IDENTIFICATION OF FACTORS WHICH FACILITATE AND HINDER THE CAREER ADJUSTMENT OF WOMEN ENGINEERS

by

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Date April 24, 1998
Abstract

A qualitative study involving twenty women engineers from the Lower Mainland and Kootenay region of British Columbia was undertaken to determine what factors hinder and facilitate their career adjustment. In the past, there has been an emphasis on the recruitment of women into the field of engineering; unfortunately, little attention has been given to retaining women once they finish their formal education. This study involved a semi-structured interview as well as a demographic questionnaire and focused on the factors which facilitated and hindered career adjustment. For those situations where women described incidents that hindered job satisfaction, they were also asked how they coped with these situations. Two additional pieces of information were gathered, how they chose to become engineers, and how they see their futures in engineering. Results from this study indicate that relationships in the workplace, career development issues, support, being excluded and women's issues are major factors in job satisfaction. Results also indicate that some methods of coping with hindering experiences may put some women at risk for leaving the field of engineering. Results from this study may assist counsellors and engineering associations in the development of strategies for the retention of women in engineering.
# Table Of Contents

Abstract ii  
Table of Contents iii  
List of Tables iv  
Acknowledgments v  

Chapter One: Introduction ................................................................. 1  
Chapter Two Review of the Literature.............................................. 6  
  Women in the Workforce ............................................................... 6  
  Factors Which Influence Career Development................................. 7  
  Career Adjustment in Non-traditional Occupations........................... 11  
  Women in Engineering................................................................. 13  
  Summary of Literature.................................................................... 16  
Chapter Three Methodology............................................................... 18  
  Participants..................................................................................... 18  
  Methodological Approach.............................................................. 20  
  Interview Questions......................................................................... 21  
  Data Collection................................................................................ 22  
  Data Analysis.................................................................................. 23  
  Validity Check................................................................................ 24  

Chapter Four Results and Discussion ............................................... 26  
  Hindering Critical Incident Themes................................................ 29  
  Facilitating Critical Incident Themes............................................. 40  
  Coping Methods............................................................................. 52  
  Reason for Choosing the Field of Engineering............................... 56  
  Future in Engineering..................................................................... 57  
  Summary of Experience................................................................. 58  

Chapter Five Summary and Conclusion ............................................ 61  
  Theoretical Implications............................................................... 61  
  Implications for Counselling.......................................................... 65  
  Implications for Engineering Associations...................................... 67  
  Limitations of the Study................................................................. 67  
  Implications for Future Research.................................................... 69  

Chapter Six References .................................................................... 70  

Appendix......................................................................................... 75
List of Tables

1. Demographic Information ................................................................. 19
2. Hindering Critical Incidents .............................................................. 27
3. Facilitating Critical Incidents ............................................................. 28
4. Reason for Choosing to be an Engineer ............................................. 58
5. Future in Engineering ................................................................. 58
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Chapter One
Introduction

The study of career development for women is a relatively new area in psychology. Previous to the 1960's the majority of the labour force consisted of men; (Statistics Canada, 1987) accordingly, the study of career and the theories which arose out of those studies primarily focused on men (Betz & Fitzgerald, 1987). In the 1960's, as a result of the women's movement, economic factors, higher education and increased divorce rates, women began to enter the labour force in record numbers, and in 1993 accounted for 45% of the labour force in British Columbia (Ministry of Women's Equality, 1994). This influx of women into the labour force led to the realization that existing career development theories, counselling techniques and educational programs did not address the specific needs of women. To rectify this problem, many areas of career development research now includes women (Betz & Fitzgerald).

This research has revealed several differences between men and women and their career choices and career experience. One major difference identified is the paucity of women in mathematics and science oriented fields of study. Factors such as gender bias, differential treatment by parents, career counsellors, society and the educational system have been identified as barriers to women entering fields of study in math and sciences (A Capella, 1990; Berkovitz, 1993). Once these factors were identified, several changes in the educational system were made to remove these barriers and encourage women to enter non-traditional fields of study.

In some fields, the changes in the educational system have been effective; gains have been made by women in many professional male dominated occupations such as law
and medicine (Kilian, 1998). Unfortunately, the increase of women studying in non-traditional fields and the subsequent increase of women working in these fields is not reflected in all disciplines; the field of engineering remains a relatively all male occupation (Alfred, 1989; Hughes, 1995). In Canada, the enrollment of women into university engineering programs has increased but the participation rate of women engineers in the labour force remains "...dismal..." (Human Resources Committee, 1993, p. 17).

Why are there so few women in engineering? In order to address this problem, at the More than Just Numbers Conference, in 1992, several recommendations were made in an attempt to increase female enrollment in engineering programs. These recommendations included portraying women engineers and scientists in the media, gender awareness training, and creating female friendly universities. Both the enrollment statistics of women in university engineering programs and the reports presented at the More Than Just Numbers Conference in 1995, suggest that several of these recommendations were successful.

Although there has been an increase in women studying engineering across Canada, there is very little research on the experience of women once they have started working as engineers (van Beers, 1995). There is evidence to suggest that women continue to confront barriers to their career development once they enter the field (Betz, 1994; Mcilwee & Robinson, 1992). These barriers may lead to women not reaching their full potential as engineers or choosing to leave the field entirely.

Presently, there is a focus on recruiting women in this field but there is little focus on retaining women (Human Resources Development Canada, 1994). Although efforts to
recruit women into the field of engineering must continue, it is important to look at the experience of women working in the field of engineering to determine what factors are important to retain them in the field. In an attempt to gain an understanding of the experience of women engineers, it is important to look at their experience of career adjustment. Career adjustment describes "... what happens to an individual after career entry" (Betz, 1993, p. 637). Research that describes the career adjustment of women engineers may identify what factors facilitate and hinder adjustment and this information can be used to develop strategies to retain women in these careers.

The purpose of the present study was to identify the factors which act as facilitators and the factors that act as barriers to the career adjustment of women engineers. Betz (1993) advocates specifically focusing on the barriers and facilitators of women's career choice not only to develop an understanding of career choice but "...for designing appropriate interventions..." (p. 637). Several factors of career choice appear to influence career adjustment, such as sex-role stereotyping, self-esteem and self-efficacy (Mcilwee & Robinson, 1992). As a result, focusing on the facilitators and barriers of career adjustment appears to be appropriate for the study of career adjustment as well as career choice. In addition, looking at career adjustment may reveal different factors that act as facilitators and barriers which only become apparent after entering the workforce.

Given that there is very little research done in this area, an exploratory study using a qualitative method of inquiry was chosen as the form of research. Within the qualitative framework, the critical incident technique (Flanagan, 1954) was used. This method of research involves semi-structured interviews which concentrate specifically on the factors that hindered or facilitated an experience.
Another reason for selecting a qualitative methodology is to limit the effect of researcher bias. I believe that there are several factors that hinder women’s career adjustment. First, I think co-workers and employers have greater expectations of their female employees than their male counterparts. I believe their work is reviewed more critically and praised less often. I also think male dominated occupations are less flexible when maternity leave or family related leave is required. Career adjustment is also problematic because there are fewer female mentors or support networks available to women, especially in smaller companies and rural areas. Giving participants the opportunity to describe their experiences and then receiving feedback about my interpretation, helps to minimize researcher bias.

The participants in this study were women who had worked not more than ten years in the field of engineering. In an attempt to develop an understanding of all women engineers, participants working in several different types of work locations such as private consulting companies, crown corporations and industry, were interviewed. Geographically, women from both the Lower Mainland and from the Kootenay region of British Columbia were included in the study. In total twenty women engineers participated. Participants were recruited by an announcement in the Division for Advancement of Women in Engineering and Geoscience (DAWEG) newsletter and referral from other engineers.

It is important to note that although twenty women agreed to participate in this study, several more women from across British Columbia expressed an interest. Unfortunately, because of geographic and financial limitations these women could not be included in this study. What does this say about women in engineering? It indicates this
study is both timely and necessary. Women in engineering want and need to have their stories told.

It is hoped that the results from this study will be used by career counsellors, to encourage women to enter a non-traditional field of study and also by professional organizations to develop strategies to retain women currently working in the field of engineering.
Chapter Two
Literature Review

The study of women’s career adjustment in non-traditional occupations has been very limited, especially within the field of engineering. Although much work has been done to recruit women into engineering, it still remains a relatively male dominated. Carter & Kirkup (1990) suggest the field of engineering will improve for women once they make up a “significant proportion of the profession” (p. 99). To help women achieve this goal it is important to understand the recent history of women’s career development.

Women in the Workforce

Women have now become a large component of Canada’s labour force, representing 44% of employed workers across all occupations (Alfred, 1989). They have entered the job market in large numbers not only out of financial necessity but also for non-monetary rewards such as increased self-esteem and social contact (Feree, 1976). Although financial necessity is one major reason for the increase of women in the workforce, women still remain concentrated in lower paying “pink collar” jobs such as clerks and secretaries (Betz & Fitzgerald, 1987), which hold little possibility for career advancement. Presently, women earn sixty-six cents for every dollar a man earns in the labour market (Alfred). This is also seen in professional occupations where women tend to be concentrated into lower paying occupations such as elementary school teachers and nurses (Betz & Fitzgerald). Women who enter non-traditional fields of work often experience “re-segregation”, where they become concentrated in jobs which are usually lower-paying and offer less opportunity for career advancement (Mcilwee & Robinson, 1992).
It has been suggested that one of the reasons women remain concentrated in lower paying occupations is because current career development theories do not account for the specific needs, concerns and societal barriers that influence career choice for women (Mawson, 1989). Gilligan, (1982), claims the female experience has, to a large part, been neglected in the literature on human development. If a woman did not “fit” into the current human development model, there was a problem with her, not with the model. Many psychological theories are based on beliefs about human development and from these theories counselling frameworks have been developed. Since human development concepts are based largely on the male life experience it is reasonable to assume that counselling frameworks are grounded in male life experience as well. Unfortunately, career development theories have followed this trend and little attention is given to the difference of the female experience or the implications that has on career development (Gustafson, & Magnusson, 1991; White, 1970).

Factors which Influence Career Development

The initial research in the area of female career development has focused on identifying differences in male and female experiences. Three interrelated areas which have evolved out of the literature on gender differences and gender biases are: sex role stereotyping, self-esteem and self-efficacy. Sex role stereotyping occurs:

Whenever specific behaviors, abilities, interests, and values are attributed to one sex... the stereotypes are culturally defined, reinforced by parents, students, teachers and the students themselves (Carelli, 1988. pp. xiii).

John Battle believes that for adolescents, self-esteem involves the following four interrelated elements:
1. general self-esteem: an individual’s overall view of her perception of self-worth;

2. social self-esteem: the individual’s perception of interpersonal peer relationships;

3. parent-related self-esteem: the individual’s perception of her status at home, including how her parents view her; and

4. academic self-esteem: the individual’s perception of her ability to succeed academically.

(as cited in Edwards, 1993, p. 2)

This definition is consistent with the findings in a study by Walters & Sroufe (1983) which found the predictors of high self-esteem were parent, peer and school support systems.

