made us successful. They believed that their personal involvement on tasks was responsible for success, and those successes have created opportunities for them.

The Lower-M group's best qualities were an extension of who they believed they were and how they differed from their peers. They saw themselves as delivering results and getting the job done. They were different from their peers in that they were not narrow in their technical focus, but knew a little about a lot of things, could identify the problems, and could find the right people to do the specific technical tasks. They were similar in focus to the Entry-Es, but just on larger scale projects. Instead of a single problem to solve, they had a big problem, and their job was technical oversight and resource management. Their job was to use people such as the Entry-Es to solve the pieces of the big problem. They were still problem solvers, just at a higher level (Table 20).

The Upper-M group's response to *who they are* was terms of how they relate to other people. They saw their best quality as how they interacted with others in high level meetings. They never talked about how they could solve problems. They talked in terms of how their people skills allowed other people to solve problems. Similarly to the Lower-Ms, they felt they were different from their peers in that they had a breadth of knowledge, but they used it to ask questions and facilitate thought rather to orchestrate execution of tasks. The nature of their jobs is such that they have little actual connection to any tangible task with a due date or a measurable accomplishment (Table 21). However, even in talking of past accomplishments, the Upper-Ms talked about interacting - not about doing.

About the Women...

Women Engineers' Expectations

The two manager groups had a common theme of what they believed the women engineers expected from their careers. Six of the seven responded to the question of *What kind of expectations do you think women engineers have?*, in the same way. This theme is that women engineers expect to be challenged and have increasing responsibility and opportunity. They believed that women expected the same things as their men counterparts (Table 22).

Table 20: Lower-Ms' Personal Qualities

Harold is probably a low profile individual who happens to sometimes get in the middle of things. I would consider myself as more of a jack-of-all-trades, knowing something about everything, but not being necessarily a real specialist or expert in any one thing. Although, there might be one or two things that people might classify me as an expert in, but more of a generalist. More of, whatever the problem is, throw it at me and I will be able to work it. I try to do a lot of networking so that I know where the experts are. So I know where the assets are to solve any problem that might come up. (Harold, Lower-M)
From a work standpoint, I've always been out there and I can say what drives me is trying to do the best job that we can. Getting noticed for getting jobs done. For me I've always liked the unknown. Give me hard job, don't tell me how to do it, tell me what you want done. You know, where do you want us to be at a certain time? ...I did spend some time in design because some people have told me that I had way too much development background and not enough actual project background - so I can do that, too, and show them I can do that.... Well, I think it's getting the job done with quality results. I think a lot of it was because I was doing quite a few different things. In fact, I could have probably written quite a few Ph.D. dissertations on some of the things that we were doing from the standpoint of we were having to do technical work, good technical work. (Steve, Lower-M)
I don't see myself as being the technical leader of the organization that I manage. I see myself as trying to take some of the administrative burden off of the people that are producing in the organization, and trying to stay on top of the bigger issues and knit things together.... So what I do is to try to piece together all this information and keep a program moving so that individual elements are contributing more than just that individual task. I try to stay up with the technology to try to provide some form of vision for where we're going.... I think organizational skills is one thing that has contributed. I think the willingness to take risk and to feel like I was able to take those risks, which I have through most of my career, and felt like I would not be punished if I failed. The ability to organize a team of people and get something accomplished even though those people don't necessarily report to me. I think are the kinds of thing that get measured. You need to be able to be a team member or a team player regardless of what your role is. I've tried at various points in my career to see opportunities and to start something in action to accomplish whatever it is I set out to do - tried to provide a vision, if you will. And one other thing, sort of shopping list of what makes a successful career really, I think that's what you are after, is the ability to deliver something. There are a lot of people out there that are technically far superior to me, but they get in the role where they're going to study it to death, they can't seize on some deliverable and put it out on the table so you finish the job. You've got to, in a timely manner, come to completion with the task and move on to something else. (Peter, Lower-M)

Table 21: Upper-Ms' Personal Qualities

I see myself as a very sincere person, very honest. I sometimes have been a little too honest. I will say what I think is true. Sometimes it's better not to say anything. I think I'm sincere, honest, I'm very compassionate with people, I think I'm a people person. My voice, in the morning especially, not in the evening like now, but in the morning I have a good speaking voice. I think that helps to articulate things, to give briefings. My ability to organize things is pretty good. I take a lot of diverse things and couple them and work them, rearrange them and classify them and bring out some unique features, understandable features, taking complex things and trying to make them simple. I don't think I communicate, I don't articulate as well as some people, but I think I can take a complex subject and make it simple. And so in the defining sequence of a job, I think that is very helpful. I have been able to... work with people and pretty much get along with all types of people. *How have you been different than your peers?* Probably being in the right place at the right time. I think it helps to be in the right place at the right time. If you're working in an area and a vacancy occurs in that area, you've been doing the work, you might get a promotion. I know some of my peers have tended to stay in one area and become specialists. I tended to hit many areas and be more a generalist. I think that's helped for my final personal career advancement. (Tom. Upper-M)
I'm smart in a sense that I can think on my feet rapidly. I can process information quickly in personal situations and I also happen to be very fortunate in that I don't get tense in talking to groups. Some people just can't stand up before group and so because I am pretty good on my feet and I can talk to a group, and I also have never been shy about saying something stupid. So I would frequently say something in a meeting when nobody else of my status would say anything; or I would give a presentation and I might have more humor and more spontaneity in it than somebody else would and so I would come to people's attention that way. It wasn't something I was plotting to do because I was planning my career; I wasn't planning my career, but it was just I felt that it was more fun to be outspoken and a little bit eccentric and unpredictable and brash. And I got reinforcement for being brash because this is an environment that doesn't penalize you for being that way. At least the time I was in this stage.... I am more frequently the person that asks the dumb question because I don't understand something. And because I can react and interact quickly I can usually participate in the conversation in such a way that it ends up not being totally dumb by the time we finish talking about it.... I have been quicker on my feet and more brash, less predictable and conventional, less censored. I have also, when I was learning to become a manager *begins speaking slowly and struggling with words* I tried to empathize with people and look at things from their point of view and because, and this is a difficult thing to discuss because this can be used manipulatively, which I think is a wrong way, I would consider an inappropriate way to use it, but I really feel that to communicate crisply and accurately - it's so difficult - communication with people. If I can understand where they are coming from and I am thinking back particularly in a work place situation where there would be emotions involved that I can diffuse situations and solve problems and get people working together that somebody else might not have been able to. So I think that that has helped me in my career and just because there have probably been fewer bad things that have blown up than if I had, let's say, asserted my authority more and forced a decision too quickly. (John, Upper-M)

Table 22: Managers' Perception of Engineers' Expectations

Well my experience has been that they both are ambitious, both expect to move through a career and be given the opportunity to achieve whatever they can. I don't think there's any difference in the ambition of the females I've seen versus the males. I think female engineers expect to be treated the same way as the males. (Peter, Lower-M)
I think most of them want a fair chance proving that they can do the job. I think they want to be judged independent of their gender. I think a lot of them have very basic concerns about what they are doing, perceived to be good or bad. I have some of the same problems with some of the younger guys. I'm not saying that just because they are female... I'm pretty sure females think somewhat different than us males. I don't care. I just want them to buy into what they're doing. (Steve, Lower-M)
I don't believe there are any substantial differences in expectations between males and females. I think they expect to be technically challenged; given interesting problems to work on; given help in solving those problems; resources, training; and expertise from the outside when they run into a problem. They sort of expect to have somebody - and I think in the beginning it probably is their immediate supervisor they look to provide that - say here's the solution. They expect to spend some time learning about the people and about the skills they have and the team draw on. They expect to contribute their part. They really expect to hold up their end of the log or maybe a little bit more. (Sam, Upper-M)

They also believed that the women think gender will have some influence on what happens in their careers. For instance, Peter (Lower-M) commented:

> I think their expectations are that they are going to have a harder path to success careerwise than their male counterparts. They expect that they are going to be treated less or have a harder time... (Peter, Lower-M)

Similarly, John (Upper-M), elaborates:

> I think that a woman probably believes that she's making a sacrifice of some sort to follow her desires in going into science or engineering because she knows it's going to be difficult. Because of gender discrimination. (John, Upper-M)

There was also a general discussion of the abilities of women engineers. The Lower-M group specifically commented on the women engineers' performance. While the Upper-M group talked about the general problems of perception of women engineers' abilities. Every Lower-M commented that they believed the women engineers abilities to be somewhat suspect (Table 23). Peter, for instance, commented that "the women tend to be at least average, and most of them better than average engineers." This comment might appear to be positive, except that no mention is made of exceptional, or simply that men and women are all individuals with each having different abilities. Steve also commented on the women engineers having good

Table 23: Lower-Ms' Perception of Women's Ability

Yea, I think the basic perception, it's just a little perception. But I guess that I always question what their real capabilities are. Of course, I do that, I do that for everyone until I can understand and work with people for a while, but probably I might have just a little bit more suspicion and I have to try to learn more about the females. You know, because I don't know, is she really superwoman or is she just starting on some very low plane? (Harold, Lower-M)
Really, most of the women engineers I've known have been fairly good engineers. I can't think of any - I couldn't name one that was a bad engineer, and I could name some males that were under-performers. The women tend to be at least average and most of them better than average engineers. But they're certainly not in the lower quarter. They're good solid performers for the most part... I probably pay a little more attention to what they're doing, not what they're doing, but how well they're doing. I want to be certain that they are considered for every opportunity. Not that everybody shouldn't be, but some people leap out at you and I want to be sure that they aren't overlooked. I really want, to the best of my ability, to evaluate people on their performance on an equal basis and let the best person get what ever opportunities come along. But I'm probably more conscious because of the fact they are women of giving them opportunities to demonstrate what they can do. Probably worry about them a little bit more. Try to be sure they get every opportunity that's out there. I don't have a very large group to worry about, so I'm able to keep tabs by getting involved with their projects, going to their meetings with their customers, listening to what they say, looking over their shoulder and seeing what they're doing to meet those expectations. Asking them to show me what they've done. It's not anything again that's different from anybody else, but some of them have worked on projects I've been personally associated with, so... Put my own evaluation on how good or bad their performance is. (Peter, Lower-M)
I'll have to explain it, but right now there appears not to be many candidates *(for promotion in the manufacturing plants)*. And what I've seen in this company, basically we've gone outside. We have not taken women inside and promoted them. We have gone outside to hire them into these spots. *Why would there not be women moving up through the ranks to be in a position for those spots?* Because I don't think in those particular areas they'd have a woman that could stand raising up through it. *How come?* Have you ever worked in the shop? *Yes.* You know the rednecks and you know that they will give you... because you are a female, you're challenging to them. They will do everything that they can to embarrass you or whatever. I mean would stay in an area that is... "I've got to spend 15 years here before I can ever lead this area?"... We've got a female that's leading a large machine shop right now. We hired her in specially from another company. That area had no women yet. They did not start hiring them 15 years ago, 20 years ago, when they would have needed to grow to those spots. They had to go outside. This is the worst place to have females come into because those guys are basically the basic rednecks. They ride Harley's and it would be very difficult for a female to come up through the ranks there. I think it's easier for females in engineering. Because in engineering are the basic guys, you know. I think now days in engineering that most people will say it doesn't bother what they can do as long as they do it right, it doesn't matter whether they are male or female in engineering. (Steve, Lower-M)

abilities, but doubted they could stand some engineering environments. Harold admitted that the women seemed to have good abilities, but was always suspicious and questioned their real capabilities until he could evaluate them. The Lower-M condescends in admitting that the women might not be so different in ability with comments such as: "They appear to be similarly educated" (Steve, Lower-M), and "Some of their intuitive thinking can be better than a man's sometimes." (Harold, Lower-M). The Lower-Ms have a man engineer's standard of performance that the women are compared too.

The Upper-Ms never qualified the women engineers' abilities. Instead, they stated that the women engineers have the ability, and questioned why they aren't in both managerial and technical leadership roles. Ability was not an issue with them. The Upper-M felt a responsibility to change things, rather than rationalize why the situation existed (Table 24).

The Difference between Women and Men Engineers

The managers were questioned about how the women engineers were different than men engineers and also if they treated the two groups differently. Once again, the Lower-Ms spoke at a more personal level about the women, describing personal traits, and the Upper-Ms spoke of women engineers as a group. The Lower-M tended to believe that they didn't treat them

Table 24: Upper-Ms' Perception of Women's Ability

I guess I would like to do some things differently for female engineers. And I feel the same about minority engineers. Because I think I owe it to some female engineers or minority engineers to help them out a little bit. I'd like to create some opportunities for them. I really don't, in this job here, since I've had this job, I have not had too many opportunities to do some things that are different. Right now I have two female engineers that have asked that they be considered for a job rotation and I've got both of them on a list. If I get a chance to make that happen, that will happen. That will be a little higher in my priority than say maybe a male engineer because I think we owe it to help a minority person or a female engineer get an opportunity. *Why do you feel that way?* Because I don't see too many female engineers moving up in the ranks here at this company. I think we have to work hard to create the opportunities... (Tom, Upper-M)
I personally think about them and worry about them a lot more. There are fewer of them so it's easier to worry about them. You can treat them more as individuals because there aren't so many. But we've purposely tried to push the promotions along for several of them because they were very worthy folks, but also because I felt that they, the ones that we promoted, were not going to be out there blowing their horn themselves. So that we had to take account of what made the individual differences in those people of wanting to be, quieter, sort of more team players, rather than individual stars. My impression is that they have a, that women engineers in general have a more integrated view of how the work place fits into the totality of their life. (John, Upper-M)

differently, and in fact, tried to make sure that women and men were treated the same. The Upper-M didn't speak of traits and explained that they did treat the women engineers differently to try to move that group forward.

The Lower-Ms' comments had a theme of how the women engineers were different. The difference was established by comparison to the men norms of workplace behavior as the standard. The Lower-Ms described how women engineers behaved differently using terms such as *weaker in combat*, *more emotional*, and *overly aggressive* (Table 25). These terms form an interesting contrast in perception. The same group is weaker, more emotional, and yet overly aggressive - all at the same time.

The Upper-M's comments were positive with regard to women. They commented that women performed as well as their men counterparts, even with family roles. They felt that women had a more integrated view of the workplace (Table 24, John, p. 84). The Upper-Ms expressed concern that things weren't changing fast enough. Their remarks about difference were in a context of different treatment of the women engineers and were mentioned in the discussion of abilities (Table 24). John elaborated on how he believed women were different, but had to fit in to survive.

> However, I find that the more successful ones, you would hardly believe it to talk to them. The more successful and visible women in the world of science and engineering, I think that they present the role of work in their life as being very similar to the way that men present the role of work in their life - which is in the work place that work is sort of 100% of the thing and the family is second on the side by the way. I don't know that they particularly feel that way, but they certainly present it that way and I suspect that they have adopted protective coloration in order to succeed in the environment they are in. And the successful ones have adopted the coloration well. My concern about that is that if it's adopted for coloration that it can, the way we act tends to influence the way we think sometimes, and it can change us inside. I would hate to think that we were causing people to act against their inner nature in a way that would hold them back from fulfilling whatever their personal goals are or might have been. If I had been in a different environment, I would have had to suppress my nature. I mean I had to, during the brief periods of time that I had supervisors that I didn't particularly care for. I had to essentially go into a lower visibility mode of behavior. And so I, and that has been so unpleasant for me that I have gotten out of those situations as quickly as I could. And so I can imagine that dilemma probably is faced by women and perhaps minorities more frequently. (John, Upper-M)

Table 25: Lower-Ms' Perception of Differences

I think the males may lean more toward management and I don't know if that's because, you know, you're dealing more with the male engineering types, I'll restrict this to engineering, but the females seem to be more inclined toward the technical. They did a good job of managing their programs but they seem, when it comes to, maybe its the types I was dealing with, dealing with people, meeting the people, with the people problems they seem to restrict themselves in what I say a conflict condition... conflict situations. I would say, females would be more weak in combat. I hate to use the word, maybe, you know, conflicting. *By conflicting, you mean internal to their jobs, disagreements?* Disagreements. You know, you get into situations where conflicts do occur. It's uh, I don't know whether the male is more apt to fight conflict head on, where the female may withdraw. But you can get two males, one can be very - you give me a conflict and I'll blow you over; or, you get another one, he withdraws. But, you see more of the withdrawal with the female. I don't know if it's their nature, some of them it's their nature. I can only go by the ladies under me. You know, you can see tendency of conflict, they kind of blow over real easy. (Charles, Lower-M)
I'll go back to you know how we hire people. We hire them in here because we think they're going to succeed. So the difference, the biggest difference probably that I see is maybe some of the women don't speak up as much as the guys. They're a little less, sometimes they are more emotional then other times they are less emotional. *laughter* (Steve, Lower-M)
That's an interesting question from a standpoint that females probably can be fit into two or three categories. You have those who are very aggressive. Their aggressiveness shows either towards other females and obviously toward their male peers. And its a demonstrated aggressiveness. I think that there's some females that want to get ahead career wise. It's like they have something to prove, so that it's like a competition, more open competition, because most people want to get ahead, but for the most part, people don't, it can't be read that they're really fighting to get ahead. I think in some of the real competitive women it is because they will sometimes put down another woman or they will try to over promote themselves. And I'm not saying that there's a lot of them like that. That's my perception because you can feel that coming out by what they say, how they say it, and that type of thing. Trying to promote themselves as being better. *You talk about the females. You think they fall in a couple of categories. Do you think the males fall in either of those categories or do they have a different structure in the workplace?* See, I hadn't thought of that but I guess I look at the males as falling into categories as kind of accepting their position or where their careers are and saying, "I'm satisfied with it;" and this is probably more for older ones. It's probably not as much as a rule for the younger ones.... There are some young to middle age guys who really are going back for advanced degrees and who are trying to learn and are looking for other job opportunities say within the company to where they can learn and boost their career. Very seldom have I, that's not to say that there hasn't been any, but very seldom is there guys with catty type of hurt remarks. For some reason, and maybe I am being biased, but I can just feel it with the females when it comes out. And it just, whereas I don't feel it that strongly with the guys. You can tell if a guy is trying to be on a fast track or trying to really get himself in that position, but it just seems like it's a little bit different for the most part. (Harold, Lower-M)

Between the Sexes

The Lower-Ms also commented about how women affected the work environment, while the Upper-Ms did not. The Lower-Ms talked about an awareness of harassment potential and how just the mere presence of females affected males (Table 26). Not one of the Upper-Ms mentioned any influence that the inclusion of women engineers had made on other's behavior. There is a theme from the Lower-M group that the presence of women engineers had changed the behavior in the work environment. The overt change was one of improved language usage in the form of *reduced swearing*. Covertly, there was an awareness that females were present and normal, and perhaps natural, behavior was affected.

