
**Wearing the Face of Change:
Experiences and Perceptions of Women in Science and Technology**

A Qualitative Research Report

**Prepared for:
Women in Science, Technology, Trades and Engineering
Steering Committee**

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Executive Summary

This focus group research was one of six components of a study on men and women employed in scientific and technical occupations in British Columbia. The study design consisted of four focus groups, all with female participants. Two of the groups consisted of women who are employed by private sector companies. Students preparing for careers in a scientific or technical field were in the third group. The fourth group was women who had moved from public sector to private sector employment or who were contemplating such a move.

The main purpose of the qualitative research was to gain a better understanding of the experiences and perceptions of women employed in or preparing for careers in science and technology. The broad topics covered in the discussions were: career decisions and goals; work, workplace policies and culture; hiring and career development; and ideas or suggestions for encouraging women and girls to consider careers in science and technology fields and for creating more female-friendly workplaces.

Following are highlights of the main results:

1. In each of the groups, some participants mentioned their interest in people in addition to their scientific and technical interests. Sometimes when talking about their interest in people, they commented that communication skills, interpersonal skills and caring about people are commonly viewed as female traits. Finding a job where their interests in both people and technical or scientific matters can be developed and used was a challenge for some of them.
2. Another general characteristic of the women in the groups was an early interest in taking things apart, building things, fixing things, and learning by working with their hands. Most parents were said to be supportive of their children's early interests, however, a few participants had been discouraged from engaging in these types of behaviours by their parents.
3. The notion that scientific and technical work was not just for "techies" was an underlying theme in the discussions. One group felt that as word spreads that qualified workers are in demand and a diverse array of jobs exist in technical industries, it is likely that people with a wide range of employment goals and non-technical interests will enter fields which are now populated primarily by technical specialists.
4. Nearly all of the women in the study had been or are visible minorities in their classes at school or in their places of work. Although there were a few exceptions, the majority of women displayed remarkable resistance to feeling demoralized or in being deterred from what they wanted to do. A few of the older women admitted that they had been influenced by the non-supportive attitudes of others.
5. To be able to perform ethical work in a company that places a high priority on ethics was discussed in several groups, but was particularly on the minds of students. Many in this

group were leaning towards working as a consultant, because of the control they believed consulting would give them over the selection of clients and projects and in balancing work and non-work pursuits. Consulting, starting a business, and assuming executive level positions were also mentioned by employed women as providing them with the means to exercise control over their time, the culture of the workplace, and the projects they were involved with. Control over one's destiny and to be able to perform work that corresponded to one's personal values were themes for the younger participants in the focus groups.

6. Co-operative education programs in post-secondary institutions were praised and valued by those who participated in them. Those who did not have this opportunity felt that it would have been valuable to them. Work term placements were said to have helped many of the women in co-operative education to focus their career goals. In addition to the benefits they gained from work experience, some women were matched with an employer who offered them their first job after graduation. Another important advantage they saw in attending a department with co-operative education was that instructors were knowledgeable about local employers and shared this information with their students.
7. A main theme to emerge from these groups was the convoluted and long path many had traveled to find their current occupation. Some participants had identified a field of interest early in their lives, but for many, a long period of exploration and/or several fields of study or career changes had transpired before they found their niche. Those for whom career paths were not a straight trajectory had changed fields, usually after taking more training, had moved laterally in their fields by changing employers or job titles, or had been employed in the public sector, then switched to private industry. A couple of the women had made this switch several times.

Several main reasons for long paths to an eventual career were identified: a lack of information about non-traditional jobs for women and a lack of opportunities to determine through experience during their childhood and teen years if they had a talent and interest in performing the tasks of non-traditional work. Another factor influencing the length of time it took for some of them who eventually entered technical programs at colleges was that they had already completed all or part of a university degree when they made the decision to enroll in a college program. Both a lack of information and misinformation on the academic requirements for many jobs in science and technology were also felt to be quite common.

8. Opportunities for advancement to management and good pay were believed to be greater in the private sector than the public sector, and small companies were felt to be more flexible environments where corporate culture and policies are influenced by the people employed there. Public institutions were felt to be excellent places to start careers or come back to at higher levels of responsibilities to gain additional skills, especially skills in project and people management.
9. In concept and in some of its implementations, employment equity was considered to be a progressive step for employers to take and beneficial to women and other visible minorities. A couple of participants credited employment equity policies for giving them the

opportunity to get their first job and *a foot in the door* to prove themselves to an employer. The problem employment equity is trying to address is a numbers issue. As the women in the focus groups pointed out, the under-representation of women in science and technology occupations has many root causes. Girls need to be encouraged to study math and science; opportunities need to be created for women to get the employment skills they need; women with the right qualifications need to know about job openings so they can apply; and employers need to make it attractive for women to apply by offering flex time.

There were two interpretations of employment equity, however, that were regarded as detrimental to women. The first was establishing quotas for hiring women (and minorities), which was believed to occur in the United States but not in Canada. Quotas were felt to inherently discriminate against non-target groups and are ultimately detrimental to those hired under a quota system, because of the resentment of their male co-workers and unsuccessful candidates. The other interpretation of employment equity considered as suspect was the rewarding of managers who hired a member of a target group.

10. Methods, which could result in the hiring of more women but were not employment equity *per se* were for employers to consider equivalent skills instead of requiring certain academic credentials, and to have committees conduct interviews and make the hiring decision. Committee decision-making was said to give women a better chance of getting hired. This was believed to be the case because most managers are male and they tend to hire candidates similar to themselves, and committees usually include female representation and younger men who are accepting of women in the workplace and of women supervisors. Some participants in the groups felt they had encountered barriers in getting hired.
11. A major theme of this research was the high level of job satisfaction of women in scientific and technical occupations. Despite the obstacles some of them experienced in getting hired and dissatisfactions with certain characteristics of their workplaces, the employed women described their jobs with enthusiasm.
12. Most of the women in these focus groups were “the first” or among “the few” when it came to enrollment in courses and programs and in their places of work. Some admitted to feeling fearful and like they *didn't fit*, and a few were initially discouraged from their path by these feelings. To voluntarily take on visible minority status in unfamiliar environments involves personal risks and requires courage and self-confidence. Some talked about the pressure they felt in being the only woman or one of only a few women in academic, training and workplace environments. Their coping strategies were varied and included: a healthy sense of humour; using interpersonal skills to defuse situations and put others at ease; keeping a low profile by not doing anything that would call attention to themselves; being able to detect potentially flammable situations and knowing when to keep quiet; and working harder than other employees to prove they belong and deserve to be there. Two women who worked for biotech companies were an exception to female minority status in the workplace.
13. Many of the women said they had not been subjected to overt discrimination in the workplace, but a few had left environments where they felt uncomfortable. Examples of

fairly common situations they had to deal with at one time or another were: a lack of recognition for their achievements; exclusion from informal communication; not being taken seriously by managers or co-workers; feeling like they were the test case for all of womankind because they were the “first female”; uncomfortable male co-workers who weren’t sure how to treat them or talk to them; insensitive male instructors; and unenlightened male managers. It was clear that the women in management positions had achieved positions of authority and respect at work.

14. The theory that computer/video games stimulate the interest of boys in technical matters was expressed in a couple of the groups. The participants believed that there were very few games designed for girls; hence, this route to a recognized interest in “gaming”, computers, and the technology and technical skills that produced them was denied to young females. Games produced for a female market were described as reflecting interests in people, interpersonal behaviour, and problem solving in general.
15. It was clear that the women in these groups want a balanced life, which they defined as being able to do work they enjoy, but having time to partake in other activities, interests, and family life. Some were actively pursuing work opportunities that will allow them to travel or were planning to work as contractors, instead of employees, for the flexibility it would allow them. They want control over the decisions that affect their lives, especially regarding their projects, tasks and responsibilities at work, and how they will spend their time. Employees who have options for work scheduling was seen as supportive of these goals.
16. Women with children were acknowledged to have more responsibilities and demands on their time than people without families, and often these demands were felt to be unexpected and inconvenient. Women with children who had professional and managerial positions in their organizations were seen as especially challenged in trying to balance work and family obligations. Some felt that women’s education and careers were being postponed and interrupted due to the inability of performing both roles well. Flexible working hours was seen as a way of allowing women with families a better chance of carrying out both their work and home duties. Those without children were also interested in work arrangements that allowed them more autonomy and control over their time.
17. Some women had various versions of alternative work scheduling available to them. A few others had made requests of their employers but had not been successful so far. The main obstacles to obtaining flexible work scheduling appeared to be these: overcoming the inertia of organizations that had been in existence for years and had always done things a certain way; unsympathetic managers with the power to simply say, “no”; unimaginative managers who couldn’t envision how alternatives to all employees working set hours and sitting at their desks might function; and the belief that job sharing or other arrangements would result in extra work for supervisors and less productivity. The general feeling was that it was difficult to influence these changes in the workplace, when initiated by one woman, in one company at a time. They felt new communication and other technologies are steadily increasing the number of jobs that are not bound to any particular location. Given this reality, flexible work options should be possible for many employees in many companies.

Attitudes toward long work days/weeks were discussed at length in a couple of the focus groups, and again the importance of having a balance between work and personal activities in their lives was reiterated. They felt that 50-60 hour workweeks were necessary in some jobs, especially management jobs. The cultures of some organizations were said to influence long work hours, at least once in awhile. Some women felt that if an individual was not willing to work long days/weeks in their industry, it amounted to a decision to abandon any ambitions to reach management level.

Finally, twenty-two suggestions were offered or implied by the discussions in the groups for increasing the number of women in fields of study leading to careers in science and technology, and for improving the work environments of women employed in these fields.

In essence, these suggestions were directed to: encouraging girls from a very early age to pursue interests and skills that can lead to these careers; providing accurate information about career potential from early on and throughout the educational and training period; adopting a more pro-active approach to female students in educational institutions; providing more hands-on experience throughout education and training; highlighting in the media and through other means any positive human resource practices by employers; developing guidelines for employers that would facilitate the full participation of women in the workforce; and supporting organizations like SCWIST and DAWEG that work to implement many of these suggestions.