Self-efficacy is a person’s belief in their ability to accomplish a task (Bandura, 1977). Self-efficacy determines if a task will be initiated and, if initiated, how long a person will persist in that task when they are experiencing barriers to completing that task. (Hackett & Betz, 1981).

Self-esteem, self-efficacy and sex role stereotyping are concepts which are interrelated and can become barriers to women in career development (Betz, 1993). The stereotypical female is expected to be passive, agreeable and sociable while males are expected to be assertive and confident (Harper & Marshall, 1991). As a result, the two sexes are often treated differently in school, home and community. In school, Berkovitz, (1993) reports that teachers call on boys and praise boys for their contributions more often than girls. Educators Myra and David Sadker (1994) have studied sexism in the schools for over twenty years and have found that teachers initiate communication with boys, ask boys more open ended questions and give detailed instructions more often to
boys than girls. They also report that teachers praise girls for their neatness and
behaviour and are more likely to take over and finish a learning activity more often for
females. Sexrole stereotyping occurs because girls are being rewarded for stereotypical
behaviour. When teachers don't allow girls to finish their learning activity, lower self-
efficacy is the result because it sends girls the message that they are unable to finish the
task and is probable that they will not attempt this task in the future. When a teacher
doesn't initiate communication with a girl or call on her in class, general self-esteem
decreases because they begin to doubt their self-worth.

The effect of this differential treatment becomes apparent in adolescence. In the
Greenberg- Lake study (1994), 3000 American children from ages 9-15 were surveyed
and a 7 point difference in self-esteem scores at age 9 rose to a 17 point difference at age
15. Although the Greenberg-Lake study may be biased because females were
oversampled, several other studies report increased differences in self-esteem, confidence
and attitudes towards math and sciences between adolescent girls and boys (Sadker &
Sadker, 1994; Soucie, 1993). Edwards (1993) reports similar concerns about the
difference between male and female self-esteem for Canadian adolescent females.

In school, teacher bias may result in females believing their opinions aren't valued
and they can begin to doubt their ability in academic areas. This can lead to lower self-
efficacy and they start to lack confidence and avoid situations where they do not think
they will succeed. This perceived lack of ability becomes more apparent in the science
and math courses where this effect is intensified by the smaller number of female science
and math teachers at the high school level. Gustafson & Magnusson (1991) capture this
process with their statement: "low self-esteem creates a propensity for individuals to
cease persisting in difficult tasks and to choose instead tasks in which success in relatively assured, thereby protecting themselves from experiencing further failure” (p. 17).

Unfortunately, the perception of ability is often not related to actual ability in females (Junge & Dretzke, 1995; Sayer, 1993) but this perception prevents females from pursuing further education in math and science. Once females stop pursuing studies in math and sciences they greatly narrow their career choices because the majority of university, technical and vocational programs have these courses as prerequisites (Betz & Fitzgerald, 1987; Campbell, 1991; Rea-Proteat & Martin, 1991).

The lack of positive role models may also be a factor which contributes to low self-esteem, low self-efficacy and sexrole stereotyping for females. The contribution of females is largely ignored in history (Edwards, 1993; Sadker & Sadker, 1994), and therefore females do not learn about successful women in school. In addition, school textbooks often confirmed sexrole stereotyping by depicting men doing professional or trade occupations and depicting women in traditional female roles (Carelli, 1988).

What does all of this have to do with career development? Low self-esteem and sexrole stereotyping play a major role in females narrowing their career choices and usually selecting a traditional female occupation (Berkovitz, 1993). Although females appear to have clearer career goals and aspirations in high school compared to males, they are less likely to achieve these goals (Gassin et al, 1993) which may be a result of low self-efficacy.

Betz and Fitzgerald (1987) report that sexrole stereotyping in education is a major area which results in a limited range of career choices for women. In an attempt to
address this issue, recommendations for changes in career counselling, curriculum, course availability, teacher behavior, use of appropriate examples and textbooks have been suggested and in some areas implemented (Betz and Fitzgerald; Carelli, 1988; Eccles, 1992). Increased enrollment rates of women in non-traditional fields of study indicate these changes have had an effect of female career choice. In some non-traditional areas, women make up almost 50% of the students at the university level (Statistics Canada, 1987). It is not surprising that women who score high on self-esteem and self-efficacy measures and have not experienced a large degree of sexrole stereotyping are more likely to enter into non-traditional fields of study (Nevill & Schelecker, 1988). Additional factors which have been shown to be influential to selecting a non-traditional career path are exposure to female role models, positive encouragement from a teacher or parent, an aptitude in math's and sciences and awareness of non-traditional job opportunities (Betz, 1993; Mcilwee & Robinson, 1992; Rea-Proteat & Martin, 1991).

Although several areas of non-traditional study women make up 50% of the students, one area that has shown a less substantial increase is the field of engineering, which increased from approximately 1% enrollment in 1971 to 19% in 1993 (Lajeunesse, 1995).

Career Adjustment In Non-traditional Occupations

Although factors which influence career choice have been identified and some appropriate changes in the education system have been made, resulting in increased enrollment for women in non-traditional fields of study, women are not remaining in these occupations after graduation or they experience re-segregation. Jacobs, (1989), reports in the United States that for every eleven women who enter a non-traditional
occupation, ten leave, usually for an occupation in a traditional field. In Canada, when Ontario Hydro downsized, a much greater number of women in non-traditional fields opted for early retirement or volunteered to leave compared to the male employees; unfortunately, this appears to be a general trend across Canada (Human Resources Development Canada, 1994).

For women who chose to stay in the field of engineering re-segregation often occurred. Mcilwee & Robinson (1992) found that women were restricted in promotion, power and received lower pay than their male counterparts in a study of women engineers in California. In British Columbia with the exception of the years 1990-1993, women received lower starting salaries than males.

The research in the area of career adjustment for women in non-traditional occupations provides some insight into factors which influence women to remain in non-traditional occupations. Rayman & Brett, (1995) looked a sample of 369 women who had attended a women’s college in the United States over the years of 1983 to 1991. The measure used in this study was a mail out questionnaire developed by the authors. The results indicated that several factors such as college major, parental encouragement and career advisement by faculty are positive influences in persistence in science careers. This questionnaire was developed by the authors with the assistance from the college’s academic science community. This is a flaw in the study, however, since the entire questionnaire is limited to only those factors which the academic community has seen or believes to be issues surrounding why women persist in science careers.

As Conwell (1992) reports, there is evidence to suggest that the workplace environment is one reason women leave non-traditional occupations, specifically in the
science and engineering fields. In 1987, the Corning Corporation research, development and engineering division had a 15% female attrition rate compared to 5% for males. In an effort to decrease the high rate of female attrition, the company introduced a project which included offering flex time work opportunities, mentoring, and awareness of gender insensitivity training to all employees in this division. In just three years female attrition rate dropped to approximately 5%. This project was very successful in altering the workplace environment to make women's career adjustment easier; but solutions such as these may be too costly for smaller companies to implement.

Women In Engineering

The study of women in engineering is relatively new and until recently the focus has been on increasing enrolment in engineering programs. At the “More than Just Numbers Conference” in 1992, several recommendations were made in an attempt to increase female enrolment in engineering programs. These recommendations ranged from portraying women engineers and scientists in the media, gender awareness training, to creating female friendly universities. Both the enrolment statistics of women in university engineering programs and the reports presented at the More than Just Numbers Conference 1995, indicate that several of these recommendations have been successfully implemented and were effective. It is important to applaud the success of these initiatives but there is still much work to be done. Roberts et al (1995), state:

Society has encouraged young women to enter non-traditional courses of study but has not changed its institutions enough to be “female friendly”. As a result, many women do not complete their studies or continue to pursue their careers. We should not be satisfied with more entrants, but continue to press for more graduates, teachers and professionals. (p. 79).
This statement suggests it is now time to study women who have worked as engineers and learn from their experiences. From this information it is possible to develop strategies for retention of women in engineering.

There have been very few studies of women engineers but the existing studies do suggest women experience several barriers to career adjustment. Finlayson, (1995), interviewed two women who had worked in the field of engineering. Both women were obviously high achievers and successful in their studies since they had won various scholarships and awards; however, their reported experience of working in the field of engineering is very different. One stated she was discriminated against while looking for a job and after finding employment because she was female. She found it lonely and didn’t feel accepted by her male co-workers. The other women reported her first job experiences taught her that she was most effective in an environment which was supportive and used a team work approach and found work in engineering environments that provided these factors. These brief case studies indicate it is an interaction of both personality characteristics and the workplace culture which play a major role in career adjustment. This has been supported by studies done on women in engineering (Carter & Kirkup, 1990; Human Resources Development Canada, 1994; Mcilwee & Robinson, 1992).

It also appears sex-role stereotyping and lowered self-efficacy also play a role in career adjustment. Mcilwee & Robinson (1992), state:

Where engineers as a group are powerful, the culture takes on a form strongly identified with the male gender role, emphasising aggressive displays of technical self-confidence as the criteria for success. As such, it devalues the gender role attribute of women, defining professional competence in strictly masculine terms. (p.138)
In addition to sex-role stereotyping, Mcilwee & Robinson suggest women lack self-confidence in performing manual tasks with tools and may avoid working on projects where the performance of such tasks is required. This experience is very similar to girls who experience lower self-efficacy and avoid tasks in school. Unfortunately, Mcilwee & Robinson found that in the early stages of an engineering career, the performance of manual tasks and use of tools are important factors in career advancement indicating an early limitation to career development.

Although sex-role stereotyping may be a disadvantage to women in the engineering field, there is a suggestion that traits usually considered feminine will be required in the future job market for engineers. In most areas of engineering there is a strong sense of competition and many women do not feel comfortable in this competitive role. This aspect of the job may be changing; results from a study of engineering graduates indicate that employers are now looking for individuals who use a teamwork approach, are creative and have good communication and interpersonal skills (Frize & Mclean, 1994).

Another major barrier to women’s career adjustment in the field of engineering are issues surrounding family. Society still views the women as the caregiver for the children in the family. The field of engineering is demanding and in most homes the primary responsibility of child care still rests with the mother, (Carter & Kirkup, 1990; Sharifi et al, 1995). In a 1993 work options survey done in B. C., 17% of the women surveyed stated they had left the profession, temporarily or permanently because of the
inflexibility of work options. Although other reasons were given for the desire to have a flexible work option, the first reason reported by women was child care (Sharifi et al).

A final barrier to the retention of women in engineering is the lack of career advancement and lower salaries compared to men. Two reasons women are initially attracted to engineering is its high salary and the opportunity to be challenged. What Mcilwee and Robinson (1992), discovered is that although women are often recruited at a higher salary than men, and offered attractive positions, they experience a downward trend in both salary and career advancement in comparison to men. In British Columbia, women usually start at a lower salary rate than men and are not given the same degree of responsibility on the job as their male counterparts (Ellis et al, 1995).