It is possible to attribute the Lower-M group's difference in awareness of changes in the workplace due to the presence of women engineers to their being closer to the working level. The Upper-M is in a position to have women engineers working under him, but is not in daily contact, and certainly, people are on their best behavior when the vice president is around. The Lower-M usually has an office in the work area, attends meetings with the workers, and is in

Table 26: The Effect of Women Engineers in the Workplace

I haven't seen females working together a whole lot in an engineering sense. Of course, I have seen a lot of males working together and I've seen males with females in the team working. I guess I couldn't, I wouldn't say they are treated any differently than the males on the team. Other than I think a male is always conscious of a female being in the room as a female, not as an engineer. And so, all those cultural things that you have, how you treat females probably, they're probably a little nicer to them. They might not swear as much.... (Peter, Lower-M)
Oh, probably in the back of my mind I'll probably treat them a little different. I'll probably try to be a little bit softer, probably have, then again, I always try to look at the person and what their strengths and weaknesses are, what the job is and then approach it that way. But I probably will try to watch myself, all my Ps and Qs a lot more and... *If you are watching your Ps and Qs, what do you mean by that?* How I address, because sometimes I could say things that could be taken a little bit out of context. Whereas then I want to try to make sure I don't say anything to the females that could be taken the wrong way in this time of everyone being so... I try to think about that a little bit more than sometimes with the guys or just give them a flip or if you just give an answer without thinking - maybe that's a better way to say it. That I'll try to think more before I answer a request or give orders or suggestions or you know, so but as far as the treating and looking, no. I look at an individual, and assess what their capabilities are and then work to that. And because that's the only way because you still got to get the job done, so you got to use all the talents and resources that you have to do that job. So, you see you got to understand everybody's capability and try to get the most out of it. Sometimes there, the gals have some very good capabilities too. I mean, just like the guys do. I mean, there's...*long pause* (Harold, Lower-M)

more of a position to observe and be personally affected by the change in workforce composition. The difference of opinion may be a result of the Lower-M being a part of the dynamic and the Upper-M observing the dynamic from a distance; or, as other themes, may be reflecting a global difference in perception.

The Paradoxes

Several paradoxes appear between the two manager groups. These conflicting descriptions of the same circumstances highlight inconsistencies in perception of the same behaviors of women engineers.

One paradox was in the perception of interaction behaviors of the women engineers. The Lower-M talked of the women engineer's behaviors as more emotional, aggressive, withdrawn, and not handling conflict (Table 25). In contrast, the Upper-M talked about how the women were not as self-serving, more integrated, and more team players than their men counterparts (Table 24).

A specific activity was discussed in opposite terms with regard to the availability of women for travel opportunities. Business travel encompasses attending educational seminars, speaking and attending conferences, evaluating equipment and vendors, and representing the technical interests of their company. It is a key part of any engineer's career development. Those who don't travel are perceived to not be capable of representing the interest of the company or not having the technical savvy to participate in the global engineering community. Travel is an important indicator of career health. Traveling was not mentioned in the guiding questions, but was brought up by the managers. This paradox in the perceived availability to travel was illustrated in comments from Charles and Tom (Table 27). Charles, a Lower-M, perceived that women can't travel because of family obligations, while Tom, an Upper-M, perceived more resistance from men.

Summary

The themes developed in this chapter concern how the managers viewed themselves, how they perceived the women engineers, and how they perceived the differences between women and men engineers. The managers were in two groups; those in low level management positions (Lower-M) and those in high level management positions (Upper-M) in the corporate structure.

There was an overall theme that the Lower-M was task oriented and had an individual focus on the contribution of his personal performance. The Upper-M had an external focus on others and his relationships with other people. Lower-M believed that people make their own opportunities through hard work. The Upper-M believed that his interactions with other people

Table 27: The Paradox of Being Away from Home

This one lady wants to be Division Head. Well, the goal is out there. Now. Her career plan was structured to get her more into a new field. The situation involving her is bring up kids. The opportunities to travel are somewhat reduced, where the male would look at an opportunity to go off-site to get training and they seem to jump at it. In her case, you mention, "Can you structure this training off-site," and she says "OOPS, I've two kids I'm bringing up and I would like to stay in the immediate area," so you know, that's something that the individual has, those pressing conditions. By the same token, a male you could have the case of a pregnant wife or situation involving the need of family life, aging parents. But, you kind of see it more in the female. It's the nature of the beast, I guess, is the best way to put it. Yes, both talented individuals, got good backgrounds, good educational background. You see, some limitations in terms of family life, but it could happen to both, but I think it's a little higher in the females. Especially when you're younger. I always hear, you know, that's when you get that career growth. (Charles, Lower-M)
I see a couple of engineers around here that I'm friends with and I know have families at home. I always said more power to you, and in fact, two of them are top, top notch engineers, and I travel with, one I traveled with one just a few weeks ago and she is handling it all. You know, having a great time at home and doing some super things at work. Our discussion was not on what her family life was but on her technical things at work.... There's flex time usually in most travel situations - there's some flexibility in picking dates and having backups cover for you when you are away. I think that helps to alleviate the potential conflicts that a female engineer might have at home with a career as a mother or someone with a large family versus here. There is some flexibility and I've not seen or heard, if anything my experiences have been with some male engineers and their, I don't know if I would call it difficulty, but their desire to not go on travel because its their turn to take the kids to the ballet lesson or something. I've not seen that in what maybe because female engineers are sensitive to that and make sure they work it out without making it a problem for us - I've not seen this. (Tom, Upper-M)

have allowed him to be successful in both resolving task issues and in moving up the corporate ladder to positions of greater influence.

The Lower-M saw himself as having the skills and abilities to solve complex problems. He didn't do the actual problem solving. His technical background, ability to break the problem up, and get it to more narrowly focused people allowed him to be successful in getting the job done. The Upper-M perceived himself as successful because of how he interacted with other people. He didn't talk of technical abilities, but had been successful because of the ability to communicate in a technical world by asking the right questions and explaining situations. He never mentioned getting anything done or even influencing technical decisions., but simply talked about interacting with others.

The managers, as a group, believed that women and men engineers expect the same things from their careers. They believed that the women engineers expect challenge and

responsibility, but also believed that the women engineers think that their gender will influence what happens to them.

With regard to abilities, the Lower-Ms found the women engineers' ability to be suspect until they could evaluate it. Descriptions of women engineers' abilities and credentials were prefaced with the qualifiers *sometimes*, *almost*, and *similar*. The Upper-Ms never questioned ability, but assumed ability and questioned why women engineers weren't in leadership roles. The Lower-Ms only felt obligated to give the women engineers a fair shake, but the Upper-Ms believed that extra attention must be give to the women engineers' careers in order to make the workplace equal.

The Lower-Ms believed that women engineers behave differently from their men counterparts due to family issues and how they interact with others. All of their comments were negatively framed. When the Upper-Ms were asked about difference, their response was that there is a difference and it is positive.

There are inconsistencies in how the two manager groups saw the women. For instance, in the case of travel, the Lower-Ms believed that the women engineers were not open to take those opportunities, while an Upper-Ms commented that travel was more of an issue with men than women. In describing behavior, the women were described by the Lower-Ms as being both aggressive and withdrawn, while the Upper-Ms described them as less self-serving and more of a team player.

THE INNUENDO

Opportunity, Recognition, Families, Children

These topics were never mentioned by the interviewer - until the interviewee brought them up. And did they bring them up!! 20 out of 22 persons talked about opportunity and recognition, and 22 out of 22 talked about families and children. These issues weren't necessarily what the interview was about, but obviously, they were what the person doing the talking wanted to say.

Chapter 9 discusses Opportunity & Recognition. Chapter 10 discusses Family Roles & Issues. These topics start to fill in the gaps in the puzzle. They are the glue that holds this picture together.

CHAPTER 9

OPPORTUNITY & RECOGNITION

> Sometimes it is not just being the expert, but being recognized as the expert. If you are recognized as the expert in a technical area, opportunities may arise where you become the selected person for an opening or a promotion... Just because of recognition. One technical director made the comment that a promotion is recognition of your ability to serve. It's kind of a vote of your potential to do something else beyond what you have been recognized for. I think there is some truth to that. *Tom*

None of the interview guiding questions mentioned the words opportunity or recognition. In fact, the topics of opportunity and recognition were not remotely suggested by the interviewer. But, in responding to the direct questions, these concepts were described and mentioned by 20 of the 22 interviewees.

Most of the Entry-E group and all of the Mid-E group talked about their opportunities and about being recognized. Their views were opposite with regard to the potential for opportunity. The Entry-Es felt that they were being recognized and that they would have plenty of opportunity. The Mid-Es believed that their strengths were not recognized, and that they had not and would not get opportunity.

All of the managers mentioned opportunity and recognition, but the two manager groups expressed different views. Again, following the model of the Lower-Ms' personal focus versus the Upper-Ms' focus on others, the Lower-M group talked about their personal opportunity and recognition, while the Upper-M group talked about how opportunity and recognition affected careers, particularly those of the women engineers.

Opportunity and recognition are interconnected, because with recognition comes opportunity and with opportunity comes recognition. These themes were mentioned at different places during the interviews, and had no association with any particular question. Opportunity and recognition may have been brought to view because of different cues and topics, but the comments were the same, regardless of where they were initiated in the interview, and they were mentioned frequently.

Engineers' Perception of Opportunity

The women engineers had one common theme and one contrasting theme concerning the concept of opportunity. The common theme was that they had not had opportunity to do hands-on technical work. The contrasting theme was about the potential for opportunity in the future. The Entry-Es' side of this contrasting theme was that they would have opportunity for movement and promotion. However, the Mid-Es' version of this theme was that they had not been given, nor could they get, opportunity. The Mid-Es then expanded on why they didn't get opportunity, and how that affected them. As in their responses to the direct questions, the Entry-Es used few words. The more mature Mid-Es mentioned opportunity and then launched into an opinion of why it was that way.

How Does that Thing Work?

Engineers make things work. That's what being an engineer is all about. This theme has to do with the women engineers being given the opportunity to do the work for which they have trained. They felt that they didn't get the real work - they got the associated work. They questioned whether or not they could *cut it* if given the opportunity to do real work.

Engineers work on just what their discipline name describes. Mechanical engineers work on mechanical devices, chemical engineers work on the processes that create materials, and electrical engineers work on getting power to the devices and processes. In every discipline there are categories of work such as: analysis of performance, analysis of failure, and procurement of new systems. Although each of these types of tasks are important, they are also vaporware - the product is resident on a piece of paper or in a computer or a handbook. The most mysterious work of all is that called *technical* or *hands-on work*. Technical work is the real thing. Design & test and build & start-up are the coveted jobs. Real work for real engineers. The hands-on engineer can actually make a new piece of equipment perform and fix that which is broken. A hands-on engineer gets the name from being able to use their hands and touch their work. Perhaps because the output is physical, it seems more important.

Recall that any of the Entry-E group who had worked with hardware mentioned it as her best experience (Table 12, p. 61). Although the women engineers were never questioned about doing technical or hands-on work, most of them brought it up during their conversation. It was a topic of concern. They wished they had that background and could get that type of opportunity. The Entry-Es were quick to explain that, since they weren't really as smart technically as their male peers (Table 10, p. 54), they probably wouldn't ever do that type of work. Several expressed wishfulness that they had been exposed to mechanical things as a child so they would have been better postured to do hands-on work. For instance, Judith

believed that helping their dads had given the guys an advantage. Rachel validated that working on things as a youngster seemed to matter because she brought up her experience helping her dad work on cars.

> I got to be the go-fer a lot helping the guys when they were working on cars and stuff, but I wish I would have joined SAE when I was in college and did more hands-on type of stuff. I think they pull a lot of experience from helping dad in the garage or something, growing up and learning more common sense things, rather than just the book smarts. (Judith, Entry-E)

> He's an electrical engineer, also. ...It was a very chauvinistic household - he started to accept me as "I like doing things that I like" instead of forcing me into a traditional role. And so we would start working on cars together, and start enjoying things that I like doing together. And we became much closer after that. (Rachel, Entry-E)

Not only is hands-on work important, it is important for engineers to do a variety of types of engineering tasks to become well-rounded. Having a diverse background is crucial for advancement. The importance of working in several engineering skill categories was expressed by Steve when he talked about making a temporary career move to another category of engineering work - just to prove that he could do it and posture himself for future opportunities. He never doubted that he could do the different type of work - in fact, he took the job to prove his ability.

Julia had been moved from a technical job working with hardware to an administrative position. She expressed that even though her move was upward in the hierarchy, she believed that others interpreted this promotion as she could not cut it is as an engineer. She felt that she had been moved out of a technical path.

Julia and Steve presented an interesting contrast in opportunity and career advancement. Steve's move was a positive experience to better equip himself. Julia's move was negative in removing her from her engineering roots (Table 28).

The women engineers pursued advanced degrees to better posture themselves for advancement and worked hard at their jobs. But they questioned their ability to do technical work, and doubted that they would get the opportunity because of their background. Somehow, they just knew that their male peers had a quality that they didn't - and it couldn't be learned in a classroom (Table 28).

Future Opportunity

The women engineers talked about potential future opportunities. The two groups had a different perception of this theme. The Entry-E group felt that they would have the opportunity to move to different jobs if they felt dissatisfied. They also believed that based on their performance, they would have the opportunity to move into management and leadership

roles. However, they talked about moving to different tasks, not of getting choice assignments. They didn't have a concept of the opportunity as moving to more challenging work, most likely because at their experience level, almost every engineering job is a challenge to them. They saw opportunity as doing something different, not being given increasing responsibility or challenge.

Table 28: Opportunity and Technical Work

Yes. I still think I could have *(done technical work)*. I do. Only, honestly, if it wasn't for that time I spent *(doing prototypes)* in my summer job, I don't know. Because I've really not had enough opportunity to do anything to technical. But I mean, I made it through school, I made it through my EIT, I made it through my Masters. Nobody did that but me. That was technical work. I think I've said this before, I think I'm a much more down to earth person than some people. *Smarts wise, how do you compare to your peers? Bookwise?* I'd say I'm somewhere in the middle. I know there's guys over there who blow me away with their smarts. But, bookwise a lot of them got the hands on experience wise too. That's something I don't have, but I wish I had. I learned a lot from them. (Judith, Entry-E)
long pause I think I should have had a stronger experience; a more in-depth experience from an engineering... Technically. Again, there are more managers more so than the actual technical experts and I've felt that I lack the technical expertise. I think that's what I'm really wanting to do. *Do you lack expertise or the opportunity to do technical work?* The opportunity. I need the opportunity to get the experience. (Laura, Mid-E)
I still don't have as thorough an understanding of the hardware side of things as some people, based on the fact that most of my career I've worked in research and development toward the advanced programs. Fairly little to no experience in actual detail and design. (Sharon, Mid-E)
I think a lot of the people around me doing the same type of work are a lot more knowledgeable. They have worked on their cars, and they have a certain kind of mechanical knowledge that I don't. I think sometimes that hurts me not to be more that way. (Joy, Mid-E)
Having talked to other women who have migrated toward the administrative from the technical, I feel as though I was forced into this. It really wasn't what I wanted to do. I don't want it to appear that the reason was that I couldn't cut it, because I know that's not the case. It just appears from here that it seems to be what happened. I don't know if it's fear that a woman couldn't handle it, or the staff. I don't know what it is. But you look around and you see a lot of the technical females who have moved up and obviously have done a good job or they wouldn't have continued to grow. But when they get so far up the technical side, then they move them over into something else. (Julia, Mid-E)
For me I've always liked the unknown. Give me hard job, don't tell me how to do it, tell me what you want done. You know, where do you want us to be at a certain time? That's always the challenge. From that standpoint that's why basically why I've stayed in developing areas. That type work. I did spend some time on in design because some people have told me that I had way too much development background and not enough actual project background. So, I can do that, too, and show them I can do that. (Steve, Lower-M)

The Entry-E group believed that the future held opportunity for them. They believed that they could control getting opportunity by just asking for different assignments and doing good work. They believed that they were in control of what would happen for them (Table 29).