I. Introduction

Study Background

This focus group research was one of six components of a study on men and women employed in scientific and technical occupations in British Columbia. Other components of the study included a literature review, a compilation of labour market statistics and results of recent university graduate surveys, key respondent interviews, and telephone surveys of employers and employees of companies involved in technical work. A more complete description of the background and objectives of the full study can be found in the introduction section of the project report, *Women in High-Tech Fields in Science and Technology in British Columbia*, May 1999. This report summarizes the results of the focus groups.

Research Objectives

The main purpose of the qualitative research was to gain a better understanding of the experiences and perceptions of women employed in or preparing for careers in science and technology. The broad topics covered in the research were: career decisions and goals; work, workplace policies and culture; hiring and career development; and ideas or suggestions for encouraging women and girls to consider careers in science and technology fields and for creating more female-friendly workplaces.

Statement of Limitations

The focus group method was chosen because of its flexibility in obtaining primary information from members of a chosen population. Focus groups are particularly useful for topics where the nature and intensity of respondents' reactions are unknown, and where it is important to identify the motivations, thought processes, and emotions associated with attitudes and behaviours. Qualitative techniques offer the advantage of yielding detailed information on the topic under review.

It must be remembered, however, that the results of qualitative research are not quantitative conclusions and, thus, cannot be used to estimate the size of any particular group. The findings reported here were drawn from a small sample of women who reside in the Lower Mainland and who are working or preparing to work in scientific and technical occupations.

As is customary in qualitative research, the results of the focus groups have been described and interpreted in text. No numbers or quantified findings have been reported.

II. Methods and Procedures

Study Design

The study design consisted of four focus groups, all with female participants. Two groups consisted of women who are employed by private sector companies. Students who are preparing for careers in scientific and technical fields were in the third group. The fourth group was women who had moved from public sector to private sector employment or who were contemplating such a move (referred to in this report as the transition group).

All sessions were held between November 25 and December 8, 1998, and took place in the boardroom of a downtown Vancouver office building. A cash incentive was given to each participant. Ana Wiggins, President of Points of View Research & Consulting Ltd., moderated each group, and the discussions were audio-taped. The discussion guides may be found in the Appendix of this report.

The participants were recruited using a variety of methods. These methods included: phoning members of the Applied Science Technologists & Technicians of B.C. and members of the Association of Engineering Professionals and Geoscientists of B.C.; asking human resources personnel to identify female employees in their company who met the eligibility criteria for the study; and voluntary contact by the prospective participant after hearing of the study through e-mail or word-of-mouth communication. All participants were screened through administration of a recruiting questionnaire that identified the nature of the individual's work and disqualified those with previous participation in focus group research according to the recruiting standards of the Professional Marketing Research Society.

Description of Participants

A total of 27 women participated in the focus groups. The two private industry-employed groups had seven and eight participants, seven women were in the student group, and the transition group had five participants.

The occupations and fields of study represented in the groups covered a fairly wide range and included the following: telecommunications technician, environmental consultant, electronics manufacturing, surveying, quality control chemist, industrial research metallurgist, GIS technologist and database analyst, pharmaceutical researchers, environmental technician for an engineering consulting firm, quality assurance technician for a software development firm, engineer and web-site designer, project manager of a software development group, marketing and technical sales director for a software development firm, developer of web-based courses in science, physics engineer, forestry researcher in production physiology, systems engineer, computer science, telecommunications engineer, electronics technician, civil engineer, researcher in molecular biology, biomedical engineer, chemical safety specialist and auditor, and chemical/pulp and paper engineer.

The women were forthright in expressing their opinions and candid in describing their experiences. It was apparent that some of them valued an opportunity to discuss these topics with other women with whom they shared interests and experiences.

While the participants were individuals with their own unique clusters of characteristics, they were observed to share some common attributes. In general, the following descriptors applied: intelligent, analytic and flexible thinkers, self-confident, independent, exploratory, adaptive, concerned about ethics, persistent and not easily discouraged, and they placed a high value on personal autonomy.

The next section of the report summarizes the findings of the study.

III. Results and Analysis

The use of *italics* in this section denotes verbatim statements of individual participants. In some instances, these statements have undergone minor editorial revisions to condense and improve their comprehensibility to the reader. As is customary in qualitative research, no attempt was made to confirm the validity of respondents' perceptions or verify the accuracy of any statements of "fact".

General Observations

A few general observations were made about the attributes and interests of the women in the focus groups, and these are described in this first section of Results and Analysis.

Combined interests in people and technical matters. In each of the groups, some participants mentioned their interest in people in addition to their scientific and technical interests. Sometimes when talking about their own interest in people, they commented that good communication and interpersonal skills and caring about people are commonly viewed as female traits. If two broad interest categories, "persons" and "things", are construed as independent (orthogonal) personality dimensions, then individuals can be said to specialize in one or the other category (or neither), or they can be generalists in their interests. Generalists have high levels of interest in both "persons" and "things", and many of the women in the focus groups could be described as generalists. Apparently, one of the challenges for the generalists in this study was to identify jobs where their dual broad categories of interests and skills can be developed and used in the workplace.

This combination of interests serves as a partial explanation for why some of the women in the groups had defined roles or accepted positions for themselves in their organizations that gave them opportunities to interact with people. For example, there were women who had decided to train for or had advanced to management positions, so they could work with people. A few had switched from performing strictly technical tasks to marketing and client servicing functions, or had moved into consulting positions. Others said they were recognized and depended on by co-workers for their trouble shooting or problem solving skills. Still others had chosen to work for companies or in jobs where they felt they were developing products or advancing knowledge that would benefit humanity in the future.

The employed generalists were aware of their need to satisfy two sets of interests and talked freely about decisions, such as job changes, that had been made to address this issue. Some of the students were still in the process of dealing with a perceived dilemma in finding an occupation that permitted a full expression of different facets of their personality.

The notion that scientific and technical work was not just for "techies" was an underlying theme in the discussions. One group explicitly discussed the likelihood that as word spreads that qualified workers are in demand and a diverse array of jobs exist in technical industries, people with a wide range of employment goals and non-technical interests will enter fields that are now populated primarily by technical specialists. As one participant put it, *As word gets out that this industry needs qualified workers, people with a range of aptitudes and interests*

will be attracted, some will be headed for management, rather than technical positions, marketing, business development proposal writing, and client servicing.

The context in which a desire to interact with people was often raised was a spontaneous statement about disliking to spend significant time working with a computer. The comments listed below were all from the student group.

I've had co-op work terms where I've done a lot of programming, and I've found I need more interaction with people than that, just staring at the screen just doesn't really do it for me. It's lonely. I like talking to people and meeting new people.

... We had a course on micro controllers and sitting there, programming in machine language for hours on end, is not what I want to do. ... Most women are more talkative I find. They interact with people more, not computers.

I think it may be more of a personality type than just male or female. The hard sciences were historically more - sit in front of a computer and anti-social - and I think that's changing a lot and maybe that's attracting more people who are more well-rounded to begin with, more guys who aren't so hard core into sciences...

Non-specialist, divergent interests were also demonstrated by the range of some of the participants' academic studies and accomplishments. Multiple degrees and diplomas were not uncommon with these women, and some of them had studied very different fields simultaneously or in succession. Some examples were: economics and hydrography; interior decorating and electronics; commerce and cell biology; creative writing, French and engineering; psychology and engineering; and physics, agriculture and forestry.

Early interests and aptitudes. Another general characteristic of the participants was an early interest in taking things apart, building things, fixing things, and learning by working with their hands. This finding suggests that a tactile style of learning, spatial ability, and advanced fine motor skills may be characteristic of children with an aptitude for technical work. The women said they thought of themselves as "typical" in their childhood and youth, but the self-descriptive statements they made during the discussions suggested some departures from social stereotypes of the typical little girl's play activities, interests, and other characteristics. Their common descriptions of themselves included: tomboy; an early interest in taking things apart or building things; a keen curiosity, especially about science and how things work; above average, sometimes exceptional, abilities in math and science; and resistance to discouragement.

For the most part, parents were said to be supportive or at least accepting of these early interests and activities. A few of the women in the groups said they spent many hours in their childhood watching their fathers perform mechanical tasks. They said they had learned from observing their fathers but not by doing, because their fathers had not asked them to participate in these activities.

Apparently, the most problematic behaviour for parents was their child's love of taking things apart, an activity a few parents were said to call *destructive*. Faced with broken toys and

disassembled appliances and other household objects, perhaps it is not surprising that some parents were annoyed. It was not clear from the findings of this study if parents are less tolerant of taking-apart behaviour in their daughters than their sons. One participant said she was punished for indulging in her childhood passion for taking things apart.

The relationship between play and future work should not be underestimated. In fact, two women who were in different focus groups but both of whom worked in research laboratories used the word, *play*, when describing how they felt about their jobs. *I find research - you're playing all the time. It's like being in the sandbox...*

The women made these comments about their early years.

... Even as a young kid, I'd take apart the plumbing. We were in a hotel, and I unscrewed all the bottom parts, and my dad had a fit.

I know I wasn't typical. I was more like a tomboy. I didn't play with toys or dolls... I could probably build a car from scratch (as a teenager).

I was the questioning one. I drove people crazy with questions. If I didn't like my answer, or if I couldn't ask a clock - but why do you work - I took it apart.

When I was a kid I was always taking things apart trying to figure out what made them work... My parents didn't really discourage it at all, which is good - until I tried to take apart the TV... I just wanted to see what was inside. I've taken apart the VCR, the TV, and my Walkman has been taken apart many times.

How their early tendencies relate to their current activities and work is reflected in these statements.

I do like fixing things and figuring stuff out.

I always liked building things, like Lego, like coming up with new ideas. One thing I like about engineering is that it gives you a chance to work with your hands when you're working on a project that's not programming. I like putting things together. I've had summer jobs where I've been building electronic components - that always seemed to work well for me.

I want to know how everything works, I want to know the why of everything. If I ask a question, I don't just want - that's the way it is - as an answer... I really like software for that reason, because it's a very much in your head kind of creative thing, and design decisions made way upstream have huge effects by the time we get the software officially.

I think for me, I like solving problems - not taking things apart but finding the answer to something... Until you got into higher level math you knew when you got the right answer, you could follow a process and get to the right answer. The same was true of

software... you start writing a program and when the thing prints out 1,2,3,4,5,6,7,8 you're done, so it's a very methodical thing.