Summary of Literature

Much of the research in female career development has focused on factors which influence career choice and act as barriers to non-traditional occupations. The research findings have resulted in major changes being made at all levels of education. The benefit of these changes has been a substantial increase in women enrolling in non-traditional fields of study. Unfortunately there is a problem with retaining women in these educational programs and in the labour force. Some factors such as workplace culture, inequity in remuneration and responsibility, family commitments and lack of confidence, have been identified as problems with the retention of women in the field of engineering but there is still very little research done on women after entering the workforce. In an effort to develop strategies to retain women in the field of engineering, it is important to understand what their career adjustment experience is like. The
proposed study will explore and describe the factors which facilitate and hinder career adjustment in an attempt to provide a better understanding of this experience.
Participants

The participants involved in this study were women who were currently employed as engineers. Woolsey, (1986) suggests that few limits on subject sampling should be placed in order to ensure a wide range of critical incidents are obtained. In order to meet this requirement for subject sampling, the only limitation placed on participant selection was that they have not worked more than 10 years in the field of engineering.

In an attempt to develop a good understanding of the experience of women engineers, participants working in several different types of work locations such as private consulting companies, crown corporations and industry, were interviewed. Women from ten different engineering fields participated in the study. In total, twenty women were interviewed, seven of the participants lived in the Kootenay region of British Columbia and the remaining participants were from the Lower Mainland of British Columbia. Participants ranged in age from under 24 to 38. They were recruited by an announcement in the Division for the Advancement of Women in Engineering and Geoscience (DAWEG) newsletter, referral from other engineers and contacts in industry.

Interviews with the participants took place in their homes or at their work place and took approximately 45 minutes to complete. Participation also required completion of a demographic questionnaire. Information from this demographic questionnaire is presented in Table 1.
Table 1  
Demographic Information

<table>
<thead>
<tr>
<th>Subject</th>
<th>Age</th>
<th>Education</th>
<th>Field</th>
<th>University Attended</th>
<th>Marital Status</th>
<th>Number of children</th>
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<td>M. App. Sc.</td>
<td>civil</td>
<td>UBC</td>
<td>single</td>
<td>0</td>
</tr>
<tr>
<td>18</td>
<td>25-29</td>
<td>B. App. Sc.</td>
<td>mining</td>
<td>Halifax</td>
<td>married</td>
<td>0</td>
</tr>
<tr>
<td>19</td>
<td>35-39</td>
<td>B. App. Sc.</td>
<td>mechanical</td>
<td>Manitoba</td>
<td>single</td>
<td>0</td>
</tr>
<tr>
<td>20</td>
<td>35-39</td>
<td>B. E. Sc.</td>
<td>mechanical</td>
<td>Western</td>
<td>married</td>
<td>1</td>
</tr>
</tbody>
</table>
Methodological Approach

As mentioned previously, the career adjustment of women engineers is a relatively new area of study. This thesis used a qualitative format because it is both exploratory and descriptive. This approach allows women to tell their story and not be limited by preconceived theories or biases that are inherent when using quantitative methods.

Researchers in the area of counselling psychology and career development recommend increased use of qualitative methods. Gelso suggests it is time “...to take a ‘step back’: to experiment less and describe more” (1988, p. 395). This movement to a greater use of qualitative methods has also been suggested in career counselling literature. Borgen & Amundson (1988), propose that existing theories of career development need to be altered to account for the technological, economic and social changes in the work environment. In order to get an accurate description of career development, they suggest the use of qualitative methods.

Critical Incident Technique

Within the qualitative framework, this research used the critical incident technique developed by Flanagan (1954). This technique focuses on eliciting critical incidents which were “...either outstandingly effective or ineffective with respect to attaining the general aims of the activity” (p. 338). Betz (1993) states that research should focus on the factors that women see as barriers and facilitators in their career development; the critical incident technique offers the best approach to pinpoint these factors. The incidents reported by participants are grouped according to themes. The information obtained using this method has been shown to be both reliable and valid (Andersson & Nilsson, 1964).
This study followed the five steps of the critical incident technique as outlined by Woolsey (1986): 1) determining the aim of the activity to be studied, 2) setting plans, specifications, and criteria for the information to be obtained, 3) collecting data, 4) analyzing the thematic content of the data, and 5) reporting the findings.

The aim of the activity required the participants to describe the factors which were significant barriers and facilitators to their career adjustment. Woolsey (1986) suggests it is important to use everyday language when determining the aim to ensure that the meaning of the aim is not misunderstood by the participants. To ensure participants understood the aim of the study, a small pilot study was conducted to test the wording of the aim and interview questions. Since pilot participants did not appear to have difficulty understanding the aim of the study or the wording used in the interview questions no major modifications to the interview questions were made.

The end of data collection is determined when there appears to be a redundancy in the types of incidents being reported.

**Interview questions**

The interviews consisted of the following questions and followed Woolsey’s (1986), suggested format for critical incident interviews. This format involves establishing the aim of the interview and then asking the participant to describe specific critical incidents.

1. Please focus on the factors in your career which are necessary for your job satisfaction.

2. What are some of these factors?
3. Think of a particular time at the start of your career where you were satisfied/unsatisfied with your job.

4. What was happening then?

5. Please describe a particular incident when you did something or something happened that significantly facilitated/hindered your job satisfaction.

6. How did you cope with that?

Interview question 6 was only asked if participant was describing a hindering incident.

In addition to the questions above, two other questions were included at the end of the collection of critical incidents. The first, was “How did you choose to become an engineer?” and second was “How do you see your future in engineering?”. These questions were asked to address the recruitment and retention aspects of women engineers.

Data Collection

Data was collected in two ways, the completion of a demographic questionnaire and the actual interview. The demographic questionnaire was usually sent out to the participants after initial contact and before the interview so the participant could fill it out at their leisure.

Each interview began with the researcher explaining the purpose of the study and answering any questions the participant had. Once the participant indicated they fully understood the purpose and procedure of the study they were presented with the subject consent form. After the form was signed by both the participant and the researcher the tape recorder was turned on and the interview began.
The participants were asked the questions as outlined above. When data is being collected in an interview, there is a potential for research bias because of the opportunity to lead the participant. To prevent this from happening, Woolsey (1986) suggests using empathic listening and perception checking and Amundson and Borgen (1984) recommend a non-directive style when interviewing. The researcher tried to do both to ensure there was a complete understanding of the incident described and the participant had not been influenced or lead by any of the researchers comments during the interviews.

Once the participant had answered all the interview questions, the researcher asked if the participant had anything else to add. Then the researcher turned off the tape recorder and explained that once all the data was analyzed and categorized they would be contacted to provide feedback on the developed themes to ensure that the themes accurately described their experience.

Data collection ends when there is repetition in the types of critical incidents reported by the participants.

**Data Analysis**

The data analysis was done based on Woolsey (1986) suggested procedure. First, the critical incidents were transcribed from the taped interviews. These incidents were sorted into either facilitating or hindering incidents. Then the incidents were further sorted based on similar themes. In many cases, an incident had two or more factors which seemed to be independent of each other. When this occurred, a copy was made of the incident and it was placed into all the categories which seemed appropriate.
Once the themes were developed a reliability check was completed. This consisted of an M.A. student reading the incidents and placing them in the themes that were developed previously by the researcher. Agreement in 85% of the cases was achieved. This meets with the acceptable criteria of 75%-85% suggested by Andersson & Nilsson, (1964).

After the reliability check, the incidents were tallied, in two ways. First, by participation rate, which is the number of participants who described an incident which fell into the particular category and also by the total number of incidents reported for that category.

After the critical incidents were categorized, the coping methods for the hindering incidents were analyzed. This analysis was done in a similar manner to the critical incidents. The coping methods were transcribed and then grouped into categories which appeared to have a similar theme. Responses to the final two questions, how the participants chose to be an engineer and how they saw their future, were tallied and grouped according to similar responses.

Validity Check

Once the data had been analyzed and grouped into themes, ten participants were contacted for a validity check. A copy of their transcribed interview and a list of the themes were sent to them before the second interview was conducted. Nine of the interviews were conducted over the phone and one was in person. In the interview, the data analysis procedure was explained to them and then they were asked to provide feedback on the thematic categorization of their experiences.
All of the participants felt the themes accurately described their experiences. Some suggested minor changes to their transcribed interviews but these changes didn’t result in a change in the way the themes were categorized.
Chapter Four

Results

This section will describe the results of the study. First the results of the critical incident analysis of both hindering and facilitating themes will be presented, followed by a description of the coping methods used by participants when faced with a hindering incident, how participants chose to be an engineer, and finally how they see their future in engineering.

Critical Incident Analysis

The twenty participants in this study reported a total of two hundred and fifty incidents which either facilitated or hindered their job satisfaction. Out of these incidents, 151 (58%) hindered job satisfaction and 108 (42%) facilitated job satisfaction. The average number of incidents reported per participant was 12.9, with a range of 2 to twenty-two incidents. All participants reported at least one hindering and one facilitating incident.

The 259 incidents were sorted into groups which appeared to have a common theme. Out of this process, eleven hindering themes and ten facilitating themes emerged. Within each of them, two or more sub-categories also emerged. The hindering themes are presented in Table 2 and are rated based on the number of participants who reported an incident that fell into a specific category (participation rate), and also by the number of incidents reported in total by all participants for that category. The facilitating themes are presented in Table 3 and follow the same format.

For each of the categories which had a participation rate of 20% or more, a description of the theme, the range of the experiences within each category, the sub-
categories and direct quotations to illustrate each theme from the participant interviews will be presented.