The Mid-Es' hindsight gave them a theme that in the past, they had not gotten opportunities. The opportunity that they had not gotten was being given important, challenging jobs - not the common perception that they felt overlooked because of not being moved into management roles. The women didn't talk about bumping against a glass ceiling, and, in fact, didn't talk about an inability to move into the higher management ranks. They simply talked about not getting the opportunity for more responsible, challenging work. They weren't selected for jobs that they felt they should have had.

They didn't just talk about not getting opportunity, they talked about why it had happened. Their perception of the *whys* wasn't about something they could correct. They were talking about a circumstance that has the same elements of their theme of a worst experience. Their lack of opportunity was because of something out of their control. The overall theme of

Table 29: Entry-Es and Opportunity

I like this company because they have a lot going on. If you get bored doing something, you can always move into another area and get to do something else. There's just lots of different things going on. The area I'm in, there's so many people working on different things that if you feel pretty good about it and show interest in something - if the timing is right they will put you in more positions where you can get more experience in different areas; you're not pigeon holed into one area.... I expect to hope to train people a lot of different people and learn more about the system and then also do other things to get experience and learn how to do different things, not just use a computer. *What do you think will make that happen?* Partially me expressing desire to do that, partially timing of when a job should become available, meeting the people. *If you expressed an interest, you would get that opportunity when jobs became available?* Yes. I think I've been here long enough to consider some different options of which career path I would like to take. As far as it being technical or managerial and... *What are you doing to posture yourself for those kind of opportunities?* Working on my MBA, and right now I'm just gaining face with experience. Do you think you would be considered *(for management)*? Yes. *Do you feel like that opportunity is available to you?* I think it could be. (Dana, Entry-E)
Do you feel like if you wanted to move into management, supervision, that you could? Yes. I do. *What can you do to make that happen?* I'm going to have to go for some training in it. Just in handling, I think some of the personal aspects. They do a lot more than budget stuff so I'm going to have to learn more on that end. But, I think they are all within my reach. I think I could do OK. I think I am a fast learner. I won't get intimidated by any of it and I will just take it all in stride and feel like I can accomplish it. I have accomplished so much in the past, I feel like it won't be that big of a deal to move in that direction if I wanted too. (Judith, Entry-E)

why they believed they were not getting opportunity was that they weren't like everybody else. They talked about problems of having a different style to the males, and not having personal interaction, both socially and "in the men's room." They also talked about how not getting opportunity made them perceive themselves. They were being penalized for something out of their control - the fundamental theme of a worst experience.

The following three excerpts from the interviews with Mid-Es Julia, Sharon, and Laura are lengthy. They illustrate not only the Mid-Es' perceptions of opportunity, but also the intensity behind this topic. These women elaborate on why they didn't get opportunity, and why they won't get it in the future. These women aren't the same as their male counterparts, and they can't do a thing about it.

> ...my supervisor and I were talking about performance. I had gotten a good performance appraisal and he mentioned that I had asked why they had selected another person for the job. His comment was because he didn't know very much about me personally, because I didn't talk about my family and what I did on the weekends. The guy they chose would come in and talk about what his children had done over the weekend, or what he and his wife had done on the weekend, that kind of thing. And so, he knew him and he said, "I can relate to him and I know him well personally, because I know things about him." He said, "I've never had an employee like you and I just don't know how to relate." He said that I was a good employee and we got along well, but personally and not knowing a lot of personal things, he couldn't relate. I had to remind him that the reason I don't come in on Monday morning and talk about the same thing is because I didn't have children to talk about. I didn't have a spouse to talk about. And so, no, he didn't hear those things. Others could do that and I couldn't. I shouldn't be penalized because I can't chew the fat about my personal life because I didn't have the same things they had. I mean, who wanted to hear that I went home to my parents on the weekend. *laughter* ...But when he said, "I never had an employee like you," and I asked what he meant, he said he had never had a female engineer working for him. It was just different for him. And he admitted that he knew he had to do some adjusting and learning. But it was just difficult for him because he didn't know what to talk about with me. That was disturbing and was probably the reason why I decided to do some different things as far as my career. Because I could sense that I was going to be struggling. But I realized again I was totally opposite of him and that's why he couldn't relate to me. And I was just naive in thinking that it would not matter when you had a professional background, you had the degree, you had the qualifications, you had the experience; that it wouldn't matter that he couldn't relate to you on a personal basis simply because you were different. Unfortunately, that's what he said. (Julia, Mid-E)

> Based on the only feedback I really have, performance appraisals, when somebody has to sign on the dotted line, I'm seen as technically good. I don't think I'm seen as having much leadership ability and I'm sort of, you know, judging from the assignments that I've had, and there might be a little touch of paranoia almost creeping in... I don't feel like I've really gotten a chance to sit down and dig into something and really work hard at it and establish a reputation. And they're like, oh yeah, we can put her over here, she can do that, but I'm not really perceived as a what we call the high-potential employee. For a long time I didn't

realize that actually was an official program and designation. I thought that was just a phrase that people used. I'm somewhat naive for not knowing... I think that I am sort of catching hold in the middle of the road technically above average, but... It's somewhat insulting on some levels because I think it's more a difference in styles than it is in capability. I think that I can lead the direction of activities and lead people to do things, but I'm not, I don't have the same style as most of the other people. Most of the people who have risen above the curve have a different style and I don't know that that necessarily correlates with ability. So from that standpoint I have this theory that we used to grade people on numbers like 1-6 and 1-5 and then 1-whatever. Like if you're working for a four, how can a four recognize a five if he's working for him, because inherent in the nature of being a four is the inability to recognize someone else that's better than you are or has a different style than you that may be more effective. My theory also goes that when you get one guy that makes a decision as to who to promote and who to surround himself with and who to mentor or champion through the system. He's gonna pick somebody who's a lot like he is and I'm not a lot like anyone. *laughter* I think that makes it very difficult and I don't know, I don't think it's an intentional "Oh well, she's a woman" or "Oh, well she's quiet," or whatever. I think it's just human nature that you surround yourself with people who share your same attributes and your same personality... When we talk about valuing diversity, we're just a bunch of words on paper. I think there's value in, not so much diversity, but stop focusing on the style that someone has and start focusing on the results they're able to achieve. I think we focus more on their style than their capabilities or their results. So , moving all the way back full circle, a sort of big circle, how does that make me feel? I think they're probably missing the boat in some cases where some capable people that aren't being given the opportunities that maybe other less capable people are given simply because they don't meet the profile or have the style that's recognized. (Sharon, Mid-E)

I still think I would not be taken seriously versus a male who probably wants to do the same thing I wanted to do. They would be taken more seriously. They say, we know this is what he can do, and he's going to do it. *What can you do to change that?* I don't think... what you will have to do is put more females in those positions that could create an atmosphere from the point of view that they understand what you're going through. I think that's what it is. There are no female engineering managers here in positions to do that. There aren't many places. I think you have to start there. You have to start where you have someone that understands basically what you are going through. Or understands you from a female point of view.... I think I should have had a stronger experience; a more in-depth experience from an engineering... *Technically?* Technically - right. Again there are more managers more so than the actual technical experts and I think I've kind of felt that I lack the technical expertise. I think that's what I'm really wanting to do. *Do you lack expertise or the opportunity to do technical work?* The opportunity. I need the opportunity to get the experience. (Laura, Mid-E)

What the perception of opportunity does to the individual is developed further by the contrasting statements made by the managers and women engineers. For instance, Mary believed that she was just average, but also said in comparing herself to others, "...my opportunities, I guess, were maybe just average." This comment takes on additional

significance when contrasted with Peter's remarks. The opportunities given to a person seem to affect their personal perception of their ability to perform.

> I guess one of the things that boosted my career was my opportunity of technical lead at a real young age. It's more subtle when they give you a responsibility that they didn't have to give you because it shows that they have confidence in you. (Peter, Lower-M)

Emily, a Mid-E, not only talked about her personal opportunity, but also of opportunity for others. The theme of getting opportunity as something out of personal control emerged in her conversation of giving one of her employees opportunity where she looked beyond the general office perception of this person's ability. She did the very thing that the other Mid-Es wished someone would do for them. Emily talked of mentoring a man who worked for her. This person had not been given the same opportunity in work assignments as his peers. She talked of having to make him believe that he counted after years of not having the same opportunities to do equal work as those in his peer group.

> I just happen to be doing a lot more with this one person because of the age he's at and the years he's been with the company, I feel like he hasn't been done justice. He just wasn't given the opportunity to prove himself or to learn more. That's why I'm spending a lot more time with him. The other guys are a lot more advanced, so I just try to sway their career path to where they want to be. *What makes working with him be a best experience?* It's just like teaching somebody. Because he wants to learn and he's looking at me for that and feel like I am helping him quite a bit. He's just a lot different now. He's the one that says he's a lot different now. *Does he seem happier?* Yes. He seems a lot happier. What's so funny, is now he even brings food for people at work. Before he used to be very aloof. Not really aloof, it's like he was below everybody else. I have to keep telling him, no, you are like everybody else. You count as much as everybody else in this department. Just as much as we need that person, we need you. (Emily, Mid-E)

Engineers' Perception of Recognition

The women engineers had a general theme of how being recognized and getting attention made them feel satisfied. Recognition to them was the notice by other people that they had made a contribution. Recognition by management seemed to be especially important. The Entry-E group felt that their contributions were recognized and that they were heard when they spoke. The Mid-E group felt that they were not recognized for their contributions, and that there was little they could do to change things.

The Entry-Es only talked about recognition in the sense that they had been pleased after getting recognition, and felt that they had been recognized for doing good work. Rachel mentioned this theme in her best experience, where she was recognized for having a successful project, and Faye and Maria talked about measurable recognition - performance appraisals and promotions to higher grades (Table 30).

Table 30: Women Engineers and Recognition

I was in charge of it: it was the first time I was really given the responsibility and I didn't fall on my face - it worked! I was the leader. I was the one that got the recognition for it coming together. That was a lot of fun. (Rachel, Entry-E)
The most satisfied was I guess recently, when I had my job appraisal. It was pretty fair. With all the effort I got the highest and I was happy about that. Because then it showed, it showed management actually appreciated everything I was doing. (Faye, Entry-E)
What was satisfying about it? Probably the way they listen. Ideas are always welcome. Anything is received well by the team. *What level of people are you usually talking too?* Man, everybody's above me! They're usually still technical, managers, department heads. (Meredith, Entry-E)
I was very pleased. I fell into that crew of employees that have been promoted to this code before they were 30. It was nice and later they had announced it in the bulletins that were sent out and my name was on there. It started some attention and I mean so it was nice. Everybody loves extra attention. It was nice to get that extra attention. (Maria, Entry-E)
I still have to have that ownership of where I am and what my career is. I have to take that ownership even though there are some things that I think have happened that have hampered those things, but a lot of them are things that are so ingrained in our society and they way we view things, that it's going to take a little longer for them to change in engineering because it's been a male-dominated field for so long and we are just looked at a little differently. We almost have to walk on water or really be 10 times better than some of our male counterparts to get some of the same recognition. And I think that's changing but it's just not changing as fast as I would like for it to change and hopefully I'll see my younger sister coming along actually not having those hurdles to have to get over. (Julia, Mid-E)
When my contribution isn't being appreciated. For a long time, when I was working in manufacturing, no one gave a damn about research. My management saw no value for it; no benefit to it. And I knew that I was progressing doing interesting things and things that have never been done before and things that needed to be done. And I was making a difference in the technology. But, they didn't care and that was a communication issue as well. I would get reviews where I wouldn't get a raise. You don't get a raise. You're not supporting production. (Donna, Mid-E)

The Mid-Es talked about how recognition was a satisfying thing, but that they didn't get much of it. They also talked about how they had been the most dissatisfied when they didn't get recognition for having contributed. Julia said, "We almost have to walk on water or really be 10 times better... to get some of the same recognition." Laura's worst experience was in a job where she just filled a position and wasn't recognized, and Donna reflected that she had been the most dissatisfied when her contributions weren't being recognized (Table 30).

Both groups valued recognition. However, the Entry-E group felt that they were being recognized, and the Mid-E group felt that they weren't being recognized.

Managers' Perception of Opportunity

The two manager groups spoke of opportunity differently, depending on whether they were a Lower-M or an Upper-M. The Lower-Ms spoke of their personal opportunities and the Upper-Ms spoke of opportunity and its connection to women engineers. This difference in focus is characteristic of the two groups on most themes.

The Lower-Ms' version of opportunity is somewhat paradoxical. They each mentioned being selected for assignments and how those special selections had advanced their careers. Yet, they were insistent that "you make your own opportunities." The Lower-Ms believed that their performance had accounted for their getting opportunities, while speaking in the same breath, of how mentors and management gave them special assignments (Table 18, p. 77). An example of this perception was Steve's comments about making his own opportunities:

> Well I think a lot of times your opportunities are, you know, you don't just get your opportunities because someone hands them to you. You've got to go out and get your own opportunities. (Steve, Lower-M)

The contrast between how the Upper-M and Lower-M groups perceived women engineers and opportunity is illustrated in remarks made by Steve and Tom (Table 31). Steve rationalized the lack of women in higher level roles, commenting that the reason there weren't many women in key positions was because there weren't many candidates to begin with, while Tom had no patience with excuses and believed that just because it is so didn't make it right.

John and Sam speculated on how opportunity affected women engineers, both in the educational system and in the workplace. They demonstrated their concern for others by reflecting on the impact of subtleties such as opportunity, and on what opportunity actually is. John believed that unfairness started with women not getting a real opportunity to pursue

Table 31: Manager's Perception of Promotion Opportunity

On the guy population, for any number of guys, there's going to be a certain number of managers. And then there's got to be others that are not managers. Right? So, if you look at the female population, gee, there aren't many managers at all. So that could be an answer to why we are stuck down here. ... I'd guess the engineering population mix is 80/20 *(percentage males to females)* (Steve, Lower-M)
I do not see many of them getting promotions. There are promotional opportunities at this location, people getting promoted to higher job classifications. I don't see female engineers getting promoted. I have talked about this on the side to other folks - why, why not? Why aren't they either getting promoted or picked up into management jobs, starting off on their career paths? ...There are strong-willed women out there that deserve a chance and just because there are none in places of supervision means that it's right. I truly believe that. (Tom, Upper-M)

technical careers, and Sam talked of how individual perception and movement opportunity affected the women engineers' careers (Table 32). The Upper-Ms admitted that the problem wasn't necessarily performance based, while the Lower-Ms could only discuss their ability to control their own destinies. The Lower-Ms projected their belief that a person controls their own career. Thus, if the women weren't successful, it was nobody's fault but their own.

Table 32: Upper-Ms' Perception of Women Engineer's Opportunity

I've managed enough women to have an opinion about them, but not as many as there might be because engineering and science are fascinating professions. (long pause) I can't avoid the feeling that we are steering away, from all the stuff that I've read about how the girls get stereotypes early and it effects their performance on mathematics and science and so forth. So, I can't help but believe that we have been steering too many women away from science and engineering. I would like them all to have the freedom to try it and then if it turns out that women don't go into science and engineering with exactly the same percentage of other professions then it's okay with me. But, my concern is that they haven't had a fair chance to decide for themselves whether they want to. (John, Upper-M)
We're talking about.....to get to be; what you would like to have is an appropriate mix. There may be some differences that reflect the differences in job opportunities. Some guys will move before they are married through a couple or three jobs; whereas with a woman, I don't know, you have to go look at the statistics, this is a hypothesis; if you look at below age 30, how many jobs have they held? Single engineers below age 30, how many jobs have they held? How many companies have they been with? It may not be companies, it may be how many different plant locations have they worked at; how many different people have they had the opportunity to..... *How broad is their experience?* Right; inside - outside the company. And then look at later success measures. There might be a correlation there. In mid-career is where you need a good broad network to be able to be effective, because you are in a middle management role, your power to the organization comes from being able to establish connections. If you don't have the connections to call on, then you're not going to be able to do that as well. So knowing who can do what, being on good enough terms with them to be able to make the call or being able to call somebody who knows about somebody who can do x, y, or z is a big strike. The degree at which somebody gets challenges in many cases is determined by their selection to work on a particular project. Sort of having the criteria to be selected, depends on a lot of things. Many of which are perceptual. How has this person contributed to the team, how deep are they, are they shallow, are they good supervisors; do they work on a team well, do they know anything about tools; what are they bringing from the outside; can they drive this; can they lead this team? I think that without exception in my experience, female engineers desire not to have those factors such as family issues be considered in their job assignment, in their travel opportunities, in the way they are treated, the shifts they operate on, where they are located. They really feel slammed if in any way you appear to or in fact allow those considerations without the individual to be part of the decision making process. (Sam, Upper-M)

Managers' Perception of Recognition

The trend of the manager's personal/other focus continued on the topic of recognition. The Lower-Ms talked of their personal careers, and the Upper-Ms talked about effects on careers in general. The Lower-M group spoke of how good performance appraisals and increased responsibility have shown them that their efforts were being recognized. The Upper-M group talked about how recognition affected others (Table 33).