Other interests. Perhaps related to their preference for hands-on learning experiences was the involvement of many of the women in different types of physical activities and enjoyment of the outdoors. As previously mentioned, several women described themselves as tomboys as children. Other participants said they were involved in athletic activities, enjoyed hiking as a leisure activity, had changed jobs from office jobs to work performed outdoors, or had made a particular career choice or said they liked their job because of its combination of inside and outside work. A woman commented on the satisfaction she felt in meeting the physical challenges of military training, and another expressed a desire to combine her technical work with wilderness guiding for part of the year.

Resistance to discouragement. Nearly all of the women in the study were visible minorities in their classes at school or at their places of work. Many stories of situations that would have discouraged less persistent individuals from their goals were shared in the groups. A few of the older women admitted that they had been influenced by the non-supportive attitudes of others. *I actually let that influence me when I was younger. It wasn't until I hit my early thirties I said, this is really stupid, this isn't who I am at all and became more myself* . Although there were a few exceptions, the majority of women displayed remarkable resistance to feeling demoralized or in being deterred from what they wanted to do by the comments or expectations of others.

The source of their resistance to discouragement was not entirely clear, although positive influences in their lives that are certain to have contributed to their strength of determination and self-confidence are discussed in other sections of this report. At times, their comments about the discouraging remarks made by other people suggested a response from them of angry defiance. Other times, they seemed to regard unwanted opinions as minor obstacles they were prepared to deal with.

Below are a few examples of their self-reported reactions to the discouragement they encountered from teachers and other people.

Some people say, no you can't do that because you are a woman, and I told them where to go with that one...

No one tells me not to do something, because then I would try harder.

I had a grade 11 physics teacher tell myself and my best friend that he didn't think we should take grade 12 physics, because girls didn't do physics... This challenged us to go ahead, but some would have been discouraged.

When I was in grade 6, a teacher declared to us in front of the class: What is this class? This is so abnormal - the top three people in math are girls - this is not normal... I remember thinking, well of course we are, we study. No one was going to tell me I would not be good...

Ethics and personal autonomy. To be able to perform ethical work in a company that places a high priority on ethics was discussed in several groups, but was particularly on the minds of students. Probably this was because students were thinking about their options and trying to decide what they wanted to do career-wise, once their studies were completed. Many in this group were leaning towards working as a consultant, because of the control they believed consulting would give them over the selection of clients and projects and in balancing work and non-work pursuits. Consulting, starting a business, and assuming executive level positions were also mentioned by employed women as providing them with the means to exercise control over their time, the culture of the workplace, and the projects they were involved with. Control over one's destiny and to be able to perform work that corresponded to one's personal values were themes for the younger participants in the groups.

These comments were made in the student group.

I went to one of those company information sessions, and I realized who I definitely didn't want to work for... and I'm afraid there are a lot of firms like this. Basically, they will do absolutely anything that comes up, and they don't really care about ethics, they don't really have a value system. In response to these remarks, another student in the group said, *It's all money.*

I think it is going to get better, because I find that the more women are involved in these areas the less cutthroat and the less unethical they (companies) become. Most of my women friends who are in the business, although they are interested in making a comfortable living, they are not so interested in doing it at the expense of anybody and everybody else. The more women that are involved in a company the more chances you have of that company having... good ethics. I think women are a real bonus to all areas of the working environment.

The other issue I wanted to bring up is integrity... the pull that a big corporation has, especially in the technology field, the ability to disagree with them or be able to bring your own product or your own view, to make a difference that way - I think it is very important to have that. I think small corporations can do that, but how do you protect yourself against being absorbed into the culture of a given corporation? ...As an independent consultant you would be able to make your voice heard...

Practical-mindedness and life-long learning. In their decisions about fields of study, courses and jobs, the women revealed themselves to be practical individuals. While students, they were thinking about the job opportunities available to them, and some had enrolled for re-training along the way or had changed programs or careers. A few criticisms were voiced about the perceived lack of practical content in some post-secondary science and computer science courses. In a related vein, a couple of participants who were very talented in math said they had no idea at the time they were deciding on a field of study what jobs an individual would be qualified for with a university degree in mathematics.

This willingness to make significant changes in career plans and paths stemmed from their evolving interests, fuller knowledge of increased labour market demand for certain skill sets, and realization that whole industries were undergoing rapid change as technology developed. It could be that an adaptive nature is the most important indicator of career success and job satisfaction in technical areas, especially those involved in the development of high technology products. People in these jobs have to function well in working environments where change is continuous, and life-long learning is required.

I felt four years of university computer science was a waste of time. I made the mistake of taking honours, which was highly theoretical and before the co-op program. So I didn't have the combination of work and school - what you should have. Third and fourth year university was not relevant to the work I do now.

What I have noticed too about our conversation is that most of us don't want to be limited. We want to keep learning. If we are in a limited situation we aren't happy - if we can't use all of our skills.

Career and Field of Study Decisions

Influence of parents. The influence of parents was acknowledged by many of the women. Some mothers and fathers served as role models, because they worked in professional capacities, or were regularly observed engaging in scientific or technical pursuits or working with their hands. Mothers, including non-working mothers and those who had not pursued formal education beyond high school, were given credit for having said the right things to their daughters at critical junctures where their child could have become discouraged and abandoned a particular path. Mothers were said to have “raised the bar” on early career goals (e.g., *So you want to be a secretary. A legal secretary is the best secretary job. Better yet, why not be a lawyer*). When difficulties in math and science were encountered, they encouraged their daughters with statements like: *Work harder, you can do it*. Some were said to have engaged their children in conversation and activities that developed thinking skills and encouraged an interest in science (e.g., *My mother has the mind of a scientist*).

Fathers were noted for the pro-active, explicit ways they influenced particular career choices and for the interests they shared with their children in working with their hands and in scientific matters. For example, some dads gave non-traditional toys to their daughters, such as microscopes, and others let their daughters watch them work on cars, build things, and fix things around the house. A few dads were also said to have advised their daughters to be independent, get training and have a career. In contrast, a few women said they had been raised in a traditional manner when it came to gender-based expectations about education and work.

Some of their comments about the influence of their parents are listed below.

My mom told me I could do anything I wanted, go for it.

For me, my father is a mechanical engineer and was always pushing for one of his kids to be an engineer. The other two are older and weren't interested, so he had me from a little kid saying, I want to be an engineer.

My father was an industrial education teacher - though he never taught me anything at home, and I don't know if that was because I was a girl or not - but I can remember hours on end hanging over the basement railing watching him do something, and that really created an interest.

Influence of school and educators. Teachers, pull-out programs in elementary school, specific courses in high school, guidance counselors, co-operative education programs, visits by college personnel to high schools, and classmates with similar interests and aptitudes were all mentioned as influential in selecting a field of study or in making career decisions. A couple of participants mentioned pull-out programs for gifted students in elementary school and the success of these programs in keeping very able students feeling challenged in school (e.g., accelerated math). These programs were said to provide exposure to science through projects that were fun and provided hands-on learning experiences (e.g., building a pin-hole camera, taking pictures with it, and developing the film).

Some participants mentioned the importance to them of getting advice and information from guidance counselors and talking to representatives from post-secondary institutions on school career days. For some, these conversations were a turning point in making decisions about their field of study. Several had taken career counseling and testing at their high school and through women's outreach at the University of British Columbia (UBC). In contrast with high school career counseling, the UBC program was described as intensive and very valuable in matching a person's interests and abilities with specific occupations. One woman had gone twice for aptitude testing and career counseling - after she finished high school and again, a number of years later, when she wanted to re-train and change careers.

A participant also mentioned taking a course on introduction to the trades for women. While she didn't continue working in her trade, she said the course gave her *exposure to a bunch of trades and a bunch of mystery was removed from a lot of things - I learned a little bit about a lot of things and enjoyed several of them. I picked one where there was an opportunity for me to start school soon.*

Perceptions were somewhat mixed regarding the quality of job-related information received in high school. The general view was that students are not well informed. A couple of the women said that no one had suggested fields of study or programs that would have suited them, given their interests at the time. On the other hand, they acknowledged the fact that when it comes to jobs, there is a lot to know, so the task of informing students is formidable. At least one participant felt that too much information could be overwhelming to some young people. *... I'm not sure it's entirely a gender-based thing, but when I was in high school I didn't have a guidance counselor saying, hey, you'd make a great engineer, or you'd make a great computer programmer...*

No one in the groups referred to a good, comprehensive source of job-related information, and some said they did not believe any such sources existed. For female students, this absence

of information was further compounded by a lack of women role models to talk to about work in scientific and technical fields. The fairly recent requirement for high school students to have some exposure to the workplace was mentioned in several groups and was felt to be a step in the right direction. One participant commented on how better informed high school students are today in comparison to when she had been in school. *Accounting and typing were the only courses where there used to be career development information. It was not the same as what I am seeing now with high school students.*

An engineering student said her high school student peers in an advanced physics class were instrumental in her choice of engineering. She said all but two of the students in this physics class entered engineering in university.

Co-operative education programs in post-secondary institutions were praised and valued by those who participated in them. Those who did not have this opportunity felt that it would have been valuable to them. The women in two of the focus groups had much to say about co-op programs, and their views are summarized in a separate section of this report. A couple of people in one group felt that co-operative education should be offered in high school for the valuable employment information and experience it would provide.

A lack of information and misinformation on the academic requirements for many jobs in science and technology were felt to be quite common. For example, a participant mentioned that she had assumed that advanced degrees were a necessary qualification for certain jobs, only to discover that this was not a requirement. It was clear from the comments of participants in the study, especially university graduates, that what constituted proper preparation for specific jobs was a topic they were not well informed on until later in their post-secondary studies.

Examples of their statements about school-related influences are listed below.

The thing that almost stopped me was the fact that engineering technology was a male domain... A BCIT instructor came to my high school and did a demonstration, and I asked if I would be welcome or would I be walking into a hostile environment (at BCIT). As a graduate of grade 12, I was only so brave at the time. He said it would be fine, you would be welcome... I needed the guy from BCIT to say it was okay.

I chose what I was going to do, because when I took grade 12 chemistry I thought it was really cool. I had a good teacher, who happened to be a man.

I knew nothing about computer science before my first course in high school, and then I couldn't think of anything else I wanted to do.