Table 2
Hindering Critical Incidents

<table>
<thead>
<tr>
<th>Category</th>
<th>Participation Rate</th>
<th>Number of Critical Incidents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Relationships</td>
<td></td>
<td></td>
</tr>
<tr>
<td>a) with co-workers</td>
<td>70%</td>
<td>32</td>
</tr>
<tr>
<td>b) with senior engineers, bosses</td>
<td></td>
<td></td>
</tr>
<tr>
<td>c) with contractors, technicians</td>
<td></td>
<td></td>
</tr>
<tr>
<td>d) mentors</td>
<td></td>
<td></td>
</tr>
<tr>
<td>e) clients</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Career development</td>
<td></td>
<td></td>
</tr>
<tr>
<td>a) unable to get into area of interest</td>
<td>65%</td>
<td>24</td>
</tr>
<tr>
<td>b) lack of educational opportunities</td>
<td></td>
<td></td>
</tr>
<tr>
<td>c) unstable employment</td>
<td></td>
<td></td>
</tr>
<tr>
<td>d) promotion/salary increase</td>
<td></td>
<td></td>
</tr>
<tr>
<td>e) recognition</td>
<td></td>
<td></td>
</tr>
<tr>
<td>f) P. Eng. Issues</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Invisibility</td>
<td></td>
<td></td>
</tr>
<tr>
<td>a) being ignored</td>
<td>55%</td>
<td>22</td>
</tr>
<tr>
<td>b) being excluded</td>
<td></td>
<td></td>
</tr>
<tr>
<td>c) feeling undervalued/not taken seriously</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Professional Pitfalls</td>
<td></td>
<td></td>
</tr>
<tr>
<td>a) lack of authority</td>
<td>55%</td>
<td>15</td>
</tr>
<tr>
<td>b) lack of challenge/boredom</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Women’s issues</td>
<td>50%</td>
<td>20</td>
</tr>
<tr>
<td>Lack of support</td>
<td></td>
<td></td>
</tr>
<tr>
<td>a) from bosses/management</td>
<td></td>
<td></td>
</tr>
<tr>
<td>b) from co-workers</td>
<td></td>
<td></td>
</tr>
<tr>
<td>c) from company</td>
<td>35%</td>
<td>12</td>
</tr>
<tr>
<td>d) from Professional Association</td>
<td></td>
<td></td>
</tr>
<tr>
<td>e) from mentors</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Workplace Structure</td>
<td></td>
<td></td>
</tr>
<tr>
<td>a) unions</td>
<td>30%</td>
<td>10</td>
</tr>
<tr>
<td>b) bureaucracy</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ageism</td>
<td>20%</td>
<td>6</td>
</tr>
<tr>
<td>Having work questioned</td>
<td>15%</td>
<td>4</td>
</tr>
<tr>
<td>Lack of ethics/Unsafe work practices</td>
<td>10%</td>
<td>3</td>
</tr>
<tr>
<td>Non-monetary benefits</td>
<td>5%</td>
<td>2</td>
</tr>
<tr>
<td>Unsure</td>
<td>5%</td>
<td>1</td>
</tr>
</tbody>
</table>
Table 3
Facilitating Critical Incidents

<table>
<thead>
<tr>
<th>Category</th>
<th>Participation Rate</th>
<th>Number of Critical Incidents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Career Development</td>
<td></td>
<td></td>
</tr>
<tr>
<td>a) promotion/new job</td>
<td>75%</td>
<td>25</td>
</tr>
<tr>
<td>b) salary increase</td>
<td></td>
<td></td>
</tr>
<tr>
<td>c) educational opportunities</td>
<td></td>
<td></td>
</tr>
<tr>
<td>d) recognition</td>
<td></td>
<td></td>
</tr>
<tr>
<td>e) groomed by management</td>
<td></td>
<td></td>
</tr>
<tr>
<td>f) P. Eng Issues</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Relationships</td>
<td></td>
<td></td>
</tr>
<tr>
<td>a) with co-workers</td>
<td>55%</td>
<td>18</td>
</tr>
<tr>
<td>b) with bosses</td>
<td></td>
<td></td>
</tr>
<tr>
<td>c) with clients</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Support/Help</td>
<td></td>
<td></td>
</tr>
<tr>
<td>a) from boss/management</td>
<td>50%</td>
<td>12</td>
</tr>
<tr>
<td>b) from co-workers</td>
<td></td>
<td></td>
</tr>
<tr>
<td>c) from friends, associations, external networking</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nature of work</td>
<td></td>
<td></td>
</tr>
<tr>
<td>a) seeing project come together</td>
<td>40%</td>
<td>14</td>
</tr>
<tr>
<td>b) project freedom</td>
<td></td>
<td></td>
</tr>
<tr>
<td>c) challenge/problem solving</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Confidence</td>
<td></td>
<td></td>
</tr>
<tr>
<td>a) shown by boss</td>
<td>35%</td>
<td>9</td>
</tr>
<tr>
<td>b) shown by co-workers</td>
<td></td>
<td></td>
</tr>
<tr>
<td>c) in self</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operational Networking</td>
<td>30%</td>
<td>6</td>
</tr>
<tr>
<td>Travel/Field work</td>
<td>30%</td>
<td>6</td>
</tr>
<tr>
<td>Working with women/Relationships with female engineers</td>
<td></td>
<td></td>
</tr>
<tr>
<td>a) as co-workers/supervisors</td>
<td>25%</td>
<td>6</td>
</tr>
<tr>
<td>b) as role models/mentors</td>
<td></td>
<td></td>
</tr>
<tr>
<td>c) as friends</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Respect of Subordinates, Contractors, Peers</td>
<td>25%</td>
<td>5</td>
</tr>
<tr>
<td>Non-monetary benefits</td>
<td></td>
<td></td>
</tr>
<tr>
<td>a) flex time/part time</td>
<td>20%</td>
<td>4</td>
</tr>
<tr>
<td>b) supportive of families</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unsure</td>
<td>10%</td>
<td>2</td>
</tr>
</tbody>
</table>
Hindering Critical Incident Themes

Relationships

Incidents that fell into this category involved relationships with individuals that made the work environment uncomfortable or tension filled and in some incidents, impeded getting the work accomplished efficiently.

Range

Relationship difficulties were the most common hindering incident reported. Fourteen participants, (70%), had problems with relationships and a total of 32 incidents were reported. It was first attempted to split up the relationship category into employer relationships and peer relationships but this proved difficult since often in engineering an individual may be the boss, a senior engineer and a co-worker all the same time depending on the size of the company and the type of project that is being worked on. As a result of this problem, this category includes all types of relationships that the participant may have in the work environment. This includes co-workers, bosses, senior engineers, administrative staff, contractors, technicians and on-site mentors. Responses in this category included inappropriate behavior by clients, verbal attacks by co-workers about personal attributes, being lied to about policies and procedures within the company, and competitive behavior among co-workers.

Examples

"I guess at the start at the second mine that I worked at there was a guy hired on at the same time I was and that was pretty competitive, he was a pretty competitive guy. He
played a little dirtier than I did. We were doing a lot of programming and stuff and getting set up in the engineering office and stuff like that. If I came up with an idea he would claim it as his own and that kind of stuff.”

“When I first started working, some of the workers were supposed to show me where the equipment was and then they would send me on a run about. They told me something didn’t exist when it did and it turned out that it caused a bunch of extra work that didn’t really need to happen. They were trying to make me look stupid, which they succeeded in doing. Maybe they would have done that with anyone I don’t know.”

Career Development

This category refers to any incident which appeared to impede an individuals’ ability to advance or progress in their career.

Range

There was a wide range in this category, since several factors contribute to career advancement. A sub-category in this theme included participants not being able to get into their area of interest. For example, one participant expressed a great interest in environmental engineering but could not pursue it because that position within her company was filled. Other sub-categories included unstable employment, lack of recognition by colleagues, not receiving promotions or increases in salary.

Lack of educational opportunities was another sub-category that emerged. Many participants recognized the importance of both field experience and formal training opportunities and expressed frustration when they were prevented from increasing their
knowledge. The lack of a Professional Engineering program within the company was also another sub-category that emerged from the data. As one participant stated, having a Professional Engineer designation is a standard in the industry and she wouldn’t stay with her current employer if it wouldn’t provide her with the opportunities to fulfill the requirements to become a Professional Engineer. This category had a participation rate of 65% and a reported 24 critical incidents.

Examples

“When I was working at the thermal station my manager’s background was in hydro-electric stations and he was my manager because he was the only Professional Engineer on site. Our regulations require us to have a Professional Engineer supervisor and so I was supposed to report to him, but the whole reason I was out there at the site was because I was supposed to get experience at the thermal site, I had just finished some field work at a hydro-electric site and this manager didn’t quite understand that so he got me to do some projects for a hydro-electric site.”

“The main thing right now is that we want to become Professional Engineers and you have to go through log books that mentors have to sign and the company doesn’t support it. Most engineering companies pay your Professional Engineering fees, which are a couple hundred bucks a year, this company does not. This company also loses people that come here that have their Professional Engineer status. It is really hard for young people because there isn’t anyone around who has their P. Eng. to sign their log books. So that has been a very frustrating experience and we have been pushing the company on that
right now. And that’s probably the single most important thing in my mind right now. This is a very important issue for us now. It is a standard in the profession and this company is a little bit behind.”

“What is frustrating is not seeing your senior people recognize those things as adding to your on the job skills. When your volunteer work is added to your resume it is disregarded and if a guy listed volunteer work it is regarded. I interviewed for a management job about two months ago which I didn’t get and I think I was probably the most qualified person, but you know whatever. When we talked about management experience, all my management experience is external, working on these boards. It is pretty valid experience, talking budgets, dealing with issues and hiring staff. It was not equated in the same way because they can’t relate to the issue so they disregard the work. And that’s very narrow vision and it reflects on me.”

Invisibility

This theme includes incidents where participants reported being ignored or excluded from various work or social events. It also includes incidents where the participants felt that they weren’t being taken seriously or that they were undervalued in some way.

Range

Participants expressed these incidents with a lot of frustration. Several of these incidents involved not being invited to important work meetings where their presence was not only desired but necessary for them to do their job effectively. Participants also
reported being left out of social event or project wrap-up luncheons even though they had been an instrumental part of the project. Participants also reported the feeling of not being taken seriously when presenting ideas or doing work. This category had a participation rate of 55% and 22 incidents were reported.

Examples

“I was in a meeting once and we were discussing a project and I had an idea. Everyone ignored it and then a little later one of the male engineers said the exact same thing and everyone said ‘Oh wow, what a great idea!’…”

(another participant had an identical experience in a meeting)

“It isn’t just assumed, OK you can do it. In fact I can get forgotten about. Like in crisis situations, it tends to be the guys will deal with it. Even though up until then you have been an integral part of this team. We had major problems with a piece of equipment and I knew a lot about what was going on with it because a lot of it was my work, but it became just the four guys trying to hammer it out. My suggestions weren’t listened to. So in crisis situations and when there are deadlines, there are certain times when you aren’t asked to reply.”

Professional Pitfalls

This category includes hindering experiences that “come with the job”; any aspect of the job that engineers encounter as part of their job which may not be as exciting or challenging as other aspects of the job.
Range

This category had a participation rate of 55% and included 15 reported incidents. Several participants talked about the boring part of working on projects, such as doing the drawings or waiting for information from other people involved in a project. Also included in this category are situations when the job assignment isn’t necessarily in the participants area of expertise or interest.

Another professional pitfall that three participants related was the lack of authority that they often feel on the job. Engineers may be in charge of a project, but because many of the people working on the project are contract employees, they do not have direct authority over these people. Although they are responsible for the work that gets done and any workers compensation board issues, they are not the direct supervisor of the people working on the project. This appeared to happen often in industry on large projects.

Examples

“When I was working in a very small company, actually it was only one engineer and myself. I had been working there for six months and for that 6 months I had been working on the same report, it was about 200 pages long, and after awhile I got bored and I didn’t feel like completing it anymore.”

“...when you run a project you are in charge of everything. I have to make sure the proper equipment is ready, manpower, the project meets environmental standards and safety standards. I have driven up to a site and not a single person is wearing a hard hat even though they have seen me drive up. I am not their direct supervisor so I don’t really have
the authority to tell them to put their hats on. I guess I do indirectly but it’s still difficult because if my supervisor drove up it would be me that gets in trouble for them not having their hats on. Not having the authority is hard....”

**Women’s Issues**

This category included incidents where the participants stated or inferred that the hindering experience was directly a result of being a woman in a male dominated occupation.