A Recognized Expert

There was an emerging theme in this topic of recognition. *Recognition* is not just being noticed. It also has to do with being considered an expert and the recognition that goes with that perception. Being a recognized expert brings a level of respect for ability. The women engineers, and both Lower-Ms and Upper-Ms talked about being an expert and the effect of expert status (Table 34).

Harold, a Lower-M, talked about how there were no women engineer experts, but rationalized that it was because women had not been in the profession long enough to become experts. Peter reflected that women who have trained as engineers did not get recognition for being engineers, but are often promoted into jobs created especially for them outside of the strict engineering disciplines. He said, "women trained as engineers should be leading engineering work." Charles suggested that women fared better in fields such as nursing because they have more opportunity to become specialists. Tom summed up the meaning of this theme when he talked about the recognition that comes with being an expert (Table 34).

The women talked of being a recognized expert in Mary's description of the respect that a Ph.D. degree would bring her. The theme of satisfaction from being a recognized expert was also reflected by Joy when she talked about who she wanted to be in the future (Table 34).

Table 33: Managers and Recognition

I'm a person that recognition is important to, and so to me a measure of success is when I get acknowledged for something, whether it's an award, or whether it's a promotion, or whatever. Some sort of public proclamation that you are doing a good job. (Peter, Lower-M)
...you're given a job to do. If you get it done right, you're going to be recognized. (Steve, Lower-M)
...a promotion is recognition of your ability to serve. It's kind of a vote of your potential to do something else beyond what you have been recognized for. (Tom, Upper-M)
This group (age 30-40 female engineers) has had to work without support recognition and sensitivity in the workplace... They had less opportunity to develop broad spanning relationships with lots of other people who were going to be their peers. (Sam, Upper-M)

Table 34: On Being an Expert

Ten years from now I would like to be able to come in my office and you know I'd have my customer, and he'd be wanting something and I would know our engineering tools, that's kind of like one of my goals. I would be a knowledgeable engineer and he would come in my office and he would have a job and I would be able to outline it, draw it up; I probably be able to do all the analysis on it. I would be able to do most of the work myself and that's pretty much my hope. (Joy, Mid-E)
Do you think people would perceive you differently if you were Dr. Mary? Yes, I think they might. They would have too. Just because of the fact that I had achieved this. They don't really know about your Master's degree. But, Mary, Ph.D. - yea, they might have to respect you more. (Mary, Mid-E)
But I do believe that it's all boiling down to capability. How do the women then get enough and keep learning the capability and get enough of the opportunities to be effective? I think this is going to show up the next 10 or 15 years, they'll become the gray beards if they elect to stay. And if anything, I think that that single point is probably the hardest. Of course, we don't know who's going to stay, whether it's male or female. Because there's always other jobs or opportunities. To stay in the profession the difference really comes between men and women; you know women can have babies. If they have babies, some will return to the work force then there's new added pressures on them that maybe interfere a little bit with their learning capability of their profession and the amount of time they can put to their profession... (Harold, Lower-M)
I think nurses become more satisfied... there's a lot more specialties, enough increments, especially if it's a big hospital. You can specialize in various children's illnesses, cancer situations, trauma... there's also lots of hospitals, maybe the job opportunities are more... (Charles, Lower-M)
I think partially tied to that though, there don't seem to be too many female engineer experts. Female engineers don't come to mind as being the expert in a particular field in almost any area. So I don't know why that is. Sometimes it is not just being the expert but being able to be recognized as the expert. If you are recognized as the expert in a technical area, opportunities may arise where you become the selected person for an opening for a promotion... *Just because of recognition?* Because of recognition. And I don't think our female engineers are getting that recognition. (Tom, Upper-M)

Summary

Opportunity and recognition are interconnected because there is a perceived close association between getting opportunities and being recognized. Although neither opportunity nor recognition were directly raised in the interview guiding questions, both terms were used and described by a majority of participants as they talked about their own careers and the careers of others.

The women engineers had one common theme and a single contrasting theme around opportunity. The common theme was that they did not have opportunity to do hands-on, technical work. The contrasting theme was around potential opportunity. The Entry-E group

believed that they would be given opportunity for movement and promotion. However, the Mid-E group's theme was that they could not get opportunity. In describing opportunity, the Mid-Es expressed the opinion that they had not developed the social interactions necessary to help them get opportunities. They were unlike the dominant men engineer group. Their words painted a picture of how not being given opportunities that they deserved had negatively affected their self perception. Their opportunities represented their ability.

To the women engineers, recognition meant having others realize that you are making a contribution - notice for making a difference. With regard to recognition, the entry level engineers felt that they were being recognized for the good work that they were doing. But, the mid-career engineers had a different story. They felt that they were not being recognized for the good work they were doing, and their descriptions of when they had been the most dissatisfied were often of a circumstance when they had not been recognized.

The men managers once again exhibited a difference in focus on the themes of recognition and opportunity. The lower level managers talked more about their personal opportunities and how they achieved recognition, while the upper level managers talked about how opportunity and recognition affected careers. A paradox emerged in the Lower-Ms' comments. They reflected on how management had given them opportunities to demonstrate their abilities, but at other points in the interview, the Lower-Ms were emphatic that *you make your own opportunities*.

The Upper-Ms commented that women were not given the opportunity to choose technical careers. Those who did become engineers and scientists were subject to other factors based on perception and bias that influenced selection for jobs and special assignments.

A theme emerged concerning the status of being recognized as an expert. It was agreed that being a technical expert is a valued form of recognition. The women engineers talked of the respect of being an expert. However, the Lower-M group found rationale for why the women engineers weren't becoming experts. The Upper-M group had little tolerance for a dearth of women technical experts.

CHAPTER 10

FAMILY ROLES & ISSUES

> I just don't know their mental make-up when it comes to family and with engineering. Because their part of family is so much different than the men's portion and I don't know how much it affects them. I know that it appears that women are becoming more career minded in general. And those that really are career minded, I don't know if they really want the children or they have a different perception of marriage and that type of thing. Maybe we'll have a couple of different classes of women in the future. Those that are family oriented and those that are really career oriented and are less family. *Harold*

None of the interview guiding questions mentioned the words family or children. In fact, the topics of family and children were not remotely suggested by the interviewer. But, in responding to the direct questions, these concepts were described and mentioned by every one of the 22 interviewees. All of the participants referred to family, children, and the potential conflict between the traditional role of the mother and a career as an engineer. As with the other themes, the groups had different perspectives. However, not a single person denied that family roles were a potential show-stopper in the women engineers' careers.

The women engineers who were planning for children spoke of cutting back on their career focus; those with children talked of delaying any career moves because of potential time demands of a new position; the men lower level managers talked of how women engineers were out of work with children and how women tended to focus on the family instead of work; and the men upper level managers talked of how women meet the job demands even with the extra role as a mother. This topic of conflict between the roles of professional and mother, although not suggested by the interview guiding questions, occurred more frequently than any other theme. Of greatest interest is the different ways the theme presented itself.

Plans for a Family

All of the entry level women engineers expressed a desire for marriage and a family. Those who were already married were planning to start their families in their early thirties. They also talked of curtailing their careers once their children arrived. Three of the five

married Entry-Es mentioned that they might go into teaching to have more time for their families, and the fourth talked of how women are perceived differently once they have children.

> What bothers me is it might be perceived as she is always leaving work, she doesn't care; when that won't be the case at all. I mean, I just see how new mothers aren't looked down on for leaving to go on a field trip or whatever, but it is mentioned, that's what they're doing today. So, whether people admit it or not, it's never the same, they're moving down a peg in their minds. (Lucy, Entry-E)

The Entry-Es believed that not only would having children affect how they were perceived, just the threat of starting a family could cause them to be treated differently. Judith sized up this dynamic when talking about the advantages of having a woman peer to talk to:

> The other female engineer and I could talk about "how are we going to work having a family together with doing jobs," and, "boy, you can't really say if you want to start planning to have a family because you don't want that to slip out and have somebody who's higher up saying, OH-H-H, does that mean she's going to be taking time off so we can't put her in some jobs?" My female friend and I could talk details about family and all that kind of planning. (Judith, Entry-E)

Even though they talked of children having a negative impact on their professional careers, they were positive in wanting to start families. The three who entertained thoughts of becoming teachers felt that this job would provide more time with their children to insure they were given every opportunity. The women engineers had a *do what it takes* approach toward their career, and had that same commitment toward raising their children and providing a family atmosphere. If it meant putting their careers on hold, they would. They had a preconceived idea that they could not be good mothers and maintain their career at the same time (Table 35).

My Career and My Family

Three of the four married Mid-Es had small children, and the fourth had been unsuccessful in her attempts to have children. Just like the Entry-Es were planning, the Mid-Es started their families in their early 30's and put their careers on the back burner because they perceived that leadership roles required extended work hours and commitment. However, none of the women with children mentioned wanting to quit to have more time for their families, and, in fact, none of them even complained or mentioned problems of the work and family combination. They all mentioned how important their children were to them, and also talked enthusiastically about their work. They did mention that their main hobby was chasing their children, but this was a positively framed statement. Mary's first response to the question *Who are you?*, was "A mom." She made other comments, as did the other Mid-Es with children (Table 36).

Table 35: EntryEs and Plans for Children

I want to have a couple of kids. I was talking to a lady this morning about how to work and have kids in a technical field; and it's pretty difficult. It's not like sales where you can make your own appointments. And so I've given a lot of thought to, I don't want to go into management because I'd just get too busy to have a family. I don't want to quit all together because I'd miss it terribly. It's difficult to work part time as an engineer because you end up working more than full time anyway. So I'm thinking of maybe going into teaching part time at a community college. Right now I'm concentrating a lot more on my career. This is kind of my time for me to get what I want out of life. But in the next five years, that will change more to focus on my personal life rather than my career. *Do you think you can have children and a career?* I think you can, but I don't think I'd want to. I couldn't, I'm a perfectionist and that would go for raising my children and everything else. I would want to, by God, be there for my own kids. I absolutely would not want to have day care unless it was occasionally, but not 10 hours Monday through Friday.... I would also want to raise my kids with a lot of knowledge and experience in the sciences and technologies. It isn't given to the public in general in school. I wouldn't know a lot of what I know if my dad had not been an engineer. (Rachel, Entry-E)
Before, I was really working to climb up the ladder because it's where the job's going. Now I'm pretty content with what I am doing. I'm totally pulling back the reins. I may move into to a supervisory position later in my career. I don't know, I think my focus is now kind of shifted more towards home life than what I'm going to be as far as being... I want to start a family and stuff. I'm real content with where I am right now. (Judith, Entry-E)
We're planning children. A year or two down the road. *Do you think that will affect your career?* It has to. No matter what people tell you, in an interview; there's just a certain amount of time that a family demands that you just can't spend at the work place whether it's... I will still get my work done; but there may be a time when there's a certain I'm supposed to go to and Jr. has to go to the dentist there's no other way around it, well, I'll have to take Jr. to the dentist and find out what I missed at the meeting later. It doesn't bother me that I have to take time away from work because I know work is generally just get it done at the end and I can do that whenever I need to - if I need to take it home or just stay late an hour after leaving an hour in the day. Then I get it done and that doesn't bother me. What bothers me is it might be perceived as she is always leaving, she doesn't care; when that won't be the case at all. I mean, I just see how new mothers aren't looked down on for leaving to go on a field trip or whatever, but it is mentioned, that's what they're doing today. So, whether people admit it or not, it's never the same, they're moving down a peg in their minds. (Lucy, Entry-E)

The Mid-Es had a similar perception as the Entry-Es about the time commitment of managers. They also wanted to stay in their current job positions because of the uncertainties associated with advancement into leadership roles. However, none of them indicated that they would turn down an opportunity (Table 37) should it be offered.

Table 36: Mid-Es and Their Children

(My idea of fun) is chasing my children, being with my kids.... (*Expectations are*) to raise my kids to the best of my ability. I expect my children to go to college. I expect a lot. *laughter* (Mary, Mid-E)
We hike. She stands on every rock on the trail and points at things.... You slow down. Before we got married, I was a certain kind of hiker. I was fast, strong. Now I'm a parent hiker. It's a whole different thing. It's make sure you have a diaper on the trail! *laughter* (Joy, Mid-E)
I love them, but they're work! Believe me, I didn't know how much work parenting was. But, now I do, now I do. (Laura, Mid-E)

They'd Rather be Moms

The theme about family for the men lower level managers was that they made assumptions about women engineers and family. This theme is not about what they said, but the fact that they all said negative things. The women engineers didn't have to be married and planning children. Just the potential combination of women engineers and family was not a plus for the woman's career. Those with children were assumed to be focused on family, and not having a family raised suspicion of personal problems.

The Lower-Ms mentioned marriage and family issues more than any of the other groups. They presumed and speculated on what women really wanted, and talked about the implications of family on the women engineers' careers. The Lower-Ms projected their personal perceptions of women's roles onto the women engineers, and made assumptions about what would make the women more personally satisfied based on these projections. Their comments weren't positive with regard to career potential of women who might be having children. The only positive comment was the presumption that women with families are happier that those without families.

Harold seemed to think that marriage and family represented a lot more about women engineers than meets the eye when, as he talked about how some are aggressive and some are not, he stated:

> ...females can be fit into two or three categories. You have those who are very aggressive, and it's a demonstrated aggressiveness.... Then there's other females... whose make-up and approach is completely different... Now, when I stop to think about it, the breakdown is such that the marital relationships are. Because I know at least a couple of the very aggressive women who show it and are not married. I am thinking of an individual I have very good respect for, and she will do everything she can to help, and was almost like a born leader and had a family, a couple of kids. (Harold, Lower-M)

Table 37: Mid-Es and the Effect of Children

I think they say "we don't want to give them too much work to do here because they are mothers and they have all of that to do." I think some of that has to do with it also. Because that is one of the stronger points that is coming out in the work force today that. We are mothers also and we need time to nurture our children. There's time we need to take off from the work force. We need to have the time to do that also. And I think, for the most part, they have been good with that. I haven't had any problems with that during my two pregnancies when I needed to take that time off. They have been very cooperative with that. I think that has something to do with it also. If you are gone they don't want work sitting around or have to pass it on to somebody else. Like, "Oh we are going to have to pass this on to you, you are going to have to take over this part. She's getting ready to go on maternity leave or whatever and it may be six months or whatever or she want to work part time. (Laura, Mid-E)
I used to say, this was about three years ago when I came over; I would like to be a director. I would like to be vice president. But you know, after seeing all the headaches that have gone on lately in the last six months, in this group, I would just be satisfied to stay right where I am at. I think maybe because of my children. I don't want to put in 12 hour days and not spend time with them. I am satisfied with what I have achieved so far. I know I'm probably different than a lot of people my age, but I am pretty well satisfied. Not that I wouldn't want to be a director or something. I think that would be okay.... It's going to be lots and lots of work. And I think maybe that's what I am afraid of right now. I don't want to be here 12 hours a day. I want to spend time with my kids. That's just my point in my career right now. And maybe in five years when my kids are all in school and they don't require as much attention from me all the time, that maybe that will happen. (Mary, Mid-E)
It's just that should I become higher management; just higher title and prestige or whatever; but I think at that time, I'd probably give it up and say I want to do this one experience now, raising kids. *So, you think you could give up all that's you've trained for?* Yea, for two kids. Not for one kid, but for two kids. I think it would be worth it. *Even if you thought you were going to be promoted and move on up?* I would think I would probably make myself juggle everything, including the kids. Because you know, I grew up with two working parents. (Emily, Mid-E)

In talking about their own personal best qualities, the Lower-Ms believed that their ability to perform and get the job done had contributed to their success. All four of them commented that the women engineers had problems recovering from time away from the job in progressing in their careers (Table 38). Performance was everything to the Lower-Ms, and the women engineers couldn't perform if they were out having children or taking care of family details. Taking time off was an issue. It was viewed as not being there for work, bending the rules, and causing women engineers to fall behind technically.