Influence of the media. Interestingly, the media was cited as both a positive and negative influence. For some of the younger participants, television was said to be a good source of information about job possibilities. In contrast, the portrayal of women on television and by the fashion industry was seen as detrimental to the self-esteem of girls and women. The reliance of these portrayals on narrow stereotypes and idealized images was seen as the problem. One participant speculated that perhaps the press isn't covering the advancements

of women into fields where their numbers are few or their presence unknown. She contrasted press coverage now with the 1970s, when feminism was newsworthy, and women felt *cheered on by the increasing numbers of women in fields as reported in the news.*

Examples of positive and negative statements about the influence of media are shown below.

TV showed different roles, and later, TV showed women doing these roles. I learned from TV about different jobs.

I still think, in general, the media portrays women or tells us that we aren't quite good enough, we'll never be quite good enough. Men are brought up and told they are competent, and they can do whatever they want... (Women are given the message that they are) not thin enough, not beautiful enough - those things make women insecure. So we need life experience to tell us we are good enough.

(From television) maybe there's still the image of girls are supposed to be.... very pretty, fetching, co-operative, and side kicks. Then you get back to that image if you are like this - you can't be like that. If we could defeat that image - to be feminine you can't be technical - maybe that would help.

Role of college and university calendars. A surprising number of participants said they chose their field of study by referring to the calendar of their post-secondary institution, and this was especially true for those who had graduated from college programs. They said there was an absence of women role models in the fields many eventually chose to pursue and little, if any, information about the jobs they could obtain with the proper preparation in a particular field of study. Given this situation, college calendars were the main source of information that enabled some of them to match their talents and interests with a program of study. It should be said that at the time they consulted a calendar they knew the subject matter for which they had an interest (e.g., math, chemistry, biology, electronics).

A few participants said they were unaware of the existence of the British Columbia Institute of Technology (BCIT) when in high school, or they felt that BCIT was *for the shop guys*. One person said she doubted that many high school girls talked to the people from BCIT when representatives of post-secondary institutions visited her school. When the lack of awareness of BCIT was discussed in one of the employed women's groups, two women who had grown up in Alberta contrasted this situation with the high profile of that province's technical colleges, Northern Alberta Institute of Technology and Southern Alberta Institute of Technology. They said these technical training institutions were well known to Alberta high school students, partly because of the rivalry between the schools.

There was discussion in one of the groups about whether or not post-secondary institutions are "marketing to women". The general feeling was that little, if any, attempt is made to encourage women to consider a full range of options. *Even engineering from UBC or SFU - that was never marketed towards the women - and I never would have had the courage to go into something like that right out of high school.*

Examples of their reliance on calendars are listed below.

After I graduated, I was flipping through a calendar and read the engineering section. I read the course outlines, course descriptions and realized this was always stuff I wanted to know, and I decided to go back to do it... No one around me was in engineering... I wasn't hanging out with the science crowd in high school, so there wasn't any other way to come about it. Well where else are you going to find out what engineers do? Many people don't know.

Initially I wanted to go into medicine, then when I took first year science courses they weren't what I expected. They... were more theory, weren't practical and not what I wanted. I didn't know if I wanted to finish my degree. Then one day in my room, I took a BCIT calendar and opened it to biotechnology and realized, it was the research side of the sciences I wanted to get into, as opposed to being a physician, and I applied for the program.

Opinions About Co-operative Education Programs

The perceived value of co-operative education programs was spontaneously raised in each of the focus groups. As previously mentioned in this report, work term placements helped many of the women in co-operative education focus their career goals. In addition to the benefits they gained from work experience, some of them were matched with an employer who offered them their first job after graduation. *My four co-op jobs eliminated saw mills and the gas and oil industry, and the last one... opened the door... (to my first job and future work).*

Another important advantage they saw in attending a department with co-operative education was that instructors were knowledgeable about local employers and shared this information with their students. Graduates of college programs were especially apt to comment on how much they had learned about jobs and employers at school. A graduate of a college program said many people in her program did not have to search for jobs after they graduated, because employers came to the school and hired from her class.

At Kwantlen College, a big focal point of the program was getting you involved in what the industry is like, guest speakers to keep you up-to-date and what is current, and in two courses over the two years we had career preparation, resumes and job interview skills, as well as work experience through co-op. That was the best point of the program.

Some of the women were critical of UBC for not having co-operative education programs when they attended this institution. The university was described as having a research focus, and good students in the sciences were expected to go on to graduate studies or into a science-related profession, such as dentistry, medicine, or pharmacy. Some of those who had attended UBC said they did not receive any employment information from their instructors.

Some of the comments of UBC graduates are listed below.

I think that universities, and probably UBC in particular, need to be more aware of what industry's needs are. They are very insular and very much a research institution.... and their attitude is very much that undergraduate degree programs are wasting their

resources, and research is really the important thing... They need an understanding from industry that that's what keeps the economy going, which allows you to get those nice grants for research.

... UBC in particular has a strong research department, and that was the focus. (If you had) academic merit you would be going into a graduate degree program, and then you would be doing your doctorate, and then you would be doing a post doc fellowship, and then going the tenured professor route, and that was the only thing they saw... It made you feel like your options were pretty limited...

The professors don't encourage students to go out into industry and get a technician job. They think you should go to BCIT if you want the hands-on work experience as a technician. The intent is to have students go on to further studies.

The women were aware that UBC now has co-operative education in some departments. *Co-op programs are bursting at UBC right now... It was part of Martha Piper's green paper, the plan for the next century...* There was speculation in one of the focus groups that UBC had introduced co-operative education programs because students were being lost to Simon Fraser University (SFU) and the University of Victoria. They said that these institutions have had their co-op programs for some time, and students recognized their value, making this one of the criteria for selecting a university. In another group, someone believed that UBC had not been able to introduce co-operative education to the full extent planned, or at least not as quickly as planned due to funding shortfalls.

An engineer in one of the groups said there was no co-op in engineering when she went to university, but while she was a student she had been matched to a mentor by the Division for the Advancement of Women Engineers and Geoscientists (DAWEG). She said she learned a lot about jobs in engineering through informal conversations with her mentor. Now this individual is involved in organizing seminars for recent engineering graduates on topics such as job search and how to negotiate a salary. Also, networking events are arranged, so that female engineering students can meet people working in the profession. She remarked that DAWEG has limited funding to undertake these important activities, and, even though highly effective, one-on-one mentoring is *very taxing* - students and volunteers have to be matched, and mentors have to make a significant commitment of time.

One drawback of co-operative education was said to be the fact that many work placements are not in the local area. Apparently, some students do not participate in co-operative education, because they do not want to re-locate or feel they can't afford the additional expenses of a move.

Education and Career Paths

Long paths and a process of elimination. A main theme to emerge from these groups was the convoluted and lengthy path many had traveled to find their current occupation. Some participants had identified a field of interest early in their lives, but for many, a long period of exploration and/or several changes in career or field of study had transpired before they found their niche. Some of those whose career paths were not a straight trajectory had changed fields, usually after more training. A few had moved laterally in their fields by changing employers or job titles. Others had been employed in the public sector, then switched to private industry, and a couple of them had made this switch several times.

A highly educated chemist who had emigrated from Europe was now under-employed in Canada, working at a technician level. She felt the main reason for this was her difficulty in communicating in English. Examples of specific career changes mentioned in these groups were moving from an apprenticeable trade to computer information systems analyst, self-employment in a service industry to electronics manufacturing, biology to software development, biochemistry to computer hardware then to computer software, and biotech electronics to computer programming.

While the women acknowledged the value of maturity in making important life decisions, a time-consuming process of self-discovery might be regarded as inefficient from a labour market standpoint. For many participants, finding their particular employment niche was largely achieved through a process of elimination - studying different subjects or working for a time at different jobs. Several reasons for these long paths were identified: a lack of information about non-traditional jobs for women and a lack of opportunities to determine through experience during their childhood and teen years if they had a talent and interest in performing the tasks of non-traditional work. Another factor influencing the length of time it took for some of them who eventually entered technical programs at colleges was that they had already completed all or part of a university degree when they made the decision to enroll in a college program.

It is important to realize that the women with long paths to a career choice valued the experience they gained during their exploratory years and probably would not wish it had been otherwise. It is only from the perspective of the labour market issue of the demand for technical workers exceeding their supply that this phenomenon might be viewed as “a problem”. In fact, while describing the benefits of sampling a variety of jobs and workplaces a participant commented on the pressure on young people from worried parents and society *to get on with it*. She had some advice to give that makes clear how much she felt she had gained from the years between high school and enrolling in technical training.

... Take some time to explore. I had about 25 jobs after high school, and it was very valuable. A lot of people don't feel they can do this. I learned people skills, management skills and problem solving skills - not a bad thing to not know for 10 years after high school. Don't spend thousands of dollars on a university education before you know.

There were two paths to a technical job that were unique in these groups, but the first situation described may be fairly common. One participant had not completed high school, and at 30 years of age she began a year of research to decide on a new career. An older friend who was a retired engineer was instrumental in helping her to recognize her interest and talent in technical areas. She then had to finish high school before she could enroll in a technical program at a post-secondary institution. The second unique path in these groups was a woman whose time in the military had provided her with a wide range of experience and gave her confidence in her abilities in non-traditional endeavors. As another woman in her group put it, *the army gave you enough variety that you could understand that you could make an unusual choice.*

I joined the military. It was a challenge for me. It was something I really wanted to do. It was outside the box. I drove and worked on trucks, played with pyrotechnics, did supply, project management. (The experience taught me) to not let anybody say, I couldn't do it; the confidence to say, yeah I could do those things; not to be sucked in by any stereotypes...

It may be the case that the process of elimination many of these women embarked on is no different from how their cohorts in non-technical fields and their male peers in technical occupations arrive at their labour market destinations. It may also be generally true that most young people do not have the benefit of a broad survey of information on jobs, the job market for these jobs, and knowledge of what training is required and what aptitudes are associated with which jobs. Nevertheless, the women in these focus groups felt that their lack of information and the absence of female role models had been significant obstacles for them to overcome. Moreover, these were among the most important reasons they cited for the still small numbers of women who are preparing for or working in many scientific and technical occupations.

Some of the participants said they started thinking about job options as teenagers by eliminating the choices that were unattractive to them. Invariably, these were traditional jobs for women, such as teacher, nurse, or secretary. However, given their lack of information and the multitude of choices left, it was interesting that few described systematic, thorough searches for employment information. They were more likely to say they *kind of stumbled onto things, were lucky in their timing* in getting a job that set their career path, took the advice of a career counselor, or based their decision on course descriptions in the calendar of a post-secondary institution. Some of the women who had been in co-operative education said the work terms helped them to focus their goals by allowing them to experience different industries and types of work. Their choices narrowed as they discovered work they enjoyed and eliminated others that did not interest them. Engineers were especially likely to mention this benefit of co-operative education.