**Range**

This category experienced a 50% participation rate and 20 critical incidents were reported. Responses ranged from not having a women’s washroom on site to being denied the opportunity to work on an overseas project. Two participants reported inappropriate behavior from clients because they were women, another reported feeling tension from support staff when she asked them to do administrative work for her. A male co-worker told a participant that women had no place in the workforce unless she was a secretary. One participant consistently saw a senior engineer select males for prize projects when she had more experience and knowledge than them. Although many participants seemed to forgive many of the older male engineers for these kinds of behaviours because of lack of awareness, they expressed contempt when they saw this behaviour in younger male engineers. For example one participant stated: “The VP of our company is only 32 and when he found out I was going to Peru, he said ‘I can’t believe you are sending her.’ I find that doubling frustrating. First the fact that you are hindered, and secondly he is in our generation, he isn’t in the 50 bracket where they don’t know any better.”
Examples

“The human resources department is brutal. They don’t get the women in careers thing. They don’t understand it. It’s kind of sad because the people in production, maintenance and the yard, all those people who are peers or hourly people, they understand I am a women, a professional, and an engineer (and they slag me for that, because I’m an engineer) but the human resources people... I got introduced to this one women who started as a receptionist and the manager of human resources said “This is Jane Doe, CAN YOU BELIEVE SHE IS AN ENGINEER??” He said that!!! I was so shocked, I didn’t know what to say. I was so shocked. And the women was just floored. It was like can you believe that she is that smart. You know that whole thing. This guy is a dinosaur, he is an idiot. He has done a lot of things that are unacceptable. I never confronted him for that comment and I should have. It’s one of those things that you think about for three days and then it’s too late to do anything about”

“I started here with another Engineer in Training and it would just bug me because I started way below sea level and he came in with a certain amount of credibility. The company I work for has a preferential hiring policy, for women. So it took me a good six months to get up to the same level.”

Lack of Support

This category includes all incidents where the participant had requested help or guidance on different issues and assistance was not made available or offered to them.
Range

This category had a 35% participant rate and 12 reported incidents. Included in this theme are all the places the respondents sought support from, such as management and bosses, co-workers, the company, the Professional Engineering Association of British Columbia and mentors. Participants spoke of not having qualified individuals to ask questions of or not receiving support from their bosses when conflicts arose among staff. One subject explained how she had gone to a senior manager in her company for career guidance and when he found out the purpose of the meeting he "abdicated all his energy from the interview".

Examples

"I had a job for 3 weeks. What I didn't like about that was that there was no support whatsoever. There was no one there I could work with. There was no one to ask and the only other engineer was someone my age and so he didn't really have a lot of experience either. And he was so busy doing his own thing and the boss was walking by saying "Hi how are you doing and keeps on walking." It was terrible. It wasn't very well structured. When I left there I was so sick about the whole thing..."

"What triggered me to say "OK I need to work with someone else" was we were working on this project and we finally took it to the senior people because they do the final review of it and they said why didn't you do this and this. And he was the one who didn't want to do it and I was the one who wanted to do it. He let them ask me that without stepping in..."
and saying this is why we didn’t do it. I have to assume that he has his reasons not to do it even if he didn’t tell me.”

Workplace Structure

This category includes incidents where the participant found policies and procedures within the company frustrating.

Range

Most subjects who reported incidents in this category used the term “bureaucracy” to describe these situations. They found that they were impeded from getting their work accomplished because of the specific procedures they had to follow. Only the participants who worked for large companies reported incidents that fell in this category. For one participant, understanding union policies was frustrating because she found they were not consistent with the types of jobs they would agree to perform. This category had a participation rate of 30% and 10 reported incidents.

Example

“When I worked in head office, things moved very slowly and that gets frustrating. There’s this new bushing product and we had a really good opportunity to do some testing and some trial runs here and it’s a bit of a risk but we did lots of research into it and we thought it would be really good. It just became this big bureaucratic thing, lots of meetings and so it ended up not happening. That gets disappointing. Being in a large company there is a lot of bureaucracy.”
Ageism

Incidents that fell into this category were situations where participants felt they experienced difficulty on the job because they were young and seen as inexperienced and lacking knowledge or had difficulties because their male co-workers treated them in a paternal way.

Range

Members in this category reported feeling their age was a big deterrent to being accepted as knowledgeable. One of the participants began to lie about her age when she realized her youth was a detriment to her on the job site. Two subjects reported concerns over paternalistic behaviour by their supervisors. Although one participant initially thought this was beneficial she expressed concern because she felt his need to “protect” her would result in having less challenging projects to work on. This category had a 20% participation rate and six reported incidents.

Example

“I was working in the petroleum industry and we were having problems with this one unit, it is a three phrase separator and we were using it as a two phase separator and it wasn’t working properly and the operator was extremely difficult. You would ask him to set the unit at a certain condition and let’s run it for 1 or 2 days so we can reach an equilibrium point and see if this is actually giving us what we want. Just getting him to do what was asked. I think a lot of the engineers had a lot of problems with him but I think in
particular he didn’t like me telling me what to do. I am a very young looking 23 year old and he was a very stubborn 50 year old. It just didn’t work very well.”

**Facilitating Critical Incident Themes**

**Career Development**

This category refers to any incident which facilitated an individuals’ ability to advance or progress in their career.

**Range**

This category had a participation rate of 75% and had a total of 25 critical incidents reported. The respondents in this category reported a number of different ways in which their career development was enhanced. For some, a promotion within their current organization or movement to a new job site was seen as progress. For six participants, going to work for a different company, one which had a more welcoming work environment or allowed them to do different types of work was considered positive change. Many participants welcomed educational opportunities, whether it involved being sent on a course or having in house training and workshops provided. Often, being recognized for a job well done, without any tangible benefit was reported as facilitating their job satisfaction. Two participants commented on being “groomed” by management, being targeted for advancement within the company. Lastly, several participants discussed the importance of obtaining their Professional Engineer status and how their employers made it a priority to help them achieve this goal. Interestingly, only three participants explicitly commented on salary as being a major factor in career satisfaction.
Examples

“Well the money is nice. I guess I should mention money, I am getting paid for this. You know a raise in the first six months. When I got my paycheck it was like wow I get paid for this and I enjoy it!!!!”

“My boss will single out my accomplishments. Like with the problem with the jockey pump, he said that was good work..”

“That’s one thing I like about this company if I want to pick up any course that I can show are useful they will pay my course costs for me. So if I want to do correspondence from UBC or Queens and get my BA. That’s another thing that increases job satisfaction are those educational opportunities and training. But another thing they have, they get a lot of publications. So I just put your name on a list & I can get a lot of business publications; Financial Post, Fortune, Business Week and I can get all the related technical publications. It all kind of just shows up. Any kind of educational opportunities a company provides really increases job satisfaction if you really want to measure it that way because it gives you opportunities to challenge yourself and grow. And if a company isn’t going to stagnate you to me that’s a good place to be.”

Relationships

This category included incidents that involved relationships with individuals that made the work environment comfortable and fun to work in.
Most of the incidents reported in this category involved the participant expressing the benefits of being able to develop positive relationships with their work colleagues or clients. Several respondents felt company social activities, outside of the workplace, were important to foster good working relationships. Often getting to know more about their work colleagues on a personal level led to a better working relationship. For example one participant reported that although her other co-workers were thirty years older than her, a work golf event gave her the opportunity to learn how much she had in common with them. Better working relationships allowed the participants the ability to feel "at home" in their work place. This category had a 55% participation rate and a reported 18 incidents.

Examples

"Now it's pretty good, one of the guys brought in pictures of his new baby today to show me, so now it is pretty friendly, now I feel like I fit in, it takes about 2.5-3 months to get to know people's names, not just in this plant but in all the plants. It's gotten a lot better."

"I just spent two weeks in Peru, 80 hour weeks, really hard work. It was crazy work. But I was down there with two wonderful people from Vancouver. It was satisfying because I finished it within the time that they gave me. But it was a good feeling to be down there with those two people who I actually work with but I don't see at work because they are in different groups. The first week, when you spend so much time with someone you get really tired of it. I called my boyfriend and said I can't get a moment alone, every time I
want to go running they want to come with me. I remember getting frustrated. But I guess human beings just adapt and then you get used to being with people all the time. To the point where it’s like ‘Where’s Bill we are eating now, I miss him.’ It was just good to be with people that you wouldn’t normally be with. I have never done anything with these guys. I remember going to the airport, feeling sad. I don’t usually feel sad at the end of the job but this one I did because I enjoyed it so much.”

Support/Help

This category includes facilitating incidents where the participant was needing help or guidance and it was offered to them or they were offered assistance without asking for it.

Range

Participation’s rate for this category was 50% and had twelve reported incidents. Participants reported receiving support from co-workers, bosses, friends and associations and networking with other female engineers. This category included incidents where the participants had asked a simple question and were given assistance to situations where the participant had just started a new job and people took the time to show them things and were really helpful at getting them settled in their new work environment. Participants also reported the benefit of networking with female engineers because it provided them with a environment where they could “vent” about their job to an understanding audience.

Examples

“I think being a part of DAWEG [Division for the Advancement of Women Engineers and Geo-Scientists] has really helped. It’s true, it is great to have these people to vent
with and talk about what was happening and they also are from different companies around town so I got a sense of what their policies were."

“I have really appreciated people taking the time to show me stuff. You are tossed in here and you are expected to do things. What happens in plants isn’t what happens in textbooks. My position is very different from the plants. Some of the guys have taken the time to show me stuff in the plant. We are dealing with an issue that is planning in the theoretical sense so we are doing testing in the lab and you don’t know how realistic what you are doing is, compared with what is going on in the plant. And it’s hard to know whether your testing accurately reflects what is going on in the plant. So having someone show you around is helpful.”

Nature of the Work

This category consists of incidents where the facilitating aspect of the experience was pure enjoyment of the actual work that they were doing.

Range

When the participants related experiences that fell into this category, their faces lit up and they usually became very animated since many of these experiences related to why women entered this occupation in the first place; their love of “crunching numbers”, challenge and problem solving. Participants also explained how great it felt to see a job completed, since often a project end is the culmination of months of hard work. Participants explained that completing a project, and doing a good job, was very satisfying. Also included in this category was the ability to have project freedom within
their job. Many women reported that their job satisfaction was greatly increased if they were able to recognize a problem that needed to be solved and then got permission to work on it. This category had a 40% participation rate and fourteen reported incidents.

Examples

"I was in Greece for 2½ weeks and worked 14-15 hour days never got a chance to see anything. I was threatened a few times because the small village where we were doing the project was against it. That was a big project, I remember I set the budget out and told the senior guys this is how much time and money I need and they cut it in half. Then you are in for 14-15 hour days. When we got there no one spoke English. There was one guy who spoke a bit of English. I remember thinking, I have half the amount of time, no one speaks English, I don’t know where to get supplies and everything. When we finished I remember thinking holy cow I did it!! I finished it!! I did it well and as crazy as the budget was I did it. It’s always really satisfying to me on the flight home because on the flight there you are always thinking what you have to do and how you will do it. The entire flight there is always stressful. But the flight home is wow I did it!! It is the best feeling."