Some of the Lower-Ms' perceptions about the effects of being off work come from a stereotypical perception of the traditional family roles. Harold and Charles not only questioned

Table 38: Lower-Ms' Perception of the Effect of Children on Career

I think it affects them in the sense that during the time when they're raising children that their off from work. Those that choose to stay off from work an extended period of time, I believe that puts a hold, if you will, on their career. Not because they are women, but just because you have to be on the job to be viewed as a contributor to the job. If you're not there for six months of the year, that's a problem from the job standpoint. I don't think it hurts them in picking up later on when they come back, but I think it puts a hold on for a couple of years while they are not available to do the job. Of course, when they are not on the job, they are missing the exposure and things that their peers are, so that probably does have some cost to it. (Peter, Lower-M)
I think in some cases the lady leaves the employment rolls because of the emphasis on the family and they never go back. I think that might be one of the reasons they get out of the work environment, their learning has fallen behind. There's so many rapid advancements and it's hard to catch up. When it's frustrating for them to catch up to the others, they go into different fields. (Charles, Lower-M)
To stay in the profession - because the difference really comes between men and women; you know women can have babies. If they have babies, some will return to the work force then there's new added pressures on them that maybe interfere a little bit with their learning capability of their profession and the amount of time they can put to their profession and then some of them say, hey, I'm going to drop out for a period of time until the kids are, whatever go to school, or drop out completely. (Harold, Lower-M)
They get married, now do they change. Obviously they are physically different. Then the whole decision comes in with what happens when families and things like that. We have one gal, great gal, but she had her first baby and we brought her back after a certain time to work part time and everything, great engineer, the same thing for her second one. We wanted to continue that because we bend the rules; part time back instead of 40 hours and things like that just to work around her. In a family situation, because she's a good enough engineer. We definitely wanted her back and it was after a while that she just says, "two kids are more than I can handle." She used to like coming in to work here because we always give her something challenging that she would get done, so to speak. She finally said, "I love that part of it, but I just can't take the two kids and juggling that," and so we lost her too. I guess she's the second one that's gone out of engineering. (Steve, Lower-M)

the women's ability to keep up technically once children arrived, they also questioned whether women without a traditional family were satisfied (Table 39).

The Lower-Ms projected their personal views of roles in the family on the women engineers. If they had a traditional family where the father worked and the mother cared for the children, they believed that the women engineers had the same role as did their wife. Charles's conversation reflected this view as he described parent's roles in a happy family. It became apparent that his beliefs were projected onto what he believed contributed to satisfaction for women engineers (Table 40).

Table 39: Lower-Ms' Perception of Traditional Roles

I don't know if those who are not as satisfied - is it because they have families, or is it because they don't have families and they feel that they've sacrificed for their careers. They don't have families, and what I mean is children. And they feel then, because of that sacrifice they should have been in a higher position or more recognition or something of that nature... I just don't know their mental make-up when it comes to family and with engineering. Because their part of family is so much different than the men's portion and I don't know how much it effects them. I know that it appears that women are becoming more career minded in general. And those that really are career minded, I don't know if they really want the children or they have a different perception of marriage and that type of thing. Maybe we'll have a couple of different classes of women in the future. Those that are family oriented and those that are really career oriented and are less family. (Harold, Lower-M)
What drives satisfaction for males? Job security and you know, when you get over 40, you're concerned about making sure you have the money to pay for the college education, making sure that you've got enough for retirement, so you kind of change your focus to want to make sure I've got a secure job, and so use that emphasis as a, "that's how I measure my success." *Can the females have the same measures, same things that drive satisfaction?* I don't think they do. I don't think security drives their satisfaction. They, job security may not be their immediate focus, I guess. I would think they're, you know, the family focus, their focus on involvement in various activities. That are, I'll say, non-association with work, and they get more involved in church. (Charles, Lower-M)

Steve didn't have the traditional view of family roles, but had his own theory of what men and women wanted from life. He projected his perception onto both the men and women engineers. His particular stereotypical insight was similar to Harold's views of aggressive women as he believed that women started panicking when they reached their thirties and weren't married. He didn't say that they would be happier if married, but the similarity was that he believed that their marital status could cause them some problems. He described what he believed they wanted, and then referred to them based on this projection.

This Isn't OK

The upper level men managers talked about the potential conflict between career and family roles, but commented that it was not an acceptable reason for differential treatment. Tom hadn't seen family conflicts to be as big an issue with women as with men (Table 41). He supposed that women were aware of the potential problems and were more sensitive to juggling their schedules. John suspected that to be successful, women had to appear to be as men in putting their job in front of their family, and it put undue pressure on them (Table 41). Sam believed that personal opinion should be set aside and the women engineers and all people

Table 40: Lower-Ms' Personal Projections and Family Roles

You know, they reach a point where, you mention the term "burnout", and I have achieved what I wanted to achieve and now I'm going to try something different. Whereas the male, you know, got to work to support my family. Got to make sure my kids go to school, being forced, not forced, but leaning toward security, making my primary focus. But they have different roles. Everybody looks at a father as the caregiver, the guy that brings money, you know the guy that makes sure, the individual that's going to make sure I'm working and gets bread on the table. Whereas the mother's role is to make sure that food, it's properly prepared and the kids are properly, you know, and the kids are going to meet their schooling commitments and they're going to make sure the clothes are properly washed and dressed, proper shoes for the kids to wear, and I think, personally bringing up the young ladies, daughters, they deserve to have the mother's attention. (Charles, Lower-M)
I think guys are still driven by, from the standpoint of, they've made a decision to stay single from their personal life and get all kinds of dates they want, you know. They date a lot. At some point or another in time they say this is kind of wearing on me so I ought to settle down, right? I think the gals are a little bit more focused on one relationship at a time. I think they are still saying well, I don't have to settle down just yet. I think because they commit more to one relationship at a time doesn't mean that that's the only one they are ever going to have. I think they are probably looking at it from the standpoint of, gee, I don't have to get married until I'm 30 or I don't have to get married until I'm 40 or something like that. It is quite different than they used to be say 20 or 30 years ago. Once again, a guy basically falls down; they may get tired of the single life and find someone that will put up with them. I've had a couple of females who worked for me that have been that way too. After so much time has passed, it's time. They get married, now do they change, obviously they are physically different. Then the whole decision comes in with what happens with families and things like that... Because I know of, from just women in general, that some of them start panicking that they're not married, it's perceived that they should be married by that time and they have put it off because, they're career oriented here. They've got money, they can do anything they want to; gals start panicking about 36 and guys start panicking probably around 30 and I think this is just in general, and this is my theory. (Steve, Lower-M)

should be presented with opportunities and allowed to choose for themselves whether they are in a position to take them (Table 41).

Summary

The potential conflict between family roles and a career was the most frequently mentioned topic of the interview. Although family roles were not suggested in the interview questions, this concern was mentioned by every participant. Each group had their own perspective on this topic, some reflecting previous themes, such as the Entry-Es exhibiting the same focus on whatever the task was. Some themes, such as the projection of personal stereotypes onto women's roles, appeared for the first time.

Table 41: Upper-Ms' Perception of Women Engineers and Family

...if anything my experiences have been with some male engineers and their, I don't know if I would call it difficulty, but their desire to not go on travel because it's their turn to take the kids to the ballet lesson or something. I've not seen that in what maybe because female engineers are sensitive to that and make sure they work it out without making it a problem for us - I've not seen this. (Tom, Upper-M)
I think that they present the role of work in their life as being very similar to the way that men present the role of work in their life which is in the work place that work is sort of 100% of the thing and the family is second on the side by the way. I don't know that they particularly feel that way but they certainly present it that way and I suspect that they have adopted protective coloration in order to succeed in the environment they are in. And the successful ones have adopted the coloration well. My concern about that is that if it's adopted for coloration that it can, the way we act tends to influence the way we think sometimes and it can change us inside and I would hate to think that we were causing people to act against their inner nature in a way that would hold them back from fulfilling whatever their personal goals are or might have been. (John, Upper-M)
I believe that some people, some women, self select out because child care issues are very significant and not well supported by society or organizations and when women believe that to be very important as I do. They have now available the kinds of options that they probably need to be able to be free to do the other kinds of things that women like to do. I try not to let that consideration keep me from nominating somebody for a job if they come in after and they say I don't have the kind of outside support. Those kinds of things have happened, but that wouldn't prevent me from offering that individual the opportunity if for some reason they elected to decline. It's okay, but the preliminary decision process shouldn't be impacted by the potential. (Sam, Upper-M)

The Entry-Es all planned to have a family with children. They planned to start their families during their early thirties. However, those who had married and were making plans to start their family believed that they would have to put their career on hold while they raised the children. They still had an attitude of doing what it takes, and, if necessary, planned to change their career path to accommodate the needs of a family. The Entry-Es mentioned the negative perception in the workplace toward women engineers with children or those known to be planning to start a family.

The Mid-Es had children that had been born while the women engineers were in their early thirties. They didn't complain about family responsibilities, but commented that they didn't believe that they could move to positions of leadership due to the long hours required by those types of roles. However, none of the Mid-Es indicated that they would turn down an opportunity.

The Lower-Ms had two main themes. First, they talked about women's roles in families, and second, how family issues impacted their careers. They believed that women were

more satisfied if they had families, and that sacrificing family for career by having no children or not being home with the children contributed to dissatisfaction. Second, they also believed that to be successful, a person must be on the job, and a family creates a dynamic where the women engineers are not as available for the job as the men. Not being on the job because of needs of the family was believed to create problems with women getting opportunities.

The Upper-Ms commented on family issues and believed that the performance of women engineers was not negatively affected by family issues. They also addressed the typical excuses around women engineers and family, and had no patience for these rationales.

THE DYNAMICS

Facts, Innuendo, and Supporting Research

Dynamics is the engineering study of force in motion. When the facts, innuendo and the supporting research are considered together, two theories of the dynamics emerge around the careers of women engineers. It is a dynamic because the theories are about life in motion.

Chapter 11 combines family issues themes with the career development of both the women engineers and the managers to suggest a theory of Risky Business. Chapter 12 discusses how personal development of the women engineer interconnects to the workplace environment and proposes a Sense of Value theory.

Constructs are the forces that put a theory in motion. These theories not only predict the future, but show how we will get there. In a sense, it's an engineering problem. To change the end dynamic, the acting forces must be changed.

CHAPTER 11

RISKY BUSINESS

> ...it's a risky proposition for mentors because a lot of times they have to, they are looking to make sure that they don't in some way hurt themselves. So they pick certain people that they feel pretty confident are going to succeed... so that... they don't somehow get a black eye because that person didn't turn out to be what they want. *Julia*

This chapter proposes a theory of risky business. This theory is about how traditional career development for engineers and a very human element of having a family are on diverging paths. This theory is built on three constructs: (a) the emerging family for the entry level women engineers, (b) the natural maturing cycle for engineering careers, and (c) personal risk for managers. Two processes are at play in this theory. First, the personal development of women engineers is on a diverging path with traditional career development. Second, the potential effect on a manager's career from sponsoring a woman engineer appears to be risky.

The first construct is the emerging family. Recall the theme that all of the married Mid-Es either had children or had intended to have children. Also recall that one of the future expectations of the Entry-Es was to be married and have a family. The Entry-Es have the expectation, and Mid-Es have fulfilled it. Thus, there is a norm that Mid-Es have children if they are married, and all Entry-Es have the potential to marry and then have children[2]. The Entry-Es are soon to enter their early 30's, and with that period of their lives, even if it is biologically based, they diverge from their men peer's behavior. Despite observing that having a family seemed to have a negative influence on careers of women, they intended to go down a path of marriage and children. Without the experience of having children, the Entry-Es still believed that they could be whatever they chose. However, the Mid-Es, on the other side of the family issue, felt that they did not have opportunity. Perhaps the Entry-Es simply had the optimism of youth, while the perceived changes brought about by marriage and children have sounded the Mid-Es' death knell to opportunity.

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[2] Recall that not having a family doesn't get around this norm as the nature of women without children was suspect (Table 39, p. 112)

The second construct is timing. Timing plays an important role in this story. Engineering is a complex profession, and it takes years for a young engineer to gain the experience to make sound technical decisions and the maturity to guide a group working on a complex project. Projects are not weeks in duration, but usually more in the range of 2 or more years from start to finish. Just about the time that the women engineers have worked long enough to have this maturity and experience, about the time they approach age 30, they are also in the age range where they begin their families. The standard development cycle for engineers is at odds with the interjection of a family.

The third construct of this theory considers how opportunity arises. Engineers are placed on jobs for reasons of their skills or for career development for future complex assignments. To get these assignments, an engineer has a sponsor, or a person who understands their capabilities and suggests them for the job. The Lower-Ms are in the management positions that observe potential and suggest people for these opportunities. Identifying and sponsoring the right people not only gets the job done, a measure of success, but is how the Lower-Ms build their own reputations and posture themselves for promotions. The performance of the engineers they sponsor directly reflects on their abilities to manage and recognize talent.

Now this is not to say that women engineers cannot have both career and family. But, as evidenced in their comments on family issues (Table 39, p. 112), the Lower-Ms, the very people who have to sponsor the Entry-Es, believe that the women would rather be home with their children. Or perhaps, the women will be off work or distracted by their children's needs. The Lower-Ms comment that a person has to be on the job to get the job done, and they suspect that women have paid a price for being off from work in career advancement. To them, it is an unfortunate circumstance, but the work must be done.

A dilemma is posed by the combination of the three constructs of (a) the Entry-Es beginning a family around age 30, (b) experience for assuming roles of leadership taking up to 10 years to develop, and (c) choice of person to sponsor representing the leadership ability of the Lower-Ms. Sponsoring a woman has a high risk factor for the Lower-Ms. Their personal career advancement depends on their ability to select people who will get tasks completed. Should they put one of these young women in a responsible role, who then becomes pregnant and is off work, the task may suffer and the Lower-Ms may damage their promotion potential.

The situation is exacerbated because these men also believe that when the women engineers have their children, there is a high probability that they will not return to the workforce. They believe that even if the engineers do return, they cannot be depended on to be at work - children get sick and have doctors appointments and there are always day care

problems. In the case of the women engineers, having the husband take care of the child is not likely an option. Most the women engineers were married to other engineers, and the Lower-Ms most likely project their own *work hard, on-the-job* attitudes on the husbands, assuming that the husband is not available to share in the family chores. Sponsoring one of these age 30-ish women engineers is a personally risky proposition for the Lower-Ms.

Remember that the Lower-Ms believed that they made their own opportunities (Table 18, p. 77). Even after discussing how they had been placed on special assignments and given leadership roles, they insisted that their good work was the reason behind it. The Lower-Ms felt no responsibility to accommodate career and family - they believed that people made their own opportunities. Why should they make opportunities for someone who can't be depended on for the most important quality - being there to work hard and get the job done. Their rationale for how women engineers' careers are affected by children and why this effect is acceptable is represented in Table 38 (p. 111).

The Upper-Ms commented that family issues should have no bearing on the careers of women engineers, because a career is long and having children is only of short duration. They also commented that they had not seen women who could not juggle both (Table 41, p. 114). However, it must be pointed out that these managers do not typically have responsibility for task accomplishment. If a key project is late, they were not the ones who will be criticized for having poor judgment in choosing the team leader. Their careers are not at personal risk by sponsoring women for lead roles. It is likely that any person they would be sponsoring would be for a upper level job and would be of an age where family was not an issue or the woman would have proven the ability to juggle both family and career. Family issues do not pose a risk for them.

The dynamic is summed up as follows. Women engineers work hard and learn their profession until about age thirty. At that point in the normal career progression of engineers, they are ready to start taking on more responsible assignments that involve leadership of others. However, they also begin their families at about the same time they are mature enough to become technical leaders. Those who sponsor them for these leadership roles, the Lower-Ms, believe that success comes from hard work and dedication, and don't believe that tasks can be accomplished when the leader is off from work or distracted. In sponsoring women engineers for important jobs, they place their own careers at personal risk should they choose a woman and have her not perform, almost due to *planned* family obligations.

CHAPTER 12

A SENSE OF VALUE

I kind of thought they were missing the point. *Sharon*

Previous chapters focused on what the engineers and managers said, either in direct response to a question or a topic that the participants repeatedly raised in the interviews. The themes from these responses developed characters that are typical representations of the groups. The engineers have developed their group's own characteristics at length, and the managers have briefly developed their group and provided their view of the women engineers. In this chapter, the comments about each group's own experience and about the experience of others, in combination with the perspective of other research, is put together to develop a theoretical framework of one of the dynamics of being a women engineer. This chapter discusses how the personal development of women engineers diverges from the traditions of the workplace to propose a *Sense of Value* theory.