A few of their statements on this topic are listed below.

There were two things I knew I didn't want to be in life, a teacher and a nurse and after that, well, the world is open.

Life skills give you confidence to look at something that is not a traditional choice.

But I didn't know what all the options were... When you went to high school they said these are some of the main ones, and they were all stuff I didn't want to do.

Knowing what your options are, and what you have to do to get there would be a really great thing.

I still don't know what I want to do!

I actually didn't decide until very recently what I wanted to do. I kind of went from job to job...

My employment evolution has almost been by accident versus planning.

Nearly all of the participants in these groups had graduated from high school before the introduction of career planning and pre-apprenticeship courses to the curriculum. Some of them talked about teenagers in their families or the children of friends, and these comments raised the question: have things changed very much when it comes to gender issues in the schools? For example, a participant said there were no females taking grade 12 computer programming in a Vancouver high school. The other women in her focus group found this very surprising information. A university student said her sister shows no interest in technical matters - even though she is a good student and is computer-literate. Another participant talked about how her academically gifted niece is socially isolated at elementary school and is not given as much time using the computer as the boys in her class. Yet another talked about how the lack of practical in career planning in high school had been a drawback for her technically inclined teenaged brother.

Women in transition. One of the focus groups consisted of women in transition, defined as having been employed at a public post-secondary institution and now in private industry, or now employed at a public institution but contemplating a move to the private sector. The main objectives for this group were to gain an understanding of their perceptions about the advantages and disadvantages of employment in the two sectors and to identify the primary concerns and considerations in thinking about a change in sector of employment.

The women in this group remarked on the excellent experience they have acquired through employment at a post-secondary institution. When asked how they came to be employed at a post-secondary institution, they mentioned attractive opportunities to work on research projects they had been exposed to as graduate students. A few simply said they knew they had the credentials and skills that would enable them to get a job in the public sector and begin their careers. One individual said that private companies did not hire women for her type of work when she started her career, and so she sought employment at a university.

Two individuals had switched from public to private and back to public sector again, each time for different reasons but always taking advantage of career advancement opportunities. *For me, it was the project... The second time I went back (to a post-secondary institution), I was making a jump up, getting into a management position and an opportunity to supervise people and a jump in the pay.* The other woman who had made the change from public to private sector and back again also mentioned that the job that enticed her back to the public sector

involved working with people. *I ended up thinking I liked to work with people more than develop things.*

Another participant remarked that she hadn't been out of school since kindergarten and isn't knowledgeable about the private sector, even now. *I finished my BA degree, did a Masters degree and knew I didn't want to do a Ph.D., but didn't know what I wanted to do after that, but I knew a university would hire me.* One of her goals at this time is to educate herself about job possibilities in the private sector. Her methods of preparing and informing herself have included taking a course on report and business writing, joining a professional women's organization, listening to people and asking questions, and reading business publications. When asked what would help her to get informed, she replied, *I am doing it myself, because it's tailored just to me, but I can see some kind of more structured service for people in graduate school or maybe finishing undergraduate...* She wondered aloud if there were professional organizations that were involved in *some formal way of introducing people to what's out there.*

This participant believed that the private sector offers job opportunities for people with Master's degrees in the sciences, but the problem is identifying which companies will do this. She said that if employers advertised for equivalent qualifications instead of requiring a Ph.D., women such as herself would know to apply for these jobs and would help *make a Masters degree a real viable option for jumping off into a responsible position in the private sector.* Recently, she had seen an employment advertisement of a research institute in the U.S. worded in this manner. She didn't think this organization was relaxing its requirements so a woman could be hired, only that it wanted people with the right skills. *...To me it's hiring the best candidate, but keeping in mind that there is not just one set of skills that is relevant. Experience might be as important as a certain type of degree... Otherwise, we systematically close down positions, and we end up with organizations that are clones.*

All of the women still employed by public institutions described their jobs with enthusiasm and acknowledged the opportunities for interesting, challenging, and satisfying work at public institutions. The main important differences they perceived between the two sectors were: an opportunity to influence workplace decisions, policy and culture; advancement to management; and financial compensation. Each of these differences tended to favour private industry, although two women had moved from private industry back to the public sector for career advancement reasons. Those who felt they were significantly underpaid in public sector employment said they had stayed as long as they had, because their work was so interesting and satisfying.

The transition group expressed some frustration in having to deal with a slow moving bureaucracy in post-secondary institutions, *the old boys network*, and male managers with out-dated attitudes. Several told stories of the difficulties they had in trying to obtain flexible work scheduling. Those with experience in both sectors pointed out that finding a compatible working environment doesn't depend on the sector so much as it *depends on the people and their attitudes.* One had worked for a private company she described as *completely stifling, competitive and hierarchical, ... not a very creative place to work.* The key attributes determining an organization's propensity to change were said to be size and the attitudes of the people at the top. In other words, large companies may be as difficult to change as a

public institution. A couple of women employed by UBC mentioned positive change *filtering from the top* since a female president had assumed leadership.

In summary, opportunities for advancement to management and good pay were believed to be greater in the private sector, and small companies were felt to be more flexible environments where corporate culture and employment policies are often influenced by the people employed there. Public institutions were felt to be excellent places to start careers or come back to at higher levels of responsibility to gain additional skills, especially skills in project and people management.

These are a few of their comments on sector differences.

I prefer working in a culture I like, regardless of whether it is private or public sector. However, I would like to return to the private sector and be in a company where I have a chance to set what the culture is, and I think you have more of a chance of doing that in a small company if you are at the management level. Whereas in the public sector, the culture is kind of there and it's harder to change a larger organization's culture, you have to accept where they're at and move towards changing it, but it's much more difficult...

I've worked in two public and two private sector environments, and I have a very strong personal preference for private over public sector environments. As for differences between them, it's often a large organization that is difficult to influence, and I like having some sort of influence on my environment, and I want the work that I'm doing to be influential and meaningful. I find that a lot easier to do in a smallish, private sector environment. I think BC is an exciting place to be right now in small private sector companies. I think there is a tremendous amount going on, and that's where I want to be. On the compensation side, I think the opportunities for compensation are a lot higher... and that's a factor as well.

... The money isn't my motivation at all in considering a move into the private sector, but I would get at least a \$10,000 raise, maybe more... I am seriously underpaid for my experience and qualifications.

Hiring Experiences and Views on Employment Equity

Employment equity. In concept and in some of its implementations, employment equity was considered to be a progressive step for employers to take and beneficial to women and other visible minorities. A couple of participants credited employment equity policies for helping them get their first job and *a foot in the door* to prove themselves to an employer. The problem employment equity is trying to address is a numbers issue, but as one participant pointed out, the under-representation of women in science and technology fields has many root causes. Girls need to be encouraged to continue studying math and the sciences, and opportunities for women to get the required employment skills need to be created. Moreover,

women with the right qualifications need to be aware of job openings so they can apply, and employers need to make it attractive for women to apply by offering flex time, etc.

There were two interpretations of employment equity mentioned in the discussions that were regarded as detrimental to women. The first was establishing quotas for hiring women (and minorities), which was believed to occur in the United States but not in Canada. Quotas were felt to discriminate against non-target groups and were ultimately detrimental to minorities hired under a quota system, because of the resentment of co-workers and unsuccessful candidates. The other interpretation of employment equity considered as suspect was the rewarding of managers who hired a member of a target group. When this particular form of employment equity was said to occur in B.C., the other participants in the group expressed surprise.

A few of the women said the organizations they worked for produce a report periodically of the numbers of women and other minorities who had been hired. The approach to employment equity at a public institution was described this way: *...If it comes down to two equally qualified candidates, you would probably be encouraged to hire the minority person, but only if they are that close in their qualifications.* Another university employee had heard negative comments about the Canadian government's policy of reserving scholarships and research fellowship grants for women. The complaints were from men who were looking for similar scholarships or positions.

In general, the women in the focus groups were supportive of employment equity but were cautious in their views on how it should be handled. In one of the groups there was some discussion about the wording of employment advertisements. Naming target groups in ads - for example, "women and visible minorities are especially invited to apply" - was known to be controversial, because these ads do not encourage men to apply or are not perceived as welcoming to men, and therefore are risky to women. The perceived risks to women that were mentioned included a social backlash against the notion of employment equity and diversity in the workplace, and the marginalizing of women in workplaces where they are under-represented. Examples of wordings of employment ads the women felt were appropriate were: "we encourage all qualified candidates to apply", and "we are an equal opportunity employer".

Methods that could result in the hiring of more women but were not employment equity *per se* were for employers to consider equivalent skills instead of requiring certain academic credentials (previously discussed in this report), and to have committees conduct interviews and make the hiring decision. Committee decision-making was said to give women a better chance of getting hired. This was said to be because most managers are male and they tend to hire candidates similar to themselves. Committees, on the other hand, usually include female representation and younger men who are accepting of women in the workplace and of having women supervisors. Even so, a participant with personal experience as a member of a hiring committee pointed out that sometimes there will be a dominant manager on the committee who emphasizes the importance of hiring a candidate with *traditional attributes*. Traditional attributes were defined as *someone who is dedicated, who is going to do overtime.*

The difficulty of how to send a welcoming message to women and not offend anyone was discussed in a non-hiring context as well, that of a professional organization that wanted to encourage female members to participate in its activities. Pictures or photos were suggested as a solution to this dilemma. *You know what the best message is though, it is to have your picture there on the advertisement, to show they have women representatives.*

These remarks were made about types of employment equity regarded as detrimental to women.

And it's another reason to say, You were hired just because you are a woman.

In the long term it would make a negative contribution to the work environment.

... It would be that much more difficult to be credible.

They'd be labeled as having come into the company under that quota system of the '90s. It would stick with them.

I guess it bothers me that employment equity is saying we must have 50% men and 50% women, because it implies if you have a job and you are a woman, you got it because we had to have 50%, instead of you got it because you're the best... We are capable, and we deserve these jobs because we are good, not because we are women.