"I find they are quite flexible here. If you find something that you are interested in and it is important they will allow you to work on it. They give you a pretty free rein. In one position they needed to improve a system for our industrial customers. We had a poor system developed and things weren’t happening the way they should. So we were able to
develop a software program to automate the process. So it was neat to see the need and carry the project forward.”

Confidence

This category includes incidents where the participant was shown confidence in her work by her boss or co-workers or when she recognized in herself that she had begun to feel confident in her work and how she dealt with problems.

Range

This category had a participation rate of 35% and 9 incidents were reported. The responses in this category usually referred to a boss allowing the participant to get involved in the work or with the participant realizing their individual growth as an engineer and reporting the satisfaction of feeling sure of themselves when dealing with clients and/or co-workers. The participants with more work experience commented on how they now will approach situations differently because of their previous work experience.

Examples

“...in the interim he has allowed me to get my hands in all the pots. In my section you deal with three different areas and usually you deal with one area but he has allowed me to deal with all of them. In that sense he has shown a lot of confidence in me.”

“I was on a site a few weeks ago where I was up in Alaska. We were at a mine site so we drove up to this mill and walked along this road and I was showing the client how the pipelines were going to crack because of the slope. So I was suggesting some ways to the
client to help prevent this from happening, some preliminary suggestions because we would have to go back to the office and talk about it and get the things we need like survey sections etc. He didn’t think there was evidence of movement but I showed him some cracks in places. And that was cool because I gave him the impression that I knew what I was talking about."

**Operational Networking**

This category includes experiences where the participant has been able to get to know who is responsible and has the technical knowledge in various departments within the company. Although similar to the relationship category, this category includes only experiences where the benefits of the relationship helped with the technical aspects of performing the job.

**Range**

This category had a total of seven incidents reported and had a 30% participation rate. The participants who reported incidents in this category worked in large industry based companies which had several different departments and/or work locations. The participants reported it was easier to do their job because if they ran into a technical problem they knew who to contact. Some of the participants commented on the competition between different divisions of a company and how much easier it was for them to do their job because they could contact people directly if they ran into problems.
Example

“Within the company I know who does what and I think that is because I have had the opportunity to work everywhere. The mills, head office etc. ... When I went to the mill no one knows anything about any other part of the company because the mill is the almighty child. There is this big battle between the pulp mill and head office. You know all the political stuff. So it’s actually like “Well so and so is really good with stuff” and this is what they do and they are like I didn’t know that. And I think that is fun because you get to help people. So moving around to the different areas of the company enhanced my job satisfaction because when I ran into a problem I knew who to call and also I could put a face to the name and you can help other people out if they have a problem and tell them who to call. That’s the people factor again I like to know how the system works.”

Travel/Field Work

This category consists of experiences when the participant reported enjoying having the opportunity to travel or work in the field.

Range

Although the majority of the participants reported they have had the opportunity to travel or do field work, not all of them reported enjoying it. Often participants reported traveling internationally was not a good experience because they were so busy working on a project they didn’t have the opportunity to do any sight-seeing while they were away. However, other participants reported the fun of being able to travel and/or do field work, since it took them out of their daily office routine and exposed them to new landscapes,
cultures and experiences. This category had a participation rate of 30% and six incidents were reported.

Example

"Traveling, seen a lot, met a lot of people. I spent a lot of time in the NWT. I love it up there. I went up there lots over a two years period. Went up there in the winter when the wind chill factor was god knows what!! The tundra in the fall is this beautiful red colour. The tundra is really spongy so you can take tundra naps. Seeing the wildlife. Just experiencing things that I never would have otherwise. I had just moved here and didn’t really know anyone so trips were great. You see the same people so you become a close knit group. So that was really nice when I first moved here."

Working with Women

In this category, participants reported the benefits of working with women, both women engineers and women in other positions within their workplace.

Range

This category had a participation rate of 25% and six reported incidents. The majority of responses in this category indicated that having other women in the workplace, regardless of what their position was within the company, created a different, more enjoyable work environment. Participants also reported working with senior female engineers was motivating because it provided them with role models and gave them the belief that they could be successful in this field.
Example

“That there are other women around. The support staff and the other women engineers. I don’t think I would enjoy my work if there weren’t other women around. It makes me happier, I look forward to going to work. It’s not like I don’t like the guys in the office, it’s just easier to talk to. The men that are in engineering are generally a different breed.”

Respect from Subordinates, Contractors, and Peers

The incidents that formed this category referred to situations where the participant was told by a co-worker they appreciated their work.

Range

Responses in this category involved appreciation coming from non-engineer co-workers, usually trades-people, with whom the engineer has a lot of interaction. The key factor in the appreciation seemed to be that the participants listened to the concerns or problems of these people and dealt with the problems. One participant reported that sometimes it is a difficult situation because: “appreciation from below doesn’t always help if you want to move upwards. If you are politically correct you have to do things for the people above but then you aren’t always appreciated by the people below. I have to work with the guys everyday who are the below people so I would prefer to work with the below people instead of the above people.” This category had a participation rate of 25% and five reported incidents.
Examples

"On one of my field rotations one of the mechanics said to me: ‘It’s really good that you listen.’ Because they have had other engineers come through and they didn’t listen to the actual concerns. So he said he was really impressed because I listened. To me that’s survival skills.”

“The people like the labourers and the welders. I work very hard to make sure that everything they will need once the job starts is ready for them on site. ... Some engineers don’t bother with the little pieces and then it’s chaos. Some of the comments you hear back are great. I heard something second hand and it was ‘I think so and so has gained a lot of respect for you because he wanted you on the job.’ To hear something like that is really satisfying especially when I didn’t even think this guy liked me at all.

Non-monetary Benefits

This category included incidents where their job satisfaction was enhanced by non-monetary benefits, such as the opportunity to work a flexible work schedule or if the company indicated they were supportive of families by providing child care.

Range

Twenty percent of participants reported an incident in this category and four incidents were reported. The majority of responses in this category concerned the opportunity to work flex-time or part time hours. This seemed to be important to the women interviewed, especially if they had children or were thinking of having children in
the near future. In addition, companies that appeared to be supportive of families, such as providing funding for a day care were also included in this category.

Example

“We have flex time. We can come in early in the morning and take a 3 hour lunch and then work later in the evening if you want, as long as you get the project done. You can do whatever you choose. For example a lot of people have are going to work at home next week and avoid all the driving hassles because of the APEC conference.”

Coping Methods

Three general coping stances appeared when the women described hindering experiences. One, they would address the issue; two, they would talk with friends or other female engineers about the situation or, three, they would internalize the situation. In some situations, more than one coping stance was used. Many participants also indicated that they would cope differently depending on the importance of the situation. For example, one participant said she will speak up if she has been excluded from an important meeting but may not say anything about being excluded from a social event. It also appeared as women became more confident in their abilities, they dealt differently with hindering experiences. Three of the women who had been engineers longer than most of the other participants, indicated that they would be more assertive dealing with hindering experiences now than in the earlier years of their career. To describe each general coping stance, a brief definition and an example from the interviews will be presented.
Address the Issue

Sometimes when an hindering experience occurred, the participant would address the situation, either by talking to the person directly, or taking their concerns to their boss, human resources department, or the Professional Engineering Association of B.C. In one situation, a group of recently hired engineers worked together to develop a rationale for their company to provide a professional engineering program for it’s engineers. Many participants expressed that they found it difficult to address the issue directly, but they also indicated that it was important to deal with the issue because it would effect their work.

Example

“Confronted him. It was the hardest thing I have ever had to do but I knew that I would have to work with this person and I would have to deal with this issue.”

Unfortunately, in some situations when the subjects had decided to deal with the situation, nothing changed or the people were not very receptive. One participant reports complaining to human resources about “whore magazine pin ups” posted in the offices of her male co-workers with nothing resulting from her complaint. Another participant explains what happens after her boss yells at her in front of her co-workers:

“I went to his office, and I explained why I had done the work the way I did. Then I said ‘You know what, I wasn’t very comfortable with the fact that you dealt with me in that way.’ He was very uncomfortable about the whole thing and pulled out a book to read while I was talking and had it upside down!!! I don’t think a guy has every told him that they were uncomfortable with the way he had handled things. I don’t think he has ever
had to deal with something on an ‘I’m not comfortable level.’ For someone to express themselves, he was so uncomfortable. I bet you that is part of the reason why he doesn’t like working with women because he will have to go that uncomfortable stage, if he says something wrong he will have to deal with it.

Talking about it with friends and co-workers

Another coping stance reported was networking with other female engineers or talking about the situation with friends and family. Participants reported this was helpful, it gave them an opportunity to express their concerns in a supportive and understanding environment and most times normalized the situation. Often, when the participants networked with other female engineers, they were able to provide them with strategies on how to deal with the situation effectively. Senior female engineers were able to provide insight into different problems that can sometimes only be gained with experience. One participant reported she worked a lot of extra non-paid hours and had been denied time off to compensate for the extra work. When she talked to engineers that worked for different companies, she found that this wasn’t the norm in the industry and this realization prompted her to look for a job with another company which treated it’s employees more equitably.

Example

“I came out here. Fortunately where I worked there is a great group of female engineers and there was a kind of mentoring program. And that helped. They have been there and they know and it just helps to vent.”
The other coping stance that was seen was internalizing the hindering experience, often looking inwards and trying to figure out what was wrong with them that made events go the way they did. Some participants reported they didn’t address the situation because they felt that it would harm them professionally, as one participant termed it “being blacklisted”. Often the internalizing stance was accompanied by avoiding the issue completely. In one situation this avoidance involved leaving one job site to work in another area of the company. Three participants reported crying frequently on their way home from work or in the evenings when they went over the hindering experience in their head. Participants also reported a sense of hopelessness, an acceptance that things would never change.

Examples

“I have gone home at nights and thought if I didn’t have such a squeaky voice, if I was taller, it might be different for me but I can’t put it down to anything that concrete. I might be totally wrong but it’s something I can’t help but wonder about.”

“I am not confrontational. The older guys I don’t think they will change. And the younger guys, well I haven’t seen one who I think we be worth it. I don’t think it’s worth my effort.”
"I really felt there wasn’t a whole lot I could do about it. If I had taken it on I felt I would have been blacklisted. It just didn’t seem worth the consequences. It was something I had to put up with even though I resented it."