This theory is not serially developed, because the dynamic of being a woman engineer is not cause and effect with a continuous pattern of doing one thing resulting in a step to the next plateau. It describes the personal development of the women engineers and predicts how they mature during their careers. The sense of value theory is composed of two constructs: (a) a sense of accomplishment, and (b) a sense of belonging.

A Sense of Accomplishment

The *sense of value* of the women engineers comes from how they individually develop in relation to their roles and relationships. There are two constructs in this Sense of Value - a *sense of accomplishment* and a *sense of belonging*. These two constructs are not independent, but vary together.

A *sense of accomplishment* is the extent to which the person is focused on accomplishing a task. This focus is object-oriented in that it is more concerned with a tangible accomplishment, and in the case of engineering, a problem solved, than with the interactions necessary for task accomplishment. A sense of accomplishment ranges from a narrow focus on getting the job done to a broader, more holistic view of both the problems and solutions. In the

broader view, the focus does not shift from narrow to broad; rather it expands to include other factors such as relationships along with the task.

Recall that best experiences for each group were different in that the Entry-Es talked of accomplishment and recognition and had a narrow focus on solving a particular problem. The Mid-Es assumed they could do the task and the relationships with other people made it a best experience. This narrow focus on the task is contrasted to the broader relationship view reflected in statements by Meredith and Mary.

> I think the satisfaction for me would be from completing a task and knowing that I had done it well. You know, know that I had come up with, the conclusions I came up with were good and what I was looking for... I could explain to someone else exactly what's going on. (Meredith, Entry-E)

Mary, in contrast, provided an example of the broader perspective of the Mid-Es when she talked about working together and getting everyone's ideas. She was still proud of her individual contribution, but had grown to appreciate the interactions with others. She had a broader sense of accomplishment in that she still believed the goal was to get the job done, but realized that working together as a group got it done, not her solving a problem.

> ...The group of people was tremendous. They were more like family. There were black people, older, younger, new hires, and we just worked together really well. ...they did what had to be done to produce the end product. (Mary, Mid-E)

All of the women engineers were task oriented because they saw their best quality as being hard working and getting the job done (Table 10, p. 54; Table 11, p. 55). A strong task orientation is the foundation of engineering. They excel at problem solving. However, recall that the Mid-Es described these qualities in terms of relationships with other people (Table 11, p. 55), and the Entry-Es talked of specific problem solving (Table 10, p. 54). The difference between the two groups was not one of change, but one of growth and development. By mid-career, they not only had the personal technical skills for task accomplishment, but were able to use and value the ideas and accomplishments of others. The Entry-Es talked of *I* in task accomplishment, while the Mid-Es talked of *I did my part*, and *we accomplished the job*. The *I* for the Mid-Es was doing their part of a group task. The Mid-Es haven't changed their focus, but expanded it to see the task in a larger, more complex context beyond just themselves.

This concept is further developed in the two group's description of their best experiences. The Entry-Es' best experience focused on accomplishing a task - solving a problem (Table 12, p. 61). They talked about having a challenging problem and solving it. In their descriptions, they talked about the feeling of accomplishment that came with a tangible result. An Answer. In their best experience, they had proof that they had accomplished something.

The Mid-Es' best experience certainly had a context of accomplishing a task. And rightfully so, because it is the job of engineers to solve problems. However, solving the problem was a given to them, most likely from learning when they were Entry-Es that they could do the work and had the skills to problem solve. As Mid-Es, they had no doubt that they could do their part. Their best experience was being a part of a group (Table 13, p. 63). Having a project to complete was simply the excuse for having the experience of group interaction. They have developed from the Entry-Es immature feeling of satisfaction from being able to complete a task to assuming that the problem can be solved - satisfaction came from the relationships formed in the process of task accomplishment. The Mid-Es had more of a group and people focus rather than an individual and object focus.

A Sense of Belonging

Along with this different perspective on accomplishment is the second construct of a *sense of belonging*. This construct can be thought of as a continuum from inclusion to alienation. The sense of belonging is the degree to which the person feels included in the group. The Entry-Es felt like they were a part of the group, while the Mid-Es felt that they are not a part of the group because their behaviors did not mimic those of the workplace norms.

The sense of belonging and sense of accomplishment are paradoxical because as accomplishment moves from an object orientation to include relationships, the women engineers' feelings about being one of the group move from inclusion to alienation. It might be intuitively thought that as women engineers start to be more conscious of relationships and value them over task accomplishment that they would feel more included, not alienated. But that's not the case.

Feeling included can also be thought of as being a member of the group. Group membership is more likely when group members share common interests, goals, and behaviors. Adherence to norms creates a group environment, where everyone has their role.

The culture of engineering at the working level was reflected by the themes of the Lower-Ms. The high level theme for the Lower-Ms had to do with a focus on task. Their best quality was getting the job done (Table 20, p. 80), and that they, *I*, made their own opportunities (Table 18, p. 77). They also believed that the obligations of motherhood took away from the women engineers' ability to accomplish tasks (Table 38, p. 111). They only mentioned relationships with others in using them to do a part of the task. They did not reflect the perspective of the Mid-Es that the interaction itself is important, but rather that accomplishment was the only measure of value.

It is suggested that management style has a strong influence on culture, and creates the values, norms, myths and symbols of the workplace (Porras and Robertson, 1992). The Lower-Ms have primary control of the culture of the working group because of their position of providing reinforcement for specific behaviors through job assignments and suggestion for promotions. If this theme of task accomplishment is the prevailing culture, then the themes of the Entry-Es are a closer match to the working group. Even though the Entry-Es' behaviors appear to foster alienation by being self-centered and focused on tangible objects, these very actions facilitate the Entry-Es having a better fit into the culture, resulting in positive reinforcement and feelings of inclusion, or a sense of belonging.

The worst experiences of the Mid-Es hint of alienation in describing their feeling of powerlessness. Being penalized for expressing female stereotyped emotions, not being considered valuable because of gender, and not being listened to because they didn't exhibit the style of leadership by intimidation served to separate them from the culture of their work environment (Table 14, p. 65).

The degree of alienation depends on how closely the experiences and behavior of the individual matches the culture of the workplace. The closer the fit between behaviors and cultural norms, the more included the person feels. The Entry-Es concept of work and accomplishment more closely matched the norms modeled by the Lower-Ms, while the Mid-Es' perspective on best experiences and valuable behaviors had a different focus. There appeared to be an inverse relationship between alienation and task orientation whereas the focus on task orientation broadened to include relationships, alienation increased.

Morris (1995) found that as women rose in organizations, that their behaviors and expectations didn't match those of the norms in male dominated corporations. She interviewed women who had left their positions to work in surroundings that better met their idea of rewarding work and interaction.

Feelings of inclusion were expressed by the Entry-Es when they talked about interacting with others. They felt like they were heard when expressing their ideas. In discussing what made her best experience the best Meredith said:

> Probably the way they listen. I mean anyone will listen. You can say anything you want, whether it's a gripe or a compliment or a new idea. Everything is received so well. (Meredith, Entry-E)

The Entry-Es took pride in being accepted as one of the guys. It was important to them to be like the dominant group, because they commented about other women who are not well accepted because of their reactions to *guy things*. Judith and Michelle talked of their

experiences interacting in the workplace. However, is it really a case of being "like the guys," or is it that they were tolerant of sexist behavior in exchange for inclusion?

> I catch them using some stuff like, the one guy gets on a joke net and if there's something funny he'll send them to my husband first to screen out if he's going to forward certain ones to me. I think they tone down some of the talk maybe about maybe other women. Like if we were out at happy hour or something, they're not going to be all goo-goo talking about some chick at the bar if I'm there versus if it's just the guys there. I think conversations will be quite different. *How do you feel about that?* Sometimes I mind it, sometimes I'm glad I don't have to hear it. *How come you mind?* Because I don't want them to feel like they have to behave differently around me. Because I just think that's tension and it shouldn't have to be there. I just want to be one of them. *Is there anything you can do to become one of them?* I catch myself swearing more around them. Where, talking about certain things that maybe there's a common interest. Like I love NASCAR and a couple of guys in the office, we get along great. We just sit around and yack about the past race or what's coming up, the drivers and everything. If you have a common interest, I think that kind of helps. (Judith, Entry-E)

> ... I've had guys tell me I think like a guy. Certain things, I guess, don't bother me. Like, they'll talk about women or they'll, there's this one manager that we work with that goes and gets something from the vending machines at a certain time every day to watch the women leave. They make fun of him. I think the male engineers feel comfortable talking with me about that and I think its funny. It's just how things are. A lot of women you could not do that with. (Michelle, Entry-E)

Part of the reason for an individual focus comes from the typical technical progression of engineers. Engineers just starting their careers are given small problems that, although they are a challenge to them, might not be to a more experienced person. Most difficult engineering problems cannot be solved by a single person because the problem requires the input of more than one engineering discipline. In expressing their ideas, the Entry-Es are typically describing a problem solution to a well-bounded, less complex problem. For instance, Meredith's job is one of making a new software system work, a piece at a time. She commented that she did her part and then was listened to when she went back to the group. For Entry-Es, the task is often one that can be solved somewhat independently of an overall project to a single solution. Even when the task is integral to a larger project, it is usually clearly defined, and, rather than influencing the overall project solution, it has a specific input to the overall system. As such, being listened to is not as much a circumstance of influencing direction as answering a question. The answer is right or wrong, and subjectivity is minimized.

The Mid-Es' task more often influences project direction, a more subjective role. As such, they talked of how they were not listened to, simply because they didn't employ the same aggressive behaviors. Their alienation in the workplace was expressed by their frustration at not being recognized as equal because they had a different way of interacting. The Mid-Es

talked of having a style of teaching, helping, and explaining to get their idea across, not insisting and being aggressive like the men.

> I think I probably would describe it as, I try to work from the back pushing forward as opposed to out front pulling. When I work with other people I try not to - well, I don't have try because it's sort of my personality, but I generally don't tell people how they should do things. I show, I either start an example of how to do something and offer to help or whatever. I'm not very, I don't like the word aggressive in that context, but in terms of how I interact with other people I try to, to get them, get the best from them and the best from me and sort of find a consensus, someplace where we can both, you know, contribute and move forward rather than... I see that as somewhat different than the way a lot of people, than most people probably do. The definition of leadership is quite often the guy who stands up and makes a big to do about something and to me that's not really the definition of leadership. And so I don't know that it's worked in my favor. It works for me because that's the way I am and I would not be comfortable necessarily in another, doing it another way. Most of the feedback that I've gotten in terms of performance reviews or whatever, at least early on, I was told I needed to be more aggressive, I needed to be more outspoken, more visible, things like that. I kind of thought that they were missing the point. *laughter* That there are many ways to get a job done... And I kind of thought we're all working on the same team to reach the same goal and why should I go out there and argue with somebody over something that I don't really care about. If it's good enough they way they've done it, just let it be. And it seems like the definition of aggressive or a good engineer is someone who was demanding their own way all the time and when someone would make that comment I would, I guess I would sort of just ignore it because I thought, well, that's not an effective, necessarily an effective way to get anything done. And when I have a point I stick to it and I don't back away from it and to me that is more important than going out and making a point just to make a point and so that everybody will recognize it. Oh, O.K. well I have to do what she says because she's got a bigger stick then this guy and then I'll do it. (Sharon, Mid-E)

Judith Rosener (1990) described the different way that women lead as more of a level, equal role. Similarly, the women in *The Female Advantage* (1990) were described as focusing solving problems with group interaction rather than decision making by the designated leader. This interaction style with a bent toward working with people exacerbates feelings of alienation for the engineers. The Mid-Es talked about being criticized for not being aggressive and offered the definition of aggression as *beating on the table* and *insisting on your way*. The Mid-Es' perceptions that their style wasn't the cultural norm were not unfounded, because the Lower-Ms brought up this topic and discussed how the women didn't behave like the men - criticizing those perceived to be aggressive and then speaking negatively of a lack of forceful participation. The women are in a double bind.

> Females probably can be fit into two or three categories. You have those who are very aggressive. Their aggressiveness shows either towards other females and obviously toward their male peers. And its a demonstrated aggressiveness. I think that there's some females

that want to get ahead careerwise. It's like they have something to prove, so that it's like a competition, more open competition, because most people want to get ahead, but for the most part, people don't, it can't be read that they're really fighting to get ahead. I think some of the real competitive women will sometimes put down another female or they will try to over promote themselves. And I'm not saying that there's a lot of them like that. That's my perception because you can feel it coming out by what they say, how they say it, and that type of thing. Trying to promote themselves as being better. *So their tactic is more by doing something to other people to make themselves look better?* Right, right. And that's usually in a bigger way. *You talk about the females. You think they fall in a couple of categories. Do you think the males fall in either of those categories or do they have a different structure in the workplace?* I hadn't thought of that, but I guess I look at the males as falling into categories as kind of accepting their position or where their careers are and saying hey, I'm satisfied with it; and this is probably more for older ones. It's probably not as much as a rule for the younger ones.... There are some young to middle age guys who really are going back for advanced degrees and who are trying to learn and are looking for other job opportunities say within the company to where they can learn and boost their career. Very seldom have I, that's not to say that there hasn't been any, but very seldom is there guys with catty type of hurt remarks. For some reason, and maybe I am being biased, but I can just feel it with the females when it comes out. And it just, whereas I don't feel it that strongly with the guys. You can tell if a guy is trying to be on a fast track or trying to really get himself in that position, but it just seems like it's a little bit different for the most part. (Harold, Lower-M)

The difference of style reflected by Sharon was found throughout the Mid-E group. Their worst experience was when they were penalized for something out of their control (Table 14, p. 65). In the workplace, the Mid-Es felt penalized by simply having a different way of accomplishing the same task. Just because they worked differently, they were penalized. They were alienated because they didn't fit into the interaction culture of the workplace.

Kanter (1977, p. 222) described that the presence of tokens can "lead the dominants to exaggerate their commonalties and the token's difference." The Entry-Es' behaviors were very much like the dominant group. They were task focused. They didn't yet have children and as such, were not saddled with the *I'd rather be a mom* stereotype. They felt included. However, consider the Mid-Es - there are obvious differences. They were moms - the dominant group can't be moms. They got emotional - guys don't get emotional. They taught and explained - leaders pound on the table. The adverse reaction of the Lower-Ms to the Mid-Es may be a result of a recognition of the differences and a subsequent exaggeration of those differences.

Kanter (1977) continued to explain that this notice of difference causes boundaries to heighten. The only way the token might be accepted into the group was to display loyalty. Loyalty was the last thing the women engineers were presumed to have. They were assumed to be more loyal to their families than work. But the women who are moms can't win at this game because social perception would penalize moms for being any other way. Those with no family

were also penalized because they were thought to be not only different from the dominant group, but also different from *normal, happy* females.

The difference in style was recognized by both groups of managers, but considered very differently by each of the two groups. John, a Upper-M, reflected on the emotional strain on the women engineers that are able to function as men when he says:

> I suspect they (the successful ones) have adopted the protective coloration in order to succeed in the environment they are in... and I would hate to think we were causing people to act against their inner nature... because of the circumstances where I have had to do so for a short time... (John, Upper-M)

However, Peter, a Lower-M, who felt that he, as did the other Lower-Ms, made his own opportunities, had a different view of fitting in.

> There's probably some good rationale to the fact that women are merging into a male-dominated work place. It's not whether its women or any other kind of minority, I think the people that succeed are the ones that try to participate, try to get to know their counterparts. I can see the barriers that are there to a degree, but I also see back here looking in my work area, I see there not being any major obstacle to the most part. It's, well, simple things. Whether, when you go to lunch do all the women all get together and go off to lunch and the men go off? If I were a young woman starting out a career I would invite myself to lunch with the men. I wouldn't go with the women. Try to get in and understand what it is that's held in high esteem in the male culture that they might not think of. You've just got to hang around with them and observe the lot and you've got to recognize that right or wrong whatever the power base is that you've got to match their expectations and their values instead of expecting more of them to change their values and expectations to match up to yours. So I think, make a big effort to fit in, look for opportunities on and off the job to participate in things with those people. Get to know them so they get to know you as one of the guys, if you will, instead of somebody that's different. That they only see briefly on the job. I guess that's just, I think that there's some validity in the fact that it's a male-dominated culture that they're trying to break into. And they way to do that is not to change the culture but to match yourself up with the culture. *Do you believe it's possible for people to change to match a culture?* Yeah, oh yeah. I think you can change. You may not want to, you may not choose not to, but I don't see any barriers there that can't be overcome. (Peter, Lower-M)

A Mismatch

Whether it's a change in style, starting a family, or a focus on people rather than task accomplishment, as the women engineers' careers develop, they diverge from the norm of the traditional male workplace. Matching the culture of the workplace brings its own stresses if the women engineers behave differently than their true natures. There is a stress that comes from being different from the group. The Mid-Es have had years in this environment, and have

become conscious that they don't behave like the norm. They didn't have to be intuitive to figure this out - they have been verbally criticized during performance reviews[3]. They didn't have to look in a mirror to see the differences because their managers told them that they didn't know how to deal with a woman.