In one of the groups, the discussion of employment equity raised the issue of informal communication among employees as an aspect of equity in the workplace. *I think there's equity in employment and equity in the workplace, and equity in the workplace for me means that you get invited to lunch with the boys... there's all this networking you end up missing.* Not being invited to participate in these types of informal communication sessions, not being able to influence the topic of informal conversations with male employees, and managers praising male employees but not female employees at staff meetings were each given as examples of inequity in the workplace. Also mentioned in the context of workplace equity was the difficulty faced by women who are perceived as aggressive. These women, described by one participant as *strong women*, recognize that they don't fit in and *leave fairly quickly*. In contrast with most male managers they were familiar with, women managers were said to prefer less hierarchy in the workplace, *a flat team*, and were finding success using this approach.

Hiring experiences. Problems in getting hiring were described, and women in the trades seemed particularly likely to have encountered total barriers. *No women's washrooms* was the most frequently mentioned excuse given by employers for not hiring women in the trades. The absence of separate sleeping quarters for women had been an obstacle for two participants whose work would have involved time in the field.

Several women talked about their experiences at job interviews where they felt a candidate of their gender was an unusual event. Following are comments on the perceived discomfort of the people carrying out the job interview.

It's almost like they are shocked to see you. They heard you, they know you are a woman... I don't know what they expect to see...

At my job interview... they didn't quite know what to expect from me - what I would be doing, or would I be interested in that, or what my background for things were. I got the sense that they were kind of taken aback... I got the sense that I was an unknown quantity almost.

A female surveyor thought that it may be an advantage to be a woman when it comes to getting jobs with city governments, which she believes have equity programs. She said she was the first person interviewed for a short term contract with a municipality and got the job. She described a similar experience with a private construction company, even though she believed that this company did not have an equity policy.

Experiences in Class and in the Workplace

Job satisfaction. Probably the most important finding of this research was the high level of job satisfaction of women in scientific and technical occupations. Despite the obstacles some of them experienced in getting hired and dissatisfactions with certain characteristics of their workplaces, the employed women described their jobs with enthusiasm. It would not be inaccurate to say that some of them were passionate about their work. In fact, if satisfaction with the tasks and responsibilities of their work was the sole predictor for the numbers of women entering the fields represented in this study, then post-secondary institutions and employers would be overwhelmed by women wishing to prepare for careers and apply for jobs.

The women in the focus groups seemed to believe that it was only a question of time before young women realized the opportunities available to them and took the necessary steps to ensure their places in these highly desirable occupations. This doesn't mean that they believed nothing needs to be done to make this a reality. The focus group participants had many suggestions for pro-active initiatives that could be implemented or expanded, and these are mentioned throughout this report and are summarized in the final section.

Wearing the face of change. There is no question that most of the women in the focus groups were "the first" or among "the few" when it came to enrollment in courses and programs and in the workplace. Some admitted to feeling fearful and like they *didn't fit*, and a few were initially discouraged from their path by these feelings. To voluntarily take on visible minority status in unfamiliar environments involves personal risks and requires courage and self-confidence. It is important to realize that these women did not choose their fields out of a desire to change the world. They said nothing in the discussions to indicate they were motivated to take personal risks by ideology, a sense of injustice toward women, or satisfaction in assuming the role of "trailblazer". To go to class or work each day wearing the face of a visible minority was sometimes unsettling and uncomfortable, and some of them talked about these feelings and the extra pressure they felt being the only woman or one of a few women. Perhaps it should come as no surprise that some of them are now volunteering

their time to try to ease the way for women who are following them into environments where they are under-represented.

The extent to which these women were a minority in their classes at school and at work is evident in the following descriptions. It was interesting that there was no hesitation in supplying precise information on this question. For example, no one said they could not remember the male-female ratio, even when they were talking about classes or workplaces from years before.

- A student enrolled in a technician program is one of two women in a class of 28. In the engineering program she was previously enrolled in, there were six women out of 140 people in the program. *I sat there and counted them.*
- *When I went through, 10 years ago, women were 5% of engineering students. Now it's about 20%.*
- Two participants said they were the only women in their current place of employment, and four had been the only woman at a former workplace.
- A participant said she was one of two girls in a high school physics class of 15 students.
- *In every one of my work terms, I was always the first woman they had ever hired.*
- *I am the only woman in my college program.*
- *When I went through engineering, 15 women graduated out of 220. When we started there were 35 women and 330 men.*
- A participant said she is one of three women in a workforce of 20 employees.
- *I was the only girl in the class. I went through the whole of training and only me. I was sort of like the token woman.*
- A participant said she was one of two women in a class of 20 in her first course, and she was the only woman in the second course.
- *When we graduated there were 50 students, and five were women.*
- *I was the first woman to go through the trades program there.*
- *I was told I was the first woman doing this kind of work since the war.*
- A participant said there were five women in her class of 60, and four women graduated.

- *I got to university, and the first year was not a problem, then I took a second year calculus course and then all of a sudden I was the only woman in that class, and I dropped out.*
- *Maybe 5% of the industrial arts students at junior high school were girls.*

Two women who worked for biotech companies were the exceptions to minority status in the workplace. The male-female ratio was 50/50 in one company, and women were over-represented in the other company (60% of employees).

Many of the women said they had not been subjected to overt discrimination on the basis of gender, but a few had left environments where they felt uncomfortable. There were several examples of fairly common situations they had to deal with. These were a lack of recognition for their achievements, exclusion from informal communication, not being taken seriously, feeling like they were the test case for all of womankind, uncomfortable male co-workers who weren't sure how to treat them or talk to them, insensitive male instructors, and unenlightened male managers. A few other situations were mentioned once or twice. These were the women's washrooms were located a considerable distance from the actual work site, comments from co-workers that suggested they were hired only because they were a woman, feeling looked down on by male co-workers, and having "calendars" in the workplace.

Several participants shared their views on the internal resources women needed to possess in order to successfully deal with criticism and less-than-accepting attitudes of co-workers. One person theorized that *women tend to internalize guilt*, and so *if a co-worker says you're not as good, we will believe it, whereas guys will say, no it's your fault, I'm better.* The participant who made these comments believed that if women accept and believe in themselves, they are going to be less affected by negative attitudes and behaviours. She went on to say that some women *deal with problems by working extra hard, being extra good...* and she thinks this has to do with a lack of confidence. Along the same lines, another participant said, *I don't think you can afford to be touchy and be a female in male-dominated areas, because you'll always come across men who don't have the greatest attitude, and, if you get upset by it, it's self defeating...* Her advice was to *have a good sense of humour and be resilient.*

In summary, their coping strategies were many and varied. Their strategies included a healthy sense of humour and using interpersonal skills to defuse situations and put others at ease. Other methods were finding common ground for casual conversation, keeping a low profile by not doing anything that would call attention to themselves, and being able to detect potentially flammable situations and knowing when to keep quiet. Also mentioned was working harder than other employees to prove they belong and deserve to be there.

A few examples of overt discrimination were described. A woman formerly in a traditional trade referred to one of her training environments as *fairly hostile.* *I had instructors tell me they would never hire me because I was a woman...* *One of the reasons I left was because I had a really hard time finding a work environment that felt like a place I wanted to be in.* In contrast, a couple of the women said they had heard much different remarks from supervisors. A surveyor said a supervisor had told her that he would rather hire women, because there was *a better chance a woman would show up be on time, be tidier, cleaner, and more organized.*

When asked, what was it like to be the only woman, the first woman, or one of a few women, they made these comments.

In the beginning I was quite scared, but after awhile they were all really good guys so I got to have a lot of fun.

If you are the first woman you are the test. They are going to hire other women based on whether you work out or not... It wasn't my screw-up, it was all womankind screwing up if I screw up. If a guy screwed up he didn't feel like he was screwing up for all of mankind. I don't feel like that way anymore because through organizations like SCWIST and DAWEG, I know a lot of women in engineering and science now.

It takes some getting used to. Where I am now working, I work with men in their 50s, and that has been more difficult. They are much less comfortable working with women, especially if the woman is in a position of power.

The reaction was kind of mixed. The instructor was very supportive, some of the guys were not very happy having me there at all, and some didn't really care.

I didn't know at the job interview there were no women in the company... When I started to work I thought it was going to be weird, but it didn't stop me from wanting to work there. They made me feel really comfortable.

The average age in our company is 32, so everyone is my age and there are no differences in the way women are treated. They take your opinions seriously, listen to the point you want to make, and everything is judged on the merits of what you have to say. Gender isn't an issue.

In the office it's comfortable but outside in the field you have to exude more confidence, speak a little more aggressively. In the office there are rules, people have to abide by certain rules. Out in the field there isn't any.

The instructor made a friend of mine drop out (of a traditional trade program). She couldn't take the pressure of the instructor constantly harassing her and the guys in the class, because she was the only woman, and they figured they could do it.

Only the first week did it take getting used to. Now it's comfortable, and they really respect my feelings and take that into consideration and not differentiate on the basis of gender.

I made deals with the guys. I said I wouldn't want naked women in the computer room, but I could live with the bikini calendar. And I tried to make sure I never stepped on any toes.

A student said she was very grateful to a dean who came to class on the first day and told the male students to look around and notice how few women were in the room. He told them to

respect the women and treat them well, because they had worked very hard to get here. *I was extremely glad he did that, because it changed a lot of the guys' attitudes. I was talking to some of the guys afterwards and they said, I never thought of it that way.*

It was clear that the women in management positions had achieved positions of authority, but some of those who did not yet have the responsibilities and clout that go with certain job titles also said their competence was respected and acknowledged in their place of work. For example, a woman in a software development firm said, *I'm the most technical person in my department and have the most technical background, and everyone comes to me for answers... I'm the first person they come to with questions...* Her company partners on projects with large international corporations, and she says her gender has not been an issue in meetings with employees of these companies either. She said the partnership companies have female project managers and vice presidents, and she has heard that some companies in this industry tend to have male technical lead people and female project management people.

One of the groups compared the field of engineering to software development, and a participant stated that computer-related jobs, unlike engineering, are so new *they don't have the stamp - this is a male field.* This person argued that the numbers of women and men in computer science *were evening out*, and this seemed to be the opinion of some people in other focus groups as well. However, a woman working for a software development firm disagreed and said that she is working with a group *straight out of university, and they are 80% male, and 80% of people applying for jobs with us are male.*

Women's choice of biology, biotech, and biomed fields of study over other sciences and engineering was a generally held opinion. In particular, a couple of groups discussed the success of the field of engineering in attracting increasing numbers of female students, but its perceived lack of success in attracting and keeping more women in the field. While the increase in the proportion of women in engineering programs was acknowledged, there was some disagreement as to whether women were continuing and graduating in the same proportions as their representation in first year classes and if they were staying in the field once they have graduated.