Reason for Choosing the Field of Engineering

The reasons the participants chose the field of engineering are presented in Table 4. Thirty percent of the participants had direct knowledge of the field of engineering since one or more close relatives were engineers. Although the majority of participants in this study were in the 24-29 age bracket, none of them reported being advised by a high school or university counsellor that engineering may be a career that would be compatible with their abilities and interests. In fact, one participant discussed outright sex-role stereotyping on the part of her high school counsellor:

"...in high school, I went to a guidance counsellor, an old fuddy duddy guy, and he said I should be an Early Childhood Educator. I am not patient, and I am not particularly good with children but I guess he thought it would be a good thing since I was a small female. You are so impressionable in high school. If my parents didn’t have that university awareness and if I had listened to my counsellor, things would have been totally different. And I don’t think it would have made the best use of my skills and I don’t think that I would have been very happy."
Future in Engineering

When asked how they saw their future in engineering, participants gave a range of responses. The majority wanted to gain skills and knowledge in a specific area of engineering, for example, environmental engineering, hoping to either work in the consulting field or work in that area of their company. Many foresaw returning to school to earn either their masters in engineering or in business. Three participants wanted to move into management, either working as a project manager or into general management. Two older participants were in the process of moving into the business side of their companies working in the marketing or financial areas. One participant said she didn’t have any regrets starting her career as an engineer but felt it was time to move on and foresaw a time when she no longer wore her engineers ring. Two participants planned to leave the field of engineering completely.

While all of the participants had future plans, several of them expressed concern of how their career and plans for having a family would interact. Five participants expressed they might leave the field once they had children because they saw the field of engineering and having a family totally incompatible. One participant saw other female engineers able to work full time and still have a family, but stated she didn’t want that for her family.
Table 4

Reason for Choosing to be an Engineer

<table>
<thead>
<tr>
<th>Reason</th>
<th># of participants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Immediate family member was an engineer</td>
<td>6</td>
</tr>
<tr>
<td>Suggested by science or math teacher</td>
<td>4</td>
</tr>
<tr>
<td>Exposure to field of engineering through programs (Shad Valley), summer jobs</td>
<td>3</td>
</tr>
<tr>
<td>Suggested by parents</td>
<td>2</td>
</tr>
<tr>
<td>Suggested by school colleagues</td>
<td>2</td>
</tr>
<tr>
<td>Liked math's and sciences</td>
<td>2</td>
</tr>
<tr>
<td>By chance</td>
<td>1</td>
</tr>
</tbody>
</table>

Table 5

Future in Engineering

<table>
<thead>
<tr>
<th>Future plans</th>
<th># of participants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Want to work in a specific area in engineering</td>
<td>7</td>
</tr>
<tr>
<td>Plan to return to school for Masters Degree</td>
<td>5</td>
</tr>
<tr>
<td>Move into management</td>
<td>3</td>
</tr>
<tr>
<td>Move into business side of industry</td>
<td>2</td>
</tr>
<tr>
<td>Leave profession entirely</td>
<td>2</td>
</tr>
<tr>
<td>Unsure</td>
<td>1</td>
</tr>
</tbody>
</table>

Summary of Experiences

During these interviews it became apparent that women love being engineers, they love the opportunities it gives them to problem solve, crunch numbers and be challenged. When they talked about working on a project or solving a problem, their eyes lit up and they became very animated.

Career development and relationships were the key facilitating and hindering categories. This indicates that both progressing in their career and having positive,
productive work relationships are important and necessary for job satisfaction. Several women talked about the different working styles of men and women engineers, they described men being more individualistic and competitive while they preferred to work as a team. Although this may hamper their working experience with male engineers, this working style appears to help them win the respect of the trades people when working in the field because they listen to their concerns and work with them to find solutions.

None of the participants reported any sexual harassment at their work site by co-workers. The majority of issues related to being a women were more subtle, such as being excluded from an event or not being allowed to work on a project. Some participants saw being a women a benefit to their work site. They commented on women being “multi-tasked” which allows them to attend to several details at once and ensures that projects run more smoothly.

Surprisingly, most participants didn’t indicate having alternative work arrangements (working flex-time, part-time, modified work week), as a major factor to their job satisfaction. The women who did comment on this issue were parents or thinking seriously about becoming parents in the near future. Since five participants expressed concern about their jobs once they became parents, it is more likely that alternative work arrangements will become a more influential factor in the future.

Although women coped with hindering experiences in different ways, the ones who took an internalizing coping stance expressed a lot of dissatisfaction with themselves and frequently commented that the situation will never change. These women were also less likely to report strong support systems, internal or external to their workplace. It was distressing to hear women report that they sometimes cried on the way home from work.
because of a hindering experience but it was encouraging to hear participants describe incidents where they addressed the problem, either by confronting a co-worker or reporting problems to their superiors.
Chapter Five
Discussion and Conclusion

This study contributes to an understanding of the experience of women currently working as engineers in British Columbia. For the most part, it appears that women will continue to stay in this field of work but there are some women who are at risk for leaving the field. This chapter will focus on the theoretical implications, the implications for counselling, implications for engineering associations, the limitations of this study and conclude with suggestions for future research.

Theoretical Implications

Osipow and Betz (1991) report the majority of career counselling occurs in educational settings, usually with younger clients whose main concern is career choice. They feel the importance of career choice has been overestimated in career development research and suggest more research in the area of career adjustment is needed.

Fortunately, some of the work done in the area of career choice is helpful understanding of the process of career adjustment. Some of the data from this study is consistent with the findings from career choice research. Other information from this study is consistent with findings from previous career adjustment studies and some of the results may lead to new directions in career adjustment research.

Betz (1994), summarized the barriers and facilitators to women’s career choice from twenty five years of research on women’s career development. She notes that a factor can operate both as a barrier or facilitator, depending on it’s absence or presence.
Several of these factors such as sex role stereotyping, female role models, support and family-career conflict appear to play a role in career adjustment as well.

The stag effect (Bernard, 1976), is a “complex of exclusionary customs, practices, attitudes, conventions, and other social forms which protect male turf from the intrusion of women.” (p. 23). Mcilwee & Robinson (1992) saw this exclusionary process in their research on women in engineering and it was also found in this study. Women described being excluded from social activities, meetings, and often completely ignored, similar to the stag effect Bernard describes. This exclusion greatly impedes career development because it is often at these times important discussions about projects or changes in organizational structure take place.

The concept of sex-role stereotyping appears to be closely tied to the concept of the stag effect. If men need to protect their turf in the work place, it is likely they have a clear concept of what they feel women should do. In this study, women were not allowed to travel or work on projects solely because they were women and not because of a lack of abilities or knowledge. Women commented on enjoying travel because they were able to work on unique challenges not offered by their usual work environment. This is another barrier to career development because it prevents women becoming more experienced working in different areas. This experience may be a critical factor when promotions, salary increases or opportunities for new jobs arise and lack of experience may prevent women from progressing in their careers.

This exclusion from the male turf also effects the day to day efficiency of the work done. As noted in the results, relationships and networking were important factors to career satisfaction. Effective communication is necessary in the workplace and good
relationships are important for that to occur. If women are excluded from the internal functioning of their work site, their skills and knowledge will not be used most effectively and in addition, they will not learn the unique skills and knowledge of others that work around them.

Sex-role stereotyping may also help to explain the internalizing coping stance adopted by some of the participants in this study. The stereotypical female is expected to be passive, agreeable and sociable while males are expected to be assertive and confident (Harper & Marshall, 1991). It is difficult for women to express their feelings in a male dominated work place because women are not expected to act that way. Instead, women may choose to say nothing and internalize their emotions.

Betz (1994) also reports on the importance of having female role models when making a career choice in a non-traditional field. This also corresponds to findings in this study on career adjustment. Women reported that having a female role model in the work place was beneficial because it gave them the belief that they could be successful in this career. Having a female role model was also a benefit because they were able to have a mentor who was more familiar with their unique experiences. Tidball (1980, 1986), has found as the number of women faculty members increases there is a proportionate increase in female students (as cited in Betz, 1994). It is possible that this effect would occur in the work place as well.

Although women role models are a benefit to new women engineers, they may raise some concerns to female engineers who are considering starting a family. One participant stated that she saw her female co-worker struggle with balancing a family and career and did not want that lifestyle for herself, suggesting the possibility of leaving the
field of engineering when she became a parent. The balancing act women perform between career and family is discussed often in the literature (Farmer, 1997; Mcilwee & Robinson, 1992; Tipping, 1997). This is problematic, and unless companies and society as a whole become more supportive of families, there may be a continuous exodus of women engineers in the workforce once they begin to have families. In their study on predicting persistence in female engineering students, Schaefers, Epperson & Nauta (1997), found that among other factors, support was significant factor in predicting persistence. Support, or lack of support was an important factor to career satisfaction reported in this study and in the area of child rearing, appears to be essential.

Betz (1994), found that women experience a family-career conflict to a much greater degree than men. Farmer, (1997), also reports women are still seen as the primary caregivers for their family and women still place a greater value on family needs compared to men. Tipping, (1997) reports that women spend more time planning for a family long before they actually start having a family. In this study, many participants expressed concern over family issues even though they were not currently planning to start a family in the near future, illustrating that raising a family and maintaining a career is a concern for female engineers in British Columbia.

Unfortunately, many engineering companies have “social” activities, outside of regular working hours where business decisions are made. This puts further stress on the family-career conflict and impedes career advancement opportunities because women are frequently with their families and unable to attend.

For women who are successful in balancing the needs of their family with their careers, there is evidence to suggest that their specialized skills will be in great demand in
the future. Frize & Mclean (1994) report that employers are now demanding engineers to be able to work on a multitude of tasks simultaneously, have good communication and interpersonal skills and teamwork. In this research the term “multitasking” came up often. Women felt they were better prepared to work because of their ability to work efficiently on several projects at once. In addition, women preferred to be in environments that promoted teamwork because the input from co-workers enabled them to be more creative and effective in their jobs.

In her qualitative study of women in sciences and engineering Giurleo, (1997), found that women persisted in these areas of work because of the challenge and problem solving that it allowed them to do. She also states that in the midst of problematic academic or work environments, women would still persist in their career because they enjoyed the intrinsic aspects of their job. Women in this study reported similar experiences. They entered their career because of their love of number crunching and problem solving and were willing to discount situations where they felt they had been hindered because of the projects they were working on. It is possible because of the barriers women have to overcome, they may be better prepared to meet the needs of employers in the future.

Implications for Counselling

This study contains useful information for high school, post-secondary and career counsellors. At the high school level, it indicates there is still a need to increase the awareness of engineering as a potential career choice to female students. In this study, not one subject was advised by their high school counsellor about the field of engineering. It was only by exposure to the field of engineering, usually through a family member,
teacher or friend that they began to consider engineering as a viable career choice. At the high school level, exposure to the wide variety of engineering careers is extremely important since the courses taken in high school often determine what possible post-secondary programs a student can enter into.

Once females have chosen the career of engineering, it is important for university counsellors to make the students aware of the problems that they may encounter in the field. Non-traditional university programs have become more “female friendly” in the past decade. Although that may increase the number of women studying engineering, it may not prepare them for the real world of work. University counsellors can play a pivotal role by helping female students become aware of some of the difficulties women face in the work world. Factors like support systems, self-esteem and coping stances should be looked at, and when required, addressed. Workshops on assertiveness training and time management should be developed and offered to female engineers.