Except for the Entry-Es, no one else even pretended that the women engineers were like their male counterparts. Unfortunately, the sponsors of the working group didn't value the differences, and considered them as potential risks to their own careers. Regardless of the difference, it was a divergence from the workplace norm, and served to move the women engineers further back in the pack.

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[3] See Julia and Sharon, pp. 97.

CHAPTER 13

TIES TO THE PAST

> I feel good about being in this study because I think it's something that needs to be done. Whatever the outcome, any information is going to be useful for someone. Now whether we use it in the right way, and not try to use it to make a different point is another matter. But, once the research is done and the report published, folks can interpret and do whatever they want with it. *Julia*

The themes and theories that have been developed in this study do not describe a happy ending for women who have chosen a career in engineering. But, these findings should come as no surprise - the results simply duplicate those found in other professions for many years. In my view, women's roles don't seem to have changed a noticeable amount in the engineering world.

A problem with studies that have to do with gender is the notion that society changes, and this type of work becomes quickly dated. Twenty year old studies may be dated in other contexts and other fields, but in this study about women engineers, these mid-1990's findings match those from the past as well as those that are more current. These findings match those found in studies of tokenism, power, and workplace socialization. The experiential descriptions of the mid-career women engineers are strikingly similar to those found in other qualitative studies.

This discussion ties the themes found in this study to those found by other researchers. It uses other findings to explain the phenomenon behind some themes, and also links these themes to other experience.

Tokenism & Gender Bias

Tokenism and gender bias effects can be considered together. In engineering, women are tokens because their gender is different than that of the dominant group. The women engineers' performance, credentials, and behaviors were in question by both managers and the engineers themselves, possibly for the reasons suggested by tokenism and gender bias.

From studies of gender bias in evaluation of performance, it was found that women's actual or anticipated performance was not judged to be equal to men's even when it was identical (Goldberg, 1968; Pheterson et al., 1971; Levenson et al., 1975; Weinberg et al.,

1984). An instant criticism of this list of related works is that one is almost 30 years old, and the most recently cited one is over 10 years old. However, the effect described by these quantitative evaluations was reflected in this current qualitative study. The lower level managers discussed their evaluation of women engineers' performance (Table 23 , p. 83). They used terms such as "...I always question what their real capabilities are..." (Harold, Lower-M), "The women tend to be at least average..." (Peter, Lower-M), and Steve's description of how he didn't believe women could stand some environments. The Lower-Ms are biased in their assumptions about women. A women engineer would have to prove herself to Harold; would get a break from Peter in that she is assumed to be at least average; but to Steve, would be questionable in some engineering jobs.

The Catalyst (1992) survey also found that opportunity was different for women engineers because men managers assumed that they would not survive in some environments. In this study, the managers rationalized their behavior by stating that they were simply protecting the women from crude and dirty environments. In fact, they were assuming that the women didn't have the capability to handle such roles.

This attitude can be attributed to *boundary heightening*. Boundary heightening describes the exaggeration of difference of a token group (Kanter, 1977). *Exaggeration of difference* must not be confused with just being different. It is the notice of difference, and a subsequent use of that notice in an extreme or exaggerated manner to manipulate a situation. In this study of women engineers, the obvious difference is that they are women. The statistical difference is that women engineers are better skilled at math and science (McIlwee & Robinson, 1992). The selective use of boundary heightening is apparent since the managers did not note that the women had superior analytical ability. It was noted that "the women seem to be *similarly* educated" (Steve, Lower-M). There are no women's engineering colleges. The women are, in fact, identically educated.

The use of exaggeration emerges in the description of family roles (Table 38, p. 111). Harold said, "...the difference really comes between men and women - you know, women can have babies." This difference is one that is out of the women engineers' control, and it is used as a rationalization for the women's problems of advancement.

Other abuses of difference were found in both the men managers' and women engineers' descriptions of emotion. The men described the women as being emotional, while the women talked of trying not to be emotional. Being emotional is perceived to be more commonly a female trait, and the managers seized on this difference. Emily's worst experience was based on an incident in which she became emotional (Table 14, p. 65), and the Lower-Ms' perception

of difference centered on emotional reactions of having a nature to withdraw from conflict, being more emotional, and being aggressive and catty (Table 25, p. 86).

Women engineers can't win at this game. Sharon, a Mid-E, explained that in her performance reviews, she was downgraded for not being aggressive enough, but yet the managers repeatedly had negative comments about aggressive women. This paradox is not uncommon. It has been suggested that "a high performing woman who acts in a feminine manner receives relatively low ratings" (Ragins & Sundstrom, 1989, p. 60). There is no clear strategy for success because it doesn't work to be aggressive, nor does it work to be feminine. The women engineers are in a double bind.

In summary, previous work suggested that the same performance was judged to be lesser when thought to be performed by women, and that for token groups, differences were exaggerated to justify unequal treatment. These findings from quantitative research reappeared in the conversations with both the women engineers and the men managers.

Workplace Socialization

It has been suggested that the reasons women drop out of professional careers are discrimination, family role conflict, and incomplete occupational socialization (Hart et al., 1986). The easy answers are discrimination and family role conflict. Society has addressed discrimination as a numbers game by setting quotas and passing laws. Family role conflict of the working women may be a problem, but a noble trade-off is offered with the high esteem placed on the role of *Mother*.

Incomplete occupational socialization is another issue. This concept suggests that women are socialized in a manner that doesn't fit the social patterns of the workplace, with a resulting conflict of values and perceptions. The extreme proposal of this concept states that women end up leaving the workplace, but leaving should not always be interpreted literally. Several of the Entry-Es mentioned that they would leave the workplace when they had children in order to provide adequate mothering. This leaving could be interpreted as role conflict, but most likely is more an effect of their socialization into the role as mother not matching the expectations of their work environment for engineering performance and dedication. The Lower-Ms expressed this belief that engineering moms were distracted performers in their comments (Table 38, p. 111). However, they made no mention of how the role of dad changed the performance of male engineers when they raised the topic of family.

The conflict in socialization patterns and women's performance has also been documented in other research. In her book, *The Female Advantage*, Sally Helgesen (1990) observed the leadership styles of women who were corporate executives. She found that these

women behaved in a different manner from their men counterparts. In the case of these women, they were in roles as business owners or CEO, and were only subjected to success as a function of their business' profit margins. Without the constraint of reporting to a man superior, these women conducted their business affairs in a manner that is in stark contrast to their men counterparts. These women were able to freely mix family and business concerns, conduct business as a relationship, and operate in a manner that had little hierarchy of authority. In effect, they were able to have a career outside of male dominance and the social patterns that accompany it.

Female engineers in large corporations must navigate in a different social pattern. They not only must do their work, but do it in a manner that doesn't violate socially accepted norms for female behavior. It is suggested that women are not recognized as candidates for positions of power because of dissimilarity to those who choose leaders (Ragins & Sundstrom, 1990). The Mid-Es commented that they were criticized for their interaction style. This perception of a problem associated with interaction style was validated by the Lower-Ms' comments that the women engineers didn't seem to be aggressive enough, or they were too aggressive. Most likely, this conflict in perception really means that the women engineers either weren't like them or weren't what they expected women to be.

Morris (1995) interviewed executive women who had left upper level management positions with large corporations. She found that the women left because they wanted to make a difference in their position of power, but felt that their men peers were only interested in the perks associated with power. This circumstance occurred because of incomplete occupational socialization. The women were not socialized to feel rewarded and valued because of perks and position. They expected that making a difference came with position. They left.

There is a difference between the women in Helgesen's (1990) and Morris's (1995) accounts and the women in this study. The women they interviewed were in top positions of power and felt enabled to be successful. The women were either running their business in their own way, or left their job to move to a position that let them do it their way. The women engineers in this study are professionals in a complicated industry. There is not much opportunity to be an engineer without being in a male dominated workplace or industry. For instance, a woman attorney in Morris's study quit her partnership position in a prestigious law firm to work for a non-profit agency to help make a difference for under-privileged others. There are few opportunities to be an engineer outside of a male-dominated arena, nor are the women engineers enabled to feel competent by their role in the workplace.

Oppression

Using the definition of oppression as *internalizing one's own inequalities through experience of unequal treatment, often subtle, to the point that one doesn't believe they are deserving of equality* (Sheila Tobias, presentation, 1995), we must first consider the subtle methods of unequal treatment, and then the manifestations of oppression in the oppressed. The family role is one theme that was initiated by the participants and appears related to the concept of oppression. The nature of work as expressed in the women engineers' self-perception of ability and desire for hands-on work is a second oppressive influence.

Perception of Ability

McIlwee and Robinson (1992) discussed the hierarchical nature of engineering work. The type of work performed represents perceived personal ability and value[4]. In engineering, doing the hands-on work or R&D is perceived to be that which is done by the most talented. This phenomenon of a hierarchy of work is not unique to engineering, but is also found in other occupations. In male-typed occupations, such as engineering, women have been found to be put in specialties in that field that don't lead to positions of power (Ragins & Sundstrom, 1989). Similarly to engineering, a hierarchy of power was also found to reside with the types of jobs, with supporting positions having less power and prestige than production positions, and disproportionate representation of women in less prestigious job types (Ragins & Sundstrom).

The women engineers talked of not believing they had the ability to do hands-on work. They believed that they weren't as technically talented as their men peers. It must be asked - *How could people with such exemplary credentials have such a mediocre opinion of their ability?* Mary, a Mid-E, provides a clue when she links her feelings of average to her average opportunities. Subtlety, the types of job assignments have caused the women engineers to believe that they are not as qualified or intelligent in an engineering sense. Nobody told them that they weren't as good or that they were average. They have figured it out for themselves, simply from how they have been treated. They most likely don't know it , but they are oppressed.

Society and Family

As previously discussed, one of the facets of tokenism is exaggeration of difference (Yoder, 1991). The Lower-Ms selectively and unanimously mentioned the negative effect of the role of *Mother* on the careers of women engineers. However, they used this fact of human existence as a rationale for the acceptability of current circumstances. This use of family roles as a rationale is oppressive from several aspects. First, society values the concept of *Mother*.

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[4] A detailed explanation of this concept is developed in Chapter 2, p. 16.

Non-working women were presumed to be better mothers (Rice & Coates, 1995). In our society, few women are presented in high esteem by proclaiming that they are focused on their career even though they have children. The Lower-Ms reflected a societal norm with their assumptions about family roles and they were proud of their insight. Certainly, they felt justified in their belief, and any women who would challenge it risks being interpreted as a poor mother or not-normal female should she be too career-minded.

Unequal treatment occurs due to the role as *Mother*. The perception of how a good mother behaves and feels with respect to her job is a subtle factor in creating an oppressive environment. The Lower-Ms talked of unequal treatment in this matter without apology (Table 38, p. 111; Table 39, p. 112). The women engineers demonstrated being oppressed by allowing their family role to be an excuse for why they found a lack of promotion to be acceptable when they talked of how they didn't believe they could be a manager and a mom due to the long hours required by such a responsible position as manager or technical lead (Table 37, p. 110).

In summary, society presumes that the best moms don't work, and the Lower-Ms help the women be good moms by not putting them in responsible roles that might require a time and thought commitment that would detract from their family role. The Lower-Ms dish out the circumstances, and the women accept them. Society's influence makes it seem like the right thing to do for both the men managers and the women engineers. However, regardless of society's norms, this treatment is unequal and sets the stage for oppression.

Summary

This discussion has addressed how the findings of this study are not so very different than what has been found by other researchers. There are some subtleties that must not be ignored in how the findings fit in the context of the engineering profession. These findings suggest that bias is not profession dependent, but instead is a result of difference since the same effects are found in many careers.

In the negative presentation of tokenism effects and oppression, it must be clearly pointed out that these attitudes were only expressed by the Lower-Ms. The Upper-Ms talked about performance and difference, but were emphatic that they had not seen poor performance or distraction by the family role. They stated that they didn't understand why women were not being put in responsible roles because they had not seen any reason that their performance should hold them back. The negative effects were not found in all of the men - just the lower level male managers.

Engineering is a high paying, secure profession. It would be difficult to leave for no other reason than the compensation. But, it becomes especially difficult to leave if self-perception is one of mediocrity. Women engineers don't match the social norms of the workplace, but most likely are suffering from oppression and feel that leaving their professions would be risky. Oppression doesn't enable them to believe they are stellar performers who can compete at a high level. Oppression convinces them that they are average. The Entry-Es talked of leaving their company if they didn't like their jobs. They have not yet been subjected to extended unequal treatment. The Mid-Es talked of working to provide a solid future for their children or saving for retirement. They just wanted to work. They may be showing up for work, but deep inside, they have withdrawn from leading the charge.

CHAPTER 14

COMMENCEMENT

> It greatly distresses me that the country seems to have, as times have gotten financially tighter, we have turned away from some of our ideas, and affirmative action is sort of an idealistic program. I'm sorry to see it under attack for political reasons. It's really too bad that we can't maintain charity towards our fellow human beings through the bad times as well as the good. So, whatever you turn up that will help people focus on the particular problems of women being able to have open choice of careers and being able to pursue them, and I greatly encourage them; I think it's a fine, fine thing to do. *John*

The intent of this study was to explore the careers of women engineers. Personal interviews of young and middle aged women engineers and technical managers were conducted to gather information. The study used a novel approach by not only asking the women engineers, but also their managers, about expectations and perceptions of the engineers themselves. The women engineers' expectations and perceptions were primarily addressed through a discussion of critical incidents in the form of best and worst experiences. The managers were primarily asked about how they believed the women engineers perceived their careers. These two perspectives were then used to develop theories of the career development of the women engineers.

Themes emerged from directly asked questions. Themes also emerged on the topics of family and opportunity and recognition, although these topics were never mentioned by the interview questions.

Guiding research questions used to focus attention on perceptions of the careers of women engineers were:

How do entry level women engineers perceive their careers?

How do mid-career women engineers perceive their careers?

How do managers perceive the careers of women engineers?

The Study Itself

Two groups of women engineers and two groups of managers were interviewed. The women engineer groups were (a) individuals between ages 25-29 (Entry-Es) and (b) individuals

between 35-39 (Mid-Es). Managers who were interviewed were either a low level manager (Lower-Ms) or vice president level (Upper-Ms) of major corporations. The subjects were from a geographic cross-section of the United States, and worked in large defense-related corporations. The interview guiding questions asked all of the subjects how they perceived themselves and about their future expectations. In addition, the women engineers were asked to describe their best and worst experiences, and the managers were asked to describe what they believed the women engineers expected and how they were different than their male counterparts.

The Results

The results from this research emerged in the form of themes. The major themes were in categories of: (a) demographics, (b) how the women engineers saw themselves, (c) best experiences, (d) worst experiences, (e) expectations, (f) how the managers saw themselves, (g) how the managers viewed the women engineers, (h) opportunity and recognition, and (i) family issues. There were also sub-themes in each of these categories.

One of the important sub-themes for the women engineers was the significance of hands-on work as a part of their career experience. A general theme for the women engineers was the tendency of the Entry-Es to be task focused while the Mid-Es saw the task as a context for relationships.

An important sub-theme for the Lower-Ms was the emergence of paradoxes. Their descriptions often were inconsistent with actual happenings in both their own careers and those of the women engineers. Similar to the women engineers, the managers had a general theme of a task focus for the Lower-Ms in contrast to a relationship focus of the Upper-Ms.

The Theories

Two theories that describe the forces at play in the careers of the women engineers were developed. The constructs that form these theories were defined and developed from the range of common experience described by the women engineers and the managers.

The first theory concerns the emerging family and the career development cycle of the women engineers, and the sponsorship role of Lower-Ms. This theory suggests that women engineers intend to start families in their early thirties, also about the time they have developed the necessary expertise to be recommended for leadership roles. Lower-Ms have a belief that hard work is what has made them successful. These managers also believe that women engineers are distracted and away from the job when they have families. A Lower-M's promotability is judged by his ability to select people who can *get the job done*. The combination of these factors results in a theory that just about the time a woman engineer has

the necessary experience to be put in a leadership role, she is also perceived to be starting her family. The Lower-Ms are in a position to sponsor these women for new roles, but put their own careers at risk through poor choice of a person who won't be present to get the job done. In normal career development, women engineers are poorly postured for advancement because of the potential family and the perceived risk to the Lower-Ms' personal careers should they sponsor women engineers.

The second theory concerns the career perceptions of the women engineers and a resulting *Sense of Value*. This theory is composed of two constructs - a *sense of accomplishment* and a *sense of belonging*. As the women engineers mature, their sense of accomplishment moves from a task focus to a broader view of the task including both the technical work and the relationships with others that combine to achieve the best result. The sense of belonging ranges from feelings of inclusion in the workplace by the Entry-Es to feelings of alienation by the Mid-Es. The sense of accomplishment and sense of belonging strike a paradox in that as the woman engineer grows to see work as both technical task and relationships, she feels more alienated. When her view of the workplace is individually focused on her task, she feels included. The paradox is evident in the comparison of terms - task focused and included contrasted with relationship focused and alienated.