If the women in these groups are typical of engineering students and graduates, it would have to be concluded that female engineers have a tendency to move sideways in their careers. The reasons given for lateral moves were varied, but their common denominator was the experience or perception that the field is highly competitive and unusually demanding of professionals' time. The general feeling was that in order to be successful an engineer has to be willing to commit to long hours and demands beyond the capacity of anyone who wants a family life, or even a balanced life permitting time for non-work interests. Some options were considered to provide more flexibility than the standard career progression, and these were self-employment, employment by a post-secondary institution, and client/customer-based work, such as marketing the products and services of a company, business development in the form of proposal writing/bid preparation, and customer service.

In the student group, two engineering students engaged in an exchange that perhaps revealed part of the dilemma of female students in their program and perhaps in other fields of

study where women are under-represented. This dialogue was exclusively concerned with what they referred to as *the look*, and how they felt about it. *I have a really hard time with people who look at me when I tell them I'm in engineering. You always get that face.* As soon as this sentence was uttered, another engineering student agreed and demonstrated the face (to everyone's amusement). The first student went on to remark *... I hesitate to tell people because of that...* With respect to a career after graduation, one student said she feels she has to decide at a young age whether or not she wants to have children, because she didn't feel it would be possible to do both well - have a family and a career in engineering.

The comment that I always get, and I get it constantly, You're in engineering physics, wow, there must not be very many girls in that, or that must be really hard. Or they think they should have to congratulate you or something. It's a really good thing that you are doing this. You must be really smart.

A third engineering student in the same group did not share these concerns and said she thought people were just curious, interested in what engineers do, and weren't reacting in a negative way when they registered surprise at hearing that she was an engineering student.

Where are the women? The views of the focus group participants on the nature of the barriers to attracting women to scientific and technical fields are discussed throughout this report. The particular issues for the fields of engineering and computer science were discussed at length in several groups. Opinion was divided on whether or not women drop out of engineering in larger proportions than men. Some quoted figures that indicated women constituted the same percentages of students in each year of the program, while others quoted figures that indicated a higher drop-out rate for women (the statistics may differ for different institutions). One participant shared the anecdotal information that her two sisters had been in first year engineering, then changed to a science field.

There was considerable discussion in a couple of the groups as to whether or not engineering was a special case when it came to getting women informed about and interested in the field and if women pursued careers as professional engineers once they had completed the necessary academic qualifications. Although consensus was not reached on these questions, opinion appeared to lean toward engineering being somewhat of a unique case. A number of problems in attracting women to the field were identified. These were: an ill-informed general public about the work of engineers, a lack of female role models, a perception that the work of engineers is dirty or dangerous, not having the proper academic preparation in high school, and a lack of exposure to relevant activities and classes like shop that would allow girls to recognize their interest and aptitude for engineering. *The mindset of a lot of engineers is to take something apart and put it back together and figure how it works, and in high school the girls weren't encouraged to go into the automotive program, woodworking...*

Some participants also thought that young women are getting *the wrong information from word-of-mouth*, and one individual who had recently graduated from university felt that there was too much discussion about why there aren't more women in engineering. She said she had participated in several discussions as a student on this topic and seemed to believe it was counter-productive to call attention to the under-representation of women in this field. Her reasoning went like this: women who haven't chosen their field of study hear that females are

not choosing a certain field; they ask themselves, why is that; they think to themselves, there must be a very good reason why women don't go into that field; they conclude, I don't know why women don't choose to be ..., but there must be a good reason, so I won't do that either.

The groups tended to feel that computer science did not have the same difficulty in attracting women. Some believed that women are represented in computer science classes and programs *in the expected numbers* in post-secondary institutions. As previously mentioned in this report, some believed that girls are not taking computer classes in large numbers in high school, however. The theory that computer/video games stimulate boy's interest in the field was expressed in a couple of the groups. It was felt that there were few games designed for girls, reflecting their interests in people and problem solving. A woman who worked in the computer industry said when she gave a presentation at a games design school, there was only one female student. When she asked why this was so, *someone from Nintendo said, because most of the games are boy-oriented. Most computer games are written by men.* Local companies that develop games were said to employ few women.

Below are a few of their comments on games.

I find that more guys play computer games than girls, so there is a negative connotation to computer courses, (girls are) biased against it...

It's very rare that I find a computer game that I like. I do not want to play (games) with blood and gore. I like to play card games and board games and intellectual games... The computer games I grew up with, PacMan, Asteroids, those were fun games. You had to use your intelligence, and also there wasn't blood and gore. Now that games are more visually real, they make them more violent.

There is only one game, the dinosaur chasing game, that is 50-50, boys and girls play. There are companies that are writing games for girls and families, so we should buy stocks in those companies.

Opinions About Flexible Work Scheduling

It was clear that the women in these groups want a balanced life, which they defined as being able to do work they enjoy, but having time to partake in other activities, interests, and family life. Some are actively pursuing work opportunities that will allow them to travel and are planning to work as contractors for the flexibility it allows. They want control over the decisions that affect their lives, especially regarding their projects, tasks and responsibilities at work, and how they will spend their time. Having work scheduling options was seen as supportive of these goals.

Women with children were acknowledged to have more responsibilities and demands on their time than people without families, and these demands were often unexpected and inconvenient when due to a child's illness, for example. Women with children who had professional and managerial positions in their organizations were seen as especially challenged in trying to balance work and family obligations. Some felt that education and

careers were being postponed and interrupted due to the inability of performing both roles well. Flexibility in working hours was seen as a way of allowing women with families a better chance of performing both their work and home duties well.

Who is looking after the kids if you have a demanding job? You can have a career as long as those kids are taken care of...

Personally I think women are, in general, more people-oriented and they have children, and it doesn't matter how much you want a family and you want a career, it is very difficult to do both of them very well, so they have to postpone or cut back to be a nurturing parent because still in most families, the mother is the nurturing parent...

While much of the content of the discussions about work scheduling options centered on men and women with family obligations, those without children were also interested in work arrangements that allowed them more autonomy and control over their time. *If I want flex time, it is to take care of other parts of my life. It sort of bugs me that it always comes back to - it's because women want babies...*

In general they felt that recent changes in the nature of work, that is, an increasing number of jobs that are not bound to any particular location, make flex time a viable option for many employees in many companies. They pointed out that it is easier now than anytime in history to work at home or anywhere away from the office because of advances in technology, such as computers, cell phones, e-mail, and faxes.

Some of the women in the groups had various versions of alternative work scheduling available to them, but a few others had requested it and had not been successful so far. One woman who had children had tried to get two different employers to agree to her working part-time. A few others told stories of how alternative work scheduling came to their workplaces, and the initial difficulty of getting managerial approval. The main obstacles appeared to be: overcoming the inertia of organizations that had been in existence for years and had always done things a certain way; unsympathetic managers with the power to simply say, "no"; unimaginative managers who couldn't envision how alternatives to everyone working set hours and sitting at their desks might function; and the belief that job sharing or other arrangements would result in extra work for supervisors and less productivity. In companies without a policy in place, it was usually a solitary female employee who raised the issue with her supervisor. The general feeling was that it was difficult to influence these changes, when initiated by one woman, in one company at a time.

The following reactions to requests for alternative work arrangements were described in the groups and illustrate the types of attitudinal barriers that have to be overcome in many organizations.

- How can we work a longer day so that we can work 9 out of every 10 days, when we already work 9 or 10-hour days here?
- You can have flex time. You can come as early as you want and leave as late as you want, but you have to be here from 8:30 to 4:30.

- Your request for flex time is denied, because it would set a precedent of special privileges that other employees would want.
- It's impossible to work part-time in a research position.
- These kinds of arrangements are perceived by management as a lack of commitment to the company and to your job.

One participant said she had heard that notes are placed in the files of employees who *have a special arrangement*. Another woman said that alternative work arrangements, such as part-time work and job sharing, are common now in lower level positions but are still uncommon in professional or management positions. One of the difficulties for managers who want alternative arrangements was said to be lack of coverage for them when they are away from the office. A participant said one of the main concerns expressed before flex time was introduced in her organization was that clients would complain when they are unable to speak to someone, because that person is away from the office or it is their job share day off. She said so far there have been no indications that clients perceive a reduction in service, nor have there been any complaints. Awareness of alternative work scheduling seemed to be universal among the working women in the groups, however, one of the students admitted aloud that she had never heard of flex time before the discussion in her focus group.

In my company, you don't have the option of job sharing if you want to work part-time... It's a majority of guys and a lot of the guys are older, so... I haven't heard of anybody asking for it. This is not something I have heard any of the guys say, I want to work part-time and spend more time with my kids. Or maybe they don't feel like it's an option economically.

There's a lot of companies that are not willing to go to that place yet anyway. I don't think that's rare.

It is something I have been fighting for years... I've pioneered it twice, in two different places now, but in the second place it was a temporary thing, and I don't have it anymore. It's very frustrating...

(These options) may be more important to women than men, because women take kids to the doctor, take care of them when they are sick, and go to the school to deal with stuff.

Some examples of approaches to the introduction of alternative arrangements were described in the groups. The first approach was an informal understanding among employees of small companies, largely based on good communication and trust. These companies tended to have women in executive positions, but there were exceptions to this generality. A time clock mentality was not part of the cultures of these organizations, and women who worked for companies offering flexibility said it fosters a productive, dedicated workforce that voluntarily worked extra hours when they felt there was a need. There was no formal policy in place in

these companies, but employees could take time off if they needed to, work outside of the usual hours if they wanted to, and didn't need to ask anyone or feel guilty for doing so. There were some constraints though having to do with the nature and deadlines of the current work in progress. It was expected that co-workers and supervisors be informed, and those who worked under this arrangement said it was not abused. Both biotechnology and software development companies were said to have these informal arrangements.

Many thought that the informal approach worked well only in smaller companies where close communication is easier, and employees develop a great deal of trust in each other, because they work together on projects and know each other well. At least one participant disagreed with this general view, and pointed out that even very large organizations have small work units, so in some ways, the work unit functions as a small company within a larger organization.