Counsellors can also help in the area of job search. Some of the larger companies appear to be more “female friendly” usually these companies are government branches or publicly owned companies. Women who worked in these areas expressed less concern about child care issues than the women who worked for smaller and privately run companies. This is probably a result of public pressure and accountability on the part of the larger companies. Frank (1994) found that women who work for companies that provide child care facilities or are supportive of families are more satisfied with their work.
Implications for Engineering Associations

Carter & Kirkup (1990) suggest the field of engineering will improve for women once they make up a “significant proportion of the profession” (p. 99). As discussed earlier in this study, the focus of the educational system and engineering associations has been to recruit women into the field of engineering. Although this is very important it equally important to ensure that women will remain working in the field and be treated as equals among their male counterparts. It is essential that engineering associations be more aggressive in recruiting members and increase awareness of the women engineer’s experience. It is possible women who internalize hindering experiences are at risk of leaving the field of engineering. Developing informal support groups may increase the awareness that their experiences aren’t unique but shared by many of their female colleagues. Having their experiences normalized may empower them to deal with hindering experiences differently in the future.

Engineering associations could also assist new engineers with guidance on appropriate starting wages and information on companies that have a record of being “female friendly” or supportive of families.

Limitations

The results of this study are based on a sample of women aged from 23-39, living in the Lower Mainland and Kootenay region of British Columbia. The majority of this sample group was 24-29 years old. Although many of the participants raised concerns about parenting, only two of the participants were parents. It is possible that these two factors limit the generalizibility of the data and a different group of subjects would have yielded different results.
This study did not indicate any major differences between the participants from the Lower Mainland and the Kootenays. The facilitating and hindering experiences the two groups described did not differ in any major way. A more complete understanding of the experience of women engineers in B. C. would include women working in more isolated areas, such as Northern B.C., where factors such as isolation from others may result in a different experience. This study also did not include any women who owned their own engineering companies, and again this is a limitation of the study.

Entrepreneurial female engineers may experience several different types of hindering and facilitating experiences because of the different responsibilities of owning a business.

This data set not is representative of all women who work in the field of engineering. Frank (1994), discusses women who enter the “boys club” often stop acting feminine and become more male than their male colleagues. They will use more traits commonly associated with males such as being aggressive and competitive. Many of the subjects in this study also referred to the other “type” of female engineer. None of the women in this study stated they had adopted masculine traits in order to be successful; as a result, this study may not be representative of all women engineers currently working in British Columbia.

Although all attempts were made to get females from a broad range of engineering fields, some fields were not represented in this study and some fields were over represented. Six of the participants were mechanical engineers and this may result in an over representation of any experiences that are unique to that field. In addition, both the areas of computer engineering and bio-medical engineering were not represented at all.
Eleven of the participants went to school at the University of B.C. which again may skew the data set.

**Implications for Future Research**

There are several directions for future research. First more general research in the area of career adjustment and more specifically an understanding of the personality types that adopt the helpless coping stance. I hypothesize that these individuals are at the greatest risk for leaving the field entirely. In addition a longitudinal study of women engineers from entry into career to becoming parents would be interesting and influential in developing guidelines for fostering a family friendly workplace.

There is a voice that needs to be heard in this area of research. I received phone calls and e-mail responses from women all over B.C. wishing to participate in this study. Unfortunately because of geographic limitations and the ten year limit on work experience, it was not possible to interview these individuals. One individual who had worked as an engineer for more than ten years, continued correspondence with me, describing her personal experiences as well as those of her female colleagues. Another women who had contacted me and initially agreed to participate in this study, later declined fearing participation in this study would jeopardize her job. The interest in this study indicated there is a great need for female engineers to be heard, understood and supported. One direction of research is to conduct qualitative research across B.C. to develop a much broader understanding of the female engineering experience.
References


Appendix
A

Sample Interviews

Factors for satisfaction

- lots of variety
- challenging
- meaningful, useful to the business
- flex time, flexible hours
- being close to where I live
- people I work with, diverse group, everyone’s input is respected

Hindering

In one situation in the previous company, they had asked us to work a lot of overtime because there was a lot of work that was required and they wanted us to work 55 hours/week. And they had core hours set, like they only wanted us to take ½ hour lunch. I found that really tough, because most people I worked with were men and they had a spouse at home so that was fine but for myself to do banking and day to day things I really needed the hour at lunch to keep my lunch going. Often it was the only time that I had to get together with someone for lunch. So I found that really hard and I was quite unhappy with that.

Coping

Told them I was going to take an hour and that was about the end of it. They weren’t really pleased and maybe it limited me in the future, I don’t know.

Hindering

Also in that job I was doing a lot of repetition. I was writing specifications and analyzing disks for equipment. Although it was for different projects each time, it was the same thing and I didn’t find that very rewarding. It wasn’t well suited to me.

Hindering

It my first job, they hadn’t had any female engineers before and it was really poor how a lot of things happened. Like they had whore posters and calendars up and here that has never occurred. You want to conduct work and here they have some whore poster and it is very embarrassing. When one of my co-workers closed his door, there were pin ups all over his door and I was quite horrified. It was frightening to me that that could actually
occur in the 90’s. It’s really embarrassing and it shows that you just aren’t at the same level and that they just don’t respect women in general.

Coping

In the first job someone else brought it to the managers attention and they were all removed. In the second job, I mentioned it to human resources and there was actually a women in charge, but nothing happened. It was just left. I just didn’t do anything else about it because I was kind of concerned because if nothing happened there, I am not going to take this battle on all on my own, I just didn’t think it was worth it. I really felt there wasn’t a whole lot I could do about it. If I had taken it on I felt I would have been blacklisted. It just didn’t seem worth the consequences. It was something I had to put up with even though I resented it.

Hindering

I had a situation where I didn’t see eye to eye with a manager. I didn’t feel I was being rewarded for the things I was doing. For example I was given a very poor salary increase at one point. I felt like I was doing a reasonable job and subsequently I had asked why because it was important to me, I need to know, if I am not doing what I should be I need to know. I was never given a proper answer there either, it was averted. Then I got moved to a different position so that’s how that got resolved. I don’t know if that was being female or just problems with that manager because other people had problems with that manager as well.

Hindering

Sometimes in office situations things are very subtle and it’s very difficult to deal with that. I remember once in an office meeting and people were brainstorming and I felt like I was being somewhat ignored and someone repeated my idea and they got credit for it. I mentioned it after, and it was sort of turned back on me. Like perhaps we should send you for communication training, you know like it was all my fault. Those sort of things happen. I think the person I talked to didn’t understand it. It is really difficult in situations like that because I wish I had never brought it up because it seemed to go on and create more problems, like you need to go get some help and that wasn’t my intent.

Hindering

When I first started working, we had a contractor who was doing some welding. And the company policy is that they are to wear their safety glasses at all times and they wouldn’t wear them. I gave them their three chances and they didn’t take me seriously. So eventually my manager had them removed from the site and they weren’t allowed to complete the work. But I have to worry about their safety record and workers compensation and everything.
Hindering

When I first started working, some of the workers were supposed to show me where the equipment was and then send would send me on a run about. And told me something didn’t exist when they did and it turned out that it caused a bunch of extra work that didn’t really need to happen. They were trying to make me look stupid, which they succeeded in doing. Maybe they would have done that with anyone I don’t know.

Coping

I didn’t really worry about it. I had asked and they were supposed to be the experts of the plant. I had asked are you sure that’s where it is, that seems kind of far and they said nope, that’s it. There weren’t drawings to verify it. So people went ahead with the work so really it wasn’t my fault. I decided not to worry about it. I felt a little badly because some unnecessary work happened. But I decided not to worry about it.

Satisfying

I was really new, it was one of the first jobs I did and I was working with a contractor. There are a number of steps that I didn’t know and they were very experienced and they could have just not done things that I didn’t include all the steps and then they told me next time you want to remember to do this. So they kind of carried me in that sense. Which you know, you kind of expect that if they want to come back for more contract work but it’s interesting because it’s tough to compare how they would treat someone else.

Satisfying

I guess here, I find they are very flexible. I came back early with from my maternity leave and kind of tying it in with my holidays. So I am coming in the office two days and doing one day at home. I am doing that over a 3 month period, so I think that is pretty accommodating. Hopefully that created a win/win situation, I am getting some work done for them and it has also helped me to work because it is hard to manage money wise on unemployment insurance.

Satisfying

I find they are quite flexible here. If you find something that you are interested in and it is important etc. They will allow you to work on it. They give you a pretty free rein. In one position they needed to improve a system for our industrial customers. We had a poor system developed and things weren’t happening the way they should. So we were able to develop a software program to automate the process. So it was neat to see the need and carry the project forward.
Satisfying

I really enjoyed working with the industrial customers. Working with them on improving their service and traveling to all these different sites and seeing the entire province.

Satisfying

It is rewarding like when there is actual equipment and for example I was working for a company and they had a coal fire generating station and they needed different magnets. Like when coal comes in there is often a bunch of stuff in there, other than coal like there is metal pieces, like you might have a bike tire in there or something. The original magnets had PCB’s in them, so they not longer met the environmental code. So they had to replace them. It was interesting going through the whole process to purchasing the new magnets, to having them installed and then seeing them operate. So it was very rewarding to work on something at the end and it actually works.

Satisfying

Another project there they just had the by-products unloading and they needed to look at their portions. So I had arranged to go to a bunch of different power plants to see what they did, to see if we could use some of their ideas and see if their was an alternative. To see if their was a way to save money over the other ideas. As it turned out, the other ideas didn’t work. But it was interesting having tests done and trying different technology. It was an interesting process to go through. So I guess I enjoy things that you can see the end product.

Satisfying

At one point in my design job I was trying to get them to change the ways things were done. I got them to have weekly status reports. If people had deadlines, instead of everyone working on their own things, sometimes it made sense if they have similar skills, that more people should be working on one thing. Although it meant taking time away from your own projects, overall it was more efficient. I guess it was rewarding to make some change in a process that I didn’t think worked very well.

Satisfying

In this job we have had a number of changes in the industry, with de-regulation etc. We have been looking at different ways to do things. Things have been done certain ways in the past and it has been interesting and enjoyable to explain to people the need to change. Sometimes, people don’t understand change because it has been done a certain way for such a long time and then when you implement a change and it works that is rewarding.
Choose to be an engineer

I wasn’t going to go into engineering. I had applied into sciences, a number of teachers had told me that instead of going into chemistry, go into chemical engineering because the job prospects are better. My mom had a fair amount of influence she arranged for me to meet a bunch of engineers. My father was an engineer, but he didn’t really push it. So then I talked to other engineers and a couple weeks before school started I changed my program. It was probably more so after I graduated I realized all the things an engineer could do. In high school, the counsellors didn’t mention it at all.

Future

I have gotten out of the direct engineering aspect and I am more in the business side now. It definitely helps because I understand the technical side. I don’t think I would go back to the design engineering, I didn’t like that. Something in the project management wise that could be a possibility. But I find the business aspect more interesting, I think for having a child now, my goal is to keep things going and keeping everything organized. So a lot of it will be keeping things going at home. Probably to get someone to clean the house because their just isn’t time.