Strategies for Change

Change will not happen by itself. It requires an understanding of the problem and a strategy to encourage change. The results from this study can be examined as a whole and in parts. The suggested theories provide starting points for changing this dynamics, and a general insight from the process suggests additional strategies.

Change will affect both the employees and performance of business. These suggested strategies necessitate changes in business management, career development of the individual, and culture of the workplace. Three strategies for change are suggested from this research:

1. *Clump* women engineers together in the workplace and on projects to facilitate the creation of norms around women's performance and behaviors, and to provide the women with a group to counter feelings of isolation and alienation.
2. Develop a focus on retention of the women engineers already in the workforce by understanding what contributes to satisfaction and dissatisfaction.
3. Provide a career path alternative that starts the woman engineers movement into responsible roles after age 35 when they have moved beyond starting their families.

The Future

The future has two thrusts. The first is about *what should be done next to learn more.* The second is *how do we use this to make a different future*. These are very different questions, but each has merit.

This research stands alone. It answers its guiding questions. However, the results are never left to just these questions. During the interviews, participants would say, *I don't think the guys are any different*. Of course, the reply to this statement is that this research is not about difference - it only examines expectations and perceptions of women engineers. My reply to the participants was, "So what! I don't care how it is for guys - it shouldn't be this way for you! And it shouldn't be this way for anybody!"

One next step is to do the same study for male engineers. This same body of work for male engineers leads to two important pieces of information - how it is for them, and in combination with this research, what are the differences and commonalties between women and male engineers. Although this research is meaningful and stands alone - the real world has both women and men in it. Full circle comes from doing the exact same thing with the men engineers to find out their expectations and perceptions. In doing the same interview, interpretation of themes of best and worst and perception of individual strengths and weakness can suggest how to improve experience of men engineers. But, this researcher suggests that the most enlightening data would be discovering the innuendo in their careers. Would every single participant mention the role conflict between father and professional roles?

The second implication of this work is in the theories it proposes. The theories and their supporting constructs offer a description of not only what is happening, but why it is happening. To change things, we can't change the theory - we can only change the constructs that drive the resulting theory. These theories propose another way to affect careers rather than increasing the numbers or promotion to management positions. The constructs offer clues about what to change to make the future different.

For instance, from the theory that deals with typical career development and family, can women engineers agree to contracts with their employer that they won't become pregnant for a certain length of time in exchange for leadership roles? Should women be encouraged to have children close to age 30, and a development plan be put in place to get them back in full stride near age 40? From the Sense of Value theory, should hands-on work be a mandatory part of the women engineers' development plan to bring them closer to workplace norms? Perhaps women engineers should be co-located with each other to encourage a change in norms of leadership styles. Even though tokenism suggests that mere numbers doesn't change acceptance of tokens, at least the women would not be isolated in their style of working and interacting.

This work also offers clues about why things are not changing. The term *management* in reference to all managers must be thrown out. The difference between those at the top and those at the bottom is as different as night and day. The same category doesn't encompass all of them. It would certainly be a long haul to change the stereotypical, sexist views expressed by the Lower-M group.

This research doesn't have a happy ending. It leaves many things unsaid about the health of the engineering workforce. It was disgusting to this researcher to have the very people society looks to for technological progress talk about themselves as simply average. It seemed nearsighted to hear of problem solving by hard work instead of creativity and thinking. It was frustrating to find that family was perceived to mean sacrifice of skill and talent.

Even though the picture painted by the women engineers and their immediate managers was not pleasant, there is a glimmer of hope from the Upper-Ms. The Upper-Ms had a theme unique to their group. In their interviews, the Upper-Ms asked to be told what to do. They wanted to know, and they have the position and power to make change happen. They are the key change agents in this story. Now we have some clues. To change the future, those who can insist on change must be told what to insist on. This research starts explanations. Once explained, a strategy can be developed. Just remember, it won't happen by itself.

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APPENDICES

APPENDIX A

INFORMED CONSENT STATEMENTS

INFORMED CONSENT

Title: Factors Contributing to Career Perceptions of Female Engineers

This research is designed to investigate the expectations and perceptions of female engineers regarding their careers, and the perceptions of technical managers about the careers of female engineers.

As a participant in this study, you are a volunteer. It is your option to terminate your participation at any time without penalty or prejudice to you. The investigation involves three parts: 1) gathering of personal demographic data through a telephone interview, 2) discussion of your perception of the experience of female engineers through a personal interview, and 3) your review of a written summary of the interviews for accuracy and approval for use. The length of these interviews is up to you, but is anticipated to be approximately 30 minutes for the first and 90 minutes for the second. The interviews and summary review will all occur within a 60 day time span. The interview questions will be open-ended, informal and conversational in nature. The interviews will be scheduled at a mutually convenient time for both you and the interviewer.

Your participation in this study entails no unusual risks or discomforts. Your personal possible benefits from this investigation include a better understanding of your career experience and the experience of those around you. The knowledge gained from this research will be presented to others through other published works. A doctoral dissertation will be prepared as partial fulfillment of degree requirements, and will be a resource for future scholarly work expanding this topic.

The only potential risk is your identification, however, confidentiality will be maintained as self-selected pseudonyms will be used in the interviews for both your name and any company affiliations. The interview process requires audiotaping of both interviews, and a transcript of each interview will be prepared. The audiotapes will be retained in a secure location at the address given below, and will be erased after your summary is reviewed. It is your prerogative to review your audiotapes, upon request, at a mutually agreed upon time and place. The transcripts will be prepared by a paid transcriber who will sign a statement of confidentiality. Upon request, a copy of the transcripts can be provided. Every precaution will be made to insure confidentiality of records and identifying information. This informed consent statement and the transcripts will be retained in a locked file cabinet for three years at the address given below.

I have read the above statement and agree to participate in the research. In addition, I am aware that:

1. My name, company affiliations, and audiotapes will remain confidential, and tapes will be erased at the end of the study.
2. I am entitled to have any further inquiries answered regarding the procedures.
3. Participation is voluntary and I may withdraw my consent and discontinue my participation at any time and for any reason without penalty.
4. No royalties are due the participant for any subsequent publication.
5. The transcripts will be reviewed by the researcher and other researchers for significance.

Signature_____

Print Name _____

Date _____

For further information about this study or your role in it, contact

Janie E. Seat or Dr. Patricia Beitel
University of Tennessee, Cultural Studies Unit
1914 Andy Holt Ave., Knoxville, TN 37996-2700
Phone: (423) 974-5111

INFORMED CONSENT

Title: Factors Contributing to Career Perceptions of Female Engineers

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Date _____

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Phone: (423) 974-5111

APPENDIX B

INTERVIEW GUIDE - ENGINEERS

Experience and Perceptions of Female Engineers

1. Tell me about yourself.

   Probes:

   - age?
   - about your family?
   - marital status, children?
   - about your hobbies?
   - about your mentors and role models?
   - how do you see yourself?

2. How do you feel about being a part of this study?
3. Tell me about your engineering career.

   Probes:

   - degree work?
   - specific jobs?

4. What sort of expectations did you have when you started your career?

   Probes:

   - about your professional life?
   - about your personal life?

5. Tell me about your experience of being an engineer?

   Probes:

   - what does it feel like?
   - how do you interact with others?
   - what has been your best experience?
   - what has been your worst experience?

6. Which of your qualities have contributed most to your success?

   Probes:

   - if I were interviewing you for a job you wanted, why should I hire you instead of the other people in your office?
   - how did these qualities compare to others around you?

7. Tell me about when you have been the most satisfied since you entered the workplace?

   Probes:

   - what was going on at work?
   - what was going on in your personal life?

8. Tell me about when you have been the most dissatisfied since you entered the workplace.

Probes:

- what was going on at work?
- what was going on in your personal life?

9. If you could sum up your experience as an engineer in a word or phrase, what would that be?

Probes:

- can you tell me more about that?

10. What sort of future expectations do you have?

Probes:

- about your professional life?
- about your personal life?

General Probes

Can you give me an example of that?

How did you feel about that?

Tell me more about that situation.

Would you explain that to me?

APPENDIX C

INTERVIEW GUIDE - MANAGERS

Interview Guide For Managers

1. Tell me about yourself.

   Probes:

   - age?
   - about your family?
   - marital status, children?
   - about your hobbies?
   - about your mentors and role models?
   - how do you see yourself?

2. How do you feel about being a part of this study?
3. Tell me about your career.

   Probes:

   - as a manager?
   - your personal life?

4. Tell me about your qualities that have contributed to your success?

   Probes:

   - how have you been different from your peers?

5. To what extent have you worked with many female engineers? Managed many?
6. What sort of expectations do you believe female engineers have?

   Probes:

   - in their careers?
   - in their personal lives?
   - are these different from males?

7. Research indicates that as engineers approach mid-career, females are not as satisfied as males. (Describe the SWE typical Curve) Why do you think this is?

   Probes:

   - specific examples?
   - why do you believe your rationale?

8. What do you do differently with regard to female engineers than males?

   Probes:

   - based on career choices?
   - based personal life situations?

9. Describe how you see yourself in the future.

Probes:

- in your career?
- in your personal life?

General Probes

Can you give me an example of that?

How did you feel about that?

Tell me more about that situation.

Would you explain that to me?

APPENDIX D

TRANSCRIBER STATEMENT OF CONFIDENTIALITY

Transcriber's Pledge of Confidentiality

As the transcribing typist of this research project, I understand that I will be hearing tapes of confidential interviews. The information on these tapes has been revealed by research participants who participated in this project on good faith that their interviews would remain strictly confidential. I understand that I have a responsibility to honor this confidentiality agreement. I hereby agree not to share any information on these tapes with anyone except the primary researcher of this project.

Any violation of this agreement would constitute a serious breach of ethical standards, and I pledge not to do so.

Transcribing Typist _____

Printed Name _____

Date _____

INDEX

—A—

Aburdene, 17, 19, 20, 142, 144
African American, 46
aggressive, 23, 59, 85, 86, 88, 90, 109, 112, 124, 125, 131, 132
assumption, 58
assumptions, 11, 109, 130, 134
astronaut, 45
attrition, 2, 5, 8

—B—

Baum, 5, 25, 142
best experience, 58, 59, 60, 61, 62, 64, 66, 93, 99, 121, 122, 123, 137
Best Experiences, 61, 63
bias, 10, 14, 15, 16, 17, 30, 31, 33, 34, 105, 129, 134
boundary heightening, 15, 130
bracketing interviews, 10

—C—

Catalyst, 4, 15, 22, 23, 130, 142
Charles, 40, 44, 86, 88, 89, 103, 104, 110, 111, 112, 113
children, 22, 27, 41, 43, 47, 52, 70, 73, 91, 97, 104, 106, 107, 108, 109, 110, 111, 112, 114, 115, 117, 118, 119, 126, 131, 134, 135, 139
coach, 15, 76
constructivist approach, 28
constructivist theory, 36
control, 21, 22, 24, 28, 31, 46, 51, 53, 56, 60, 64, 66, 69, 70, 74, 76, 96, 99, 102, 123, 126, 130
critical incident, 33, 58, 136, 142
critical incident theory, 11, 27
critical incidents, 33, 58, 136

—D—

dad, 45, 94, 108, 131
Dana, 40, 53, 54, 61, 68, 71, 96
Dilbert, 22, 142
discrimination, 22, 82, 131
Donna, 40, 52, 53, 55, 58, 65, 66, 68, 100

—E—

Emily, 40, 43, 52, 55, 65, 66, 70, 99, 110, 130
entitled, 16
entitlement, 16
expectations, 21, 23, 25, 26, 33, 34, 48, 49, 52, 67, 68, 69, 70, 71, 72, 73, 74, 75, 79, 82, 83, 117, 123, 127, 131, 136, 137, 139
expert, 16, 55, 80, 92, 103, 104, 105

—F—

family, 8, 18, 21, 22, 23, 28, 29, 30, 33, 41, 44, 45, 47, 48, 50, 67, 70, 71, 73, 85, 88, 89, 90, 97, 102, 106, 107, 108, 109, 110, 111, 112, 113, 114, 115, 116, 117, 118, 119, 121, 127, 130, 131, 132, 133, 134, 136, 137, 139, 140
father, 45, 47, 111, 113, 139
Faye, 54, 65, 68, 99, 100
field dependence, 11
Flanagan, 11, 142

—G—

gender appropriateness, 19
geographic, 1, 21, 29, 32, 137
glass ceiling, 6, 7, 18, 96

—H—

hands-on, 60, 62
Harold, 14, 40, 44, 77, 80, 83, 84, 86, 87, 103, 104, 106, 109, 110, 111, 112, 126, 130
Helgesen, 8, 24, 131, 132, 143
hobby, 43, 107
Hudson Institute, 4, 17, 18, 143
husband, 119, 124

—I—

incomplete occupational socialization, 11
informed consent, 32, 35, 149

—J—

John, 17, 22, 26, 39, 40, 44, 75, 78, 81, 82, 84, 85, 101, 102, 112, 114, 127, 136, 142, 144, 145
Joy, 40, 50, 52, 55, 95, 103, 104, 109
Judith, 42, 52, 54, 61, 65, 66, 71, 93, 94, 95, 96, 107, 108, 124, 125, 144, 145
Julia, 40, 52, 55, 56, 63, 64, 68, 69, 72, 94, 95, 97, 100, 117, 128, 129

—K—

Kanter, 15, 19, 126, 130, 143
Katzenbach, 24, 143

—L—

Lareau, 21, 22, 143
Laura, 40, 52, 63, 64, 68, 69, 70, 95, 97, 98, 100, 109, 110
Levinson, 33, 144
Lucy, 40, 45, 50, 52, 61, 107, 108

—M—

Maria, 40, 45, 50, 52, 68, 71, 99, 100
marriage, 41, 106, 109, 112, 117
Mary, 40, 42, 52, 55, 59, 62, 64, 70, 98, 103, 104, 107, 109, 110, 121, 133
McIlwee, 6, 7, 16, 21, 130, 133, 144
Megatrends, 17, 19, 20, 142, 144
mentor, 76, 77, 78, 98
Meredith, 40, 45, 52, 54, 68, 100, 121, 123, 124
Michelle, 1, 40, 54, 65, 67, 124
minority, 12, 13, 14, 17, 19, 22, 29, 45, 46, 84, 127
mom, 45, 56, 107, 126, 134
mother, 52, 89, 106, 111, 113, 131, 134

—N—

Naisbitt, 6, 17, 19, 20, 142, 144

—O—

opportunity, 4, 14, 19, 24, 30, 31, 34, 36, 37, 58, 59, 62, 67, 70, 71, 79, 82, 83, 84, 89, 91, 92, 93, 94, 95, 96, 97, 98, 99, 101, 102, 103, 104, 105, 107, 108, 114, 117, 118, 130, 132, 136, 137
oppression, 2, 16, 48, 133, 134
oriental, 46

—P—

paradox, 50, 88, 105, 131, 138
paradoxes, 75, 88, 137
perception, 11
Peter, 40, 76, 77, 80, 82, 83, 87, 99, 103, 111, 127, 130
prototypicality, 29

—R—

Rachel, 40, 45, 71, 94, 99, 100, 108
recognition, 20, 21, 78, 91, 92, 99, 100, 103, 104, 105, 112, 121, 126, 136, 137
role model, 23, 49, 75, 78

—S—

Sam, 40, 44, 78, 82, 101, 102, 103, 112, 114
Sharon, 40, 42, 52, 72, 95, 97, 98, 120, 125, 126, 128, 131, 143
spouse, 41, 97
Steve, 40, 44, 76, 77, 80, 82, 83, 84, 86, 94, 95, 101, 103, 111, 112, 113, 130
SWE, 5, 25, 34, 145

—T—

task oriented, 60, 64, 67, 76, 78, 88, 121
token, 8, 14, 20, 89, 126, 130, 131
tokenism, 6, 19, 129, 133, 134, 139, 142, 146
Tom, 40, 44, 78, 81, 84, 88, 89, 92, 101, 103, 104, 112, 114, 145

—W—

Whyte, 3, 20, 146
wife, 44, 65, 89, 97, 111
Witkin, 11, 31, 146
Workforce 2000, 17, 18, 19, 143
worst experience, 33, 48, 49, 58, 60, 64, 66, 74, 96, 100, 123, 126, 130, 136, 137
Worst Experiences, 65

—Y—

Yoder, 17, 19, 20, 133, 146

—Z—

Zimmer, 20, 146

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Janie Elaine Seat was born in Nashville, Tennessee in 1956. She attended the University of Tennessee, Knoxville, where she received her BS and MS degrees in Mechanical Engineering in 1979 and 1983, respectively. After a career in engineering, she returned to the University of Tennessee, Knoxville, and received the Doctor of Philosophy in Education with an emphasis in Sport Psychology/Human Motor Behavior in 1996.

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