A similar approach was to have no written policy, but decisions on employee requests for paid sick days, family days, and flexible scheduling were left to the manager's discretion. It is a little more formal than the approach described above, because a manager must always approve the request. This approach has the potential to provide employees with quite a lot of flexibility, depending on the attitude of the manager.

In our company, there isn't a written policy on flex time, but there's an attitude whereby it's tolerated to a large extent... The only reason it works is because we trust each other. We trust each other to all be working toward the same goal, and putting enough priority on the company and the company's work.

We have an honour system, we take time off when we want or leave early. They trust you to do the work and put into the time. People put in more hours than they are supposed to when they are trusted and given flexibility.

Most companies I've worked for it doesn't matter when you work as long as you get the job done.

I have worked in a department where you're watched like a hawk, you have to be there from 8 to 4, and everyone leaves promptly at 4. At another department, as long as you get the job done they don't care, so you work more for them.

Another type of situation was common to software development companies. There are core hours for employees, but other employees, whose work was not tied to a particular location, were allowed a good deal of latitude in their hours and place of work. Several of the women said their next career move would be motivated by a desire to have a job that allowed them this flexibility.

From their comments, it seemed that companies that haven't been in business a long time tended to deal with situations as they develop, rather than having a policy on something before the need arises. While this sounds reasonable from a business standpoint, the onus is on the employee, usually a female, to ask for any change. The individual employee who is the

first to ask and the only one asking for the change may feel like he or she is taking some personal risks in doing so.

The women felt this situation could change in the future. Not only are many high technology companies relatively new companies, they also have young employees. It may not have been an issue in the past, but as workers age and move through the life cycle, many companies may feel pressure from more than one employee, even groups of employees, that will not be easy to ignore. Employees who need or want flex time or other alternative arrangements because of family responsibilities will increase in numbers as the workforce ages.

We have core hours from 9:30 to 3:30, and then it's flexible. You don't want to lose that privilege so you do your job and then some, so it works quite well.

The only people who automatically have flex time are developers. They have to be in the office from 11 to 4, other than that they can work at home. Everyone else is expected to be at the office... although programmers are starting to get flex time... It hasn't been until this year that there have been employees with children... and recently, an employee took maternity leave. This was the first time the company had to deal with this.

The third type of policy described in the groups was a formal written policy, and this was characteristic of some public institutions, as well as some private companies. The written policy specifies "the rules" that are to be followed for all employee benefits, including alternative work or scheduling arrangements. In public institutions the rules could vary from department to department in the same institution. Some of the research and development units in post-secondary institutions appeared to operate like small private companies, in that there was no written policy, and employee requests were dealt with on a case-by-case basis.

People are happier now, and they work harder. The male employees helped develop this policy, and they take advantage of it too. The boss takes flex days now.

A participant who telecommutes two days a week said she is the only employee telecommuting in her large organization. She said she does not have children but asked for telecommuting because she lives quite a distance from her office. None of the women in the focus groups worked full-time from a home-based office, but one person described a programmer friend with a young child who formed her own company, so she could work at home most of the time. The participant telling this story felt that because programmers are in demand and the majority of their work is not tied to a particular location, they may have more success than other employees in achieving flexible options.

A single parent who worked for a private company and a new parent who worked at a post-secondary institution were in the process of trying to arrange for alternative hours. One was asking for permission to work at home one day a week, and the other planned to ask for a long mid-day break to spend with her newborn in exchange for working evenings at home. Again, the shortage of people in certain occupations was cited as a reason for why things will eventually change. The feeling was that employers will have to offer more flexibility to their workers in order to keep them.

Attitudes toward long workdays were discussed at length in a couple of the groups, and again the importance of balance in their lives was reiterated. *To me, success is achieving balance...* When asked if they thought that 50-60 hour workweeks were necessary in some jobs, they replied: long days go with some management jobs; long hours are expected because of the culture of some organizations but may not be necessary; and most jobs require extra hours now and then for up to months at a time but not on an ongoing basis. The managers in the groups confirmed that extra hours were sometimes necessary in their jobs, but one of them contrasted her situation with other professionals. *You can see the end of it... It's not like a junior lawyer or a resident doctor where you absolutely have to put that time in for four years if you're going to make it...* Another participant talked about the *law of diminishing returns*, and the illusion that tired people are productive employees. Some women felt that if an individual was not willing to work long workweeks in their industry, it amounted to a decision to abandon any ambitions to reach management level.

I want to enjoy what I do and feel I am being paid for my level of responsibility. I prefer to work 40 hours a week and don't need to finish my career as a vice president.

My job is a huge part of my life because I enjoy it so much, but I am not going to work a 60 hour week, so being the president of a company is not part of my agenda... I am going to take my work and keep some sacred time separate.

A vision of the future of work could be distilled from these discussions. Mainly due to technological advances, and the values and preferences of young people beginning their careers, technical work in the not too distant future may have these characteristics.

- Relationships between workers and employers will largely be project or assignment-based, temporary and contractual.
- People will use technology to perform their work tasks anywhere.
- Workers will be mobile, both in terms of being able to perform their duties at considerable distance from corporate offices or other employees, and in terms of the number and variety of employers for whom they will have worked during their career.
- The average number of hours worked per week will decrease, if calculated over the course of a year, because workers will voluntarily choose not to work for significant periods of time.
- The number of technical workers who call themselves consultants will increase, and these consultants will define their own labour market niche based on their skills, interests and values.
- Life long learning will be regarded an integral part of work, and learners will need access to a revolving door type of educational institution to update their skills and re-train on a frequent and regular basis.

There are far reaching implications in these changes. Among the implications relevant to this research are: how people will find their next job and how employers will find their workers, which employment benefits are most important to workers and how these benefits will be administered, and how post-secondary institutions will define their roles, what programs will be offered, and how these programs will be delivered/accessed by the learner.

It's almost going back to the cottage industry without really being a cottage industry, which is fascinating, and it's my favorite part of our technology.

If I think about my perfect job or work environment, I would be this perfectly mobile person... I think that the time has come. We have all this technology - we should be using it to make more time for our families, to be more flexible, to be able to live wherever we want, not to be connected to a place. If we want to travel, be on vacation and work at the same time we should be able to do so, and I think in my field it is possible... How to get there? I don't know how to get there...

Their Beliefs About the Issue

During the course of these discussions, the women voiced many beliefs, opinions and feelings about the issues covered in the study. Beliefs held by some or many of the participants are summarized below.

1. Careers in science and technology provide people who have the necessary aptitudes and learned skills with interesting work and a great deal of job satisfaction.
2. Demand exceeds the supply for many occupations in these fields, so the opportunities for employment and career advancement are very good.
3. Technology will eventually solve the flexibility issue for some women, because many workers will be able to perform their tasks anytime, anywhere.
4. The main obstacles to female-friendly work environments and company policies are the out-dated attitudes of older male managers and, for some occupations, the nature of the work itself.
5. It is very difficult for women to bring about change in organizations where they are the only woman or one of a few employees asking for changes.
6. At this time, it is more difficult for women to get jobs than it is to get training in trades and technical fields with long histories of male-domination. At this time, it may be as easy for females as males to get hired for scientific and technical occupations that are of recent origin, that is, too new to be perceived as male occupations.
7. Women with non-traditional jobs often feel they have to work harder than their male counterparts to prove themselves.

8. Even though their numbers are increasing, too many young women are closing off their career options while still in high school by not taking science, math, and technical courses.

9. The main reasons girls are not taking preparatory courses in secondary school were felt to be: a lack of role models, a lack of information about job opportunities in these fields, a lack of interest or a lack of exposure to find out if they are interested, peer culture and social pressure to conform and avoid the label of “geek”, lack of encouragement from teachers and parents, few computer or video games designed for girls, and the media’s narrow and stereotyped portrayal of females.

Most of these reasons are inter-related, but since motivation is a necessary requirement for learning and stems from personal interest, and because interest is generated from successful, enjoyable experience with an activity, the lack of opportunities for young girls to explore non-traditional activities may be the most significant reason. Girls as children and youth need more and better opportunities to discover if there is a match between their talents and interests with work in scientific and technical fields.

10. In the absence of information and hands-on experience in the early years, it often takes maturity and life experience to recognize what a person wants to do if their eventual choice is a type of work that is not typical for women.

11. For some reason the message isn’t getting through to young women in high school to keep their options open by taking technical courses and courses in math and science. This is a complex issue and needs to be addressed in more effective ways.

12. Since the mid-1970s, it is believed that the numbers of women enrolled in science, math, and technical courses in high school and post-secondary institutions has steadily increased. The proportion of women in post-secondary computer science programs is believed to be especially high.

13. Engineering was said to be a difficult profession for women, and some graduates may be deciding not to pursue careers in the field, or they may be choosing to move laterally into jobs where they use their training but do not work as engineers. The reason why engineering is not attractive to some women is because of its reputation as a demanding, competitive profession with long hours, making it difficult to combine a successful career with family life or other non-work interests.

14. Proportionately fewer women than men pursue graduate studies in scientific and technical fields.

Ideas and Suggestions

Suggestions were offered in each of the four groups for increasing the number of women in fields of study leading to careers in science and technology and for improving the work environments of women employed in these fields. While some suggestions were impractical due to their far-reaching implications and complexities (e.g., change society's gender-based stereotypes), others would be possible to implement, or are operating in some way now but need to be improved or expanded. A few of the suggestions listed below were implied by the discussions, rather than offered as an explicit suggestion.

1. Inform parents of the behaviours that may indicate an aptitude for science or technical work so they can provide appropriate outlets for their child's curiosity and not unintentionally discourage them. This is especially important for girls who learn by taking apart household objects.
2. Provide opportunities at home, at school, and in the community for girls to discover their interests and aptitudes through hands-on exploration. These opportunities should begin at an early age and continue through high school.
3. Encourage the development of computer and video games designed for girls.
4. Use technology to provide information to children and youth. An example would be videos of female role models who are working in science and technology fields (e.g., a day in the life of...), which are accessed through the Internet. Another example is electronic mentoring through interactive websites, giving young people a chance to ask questions and dialogue with someone working in a field they are interested in.
5. Develop effective ways of informing young women to keep their future employment options open by taking math, science and technical courses in high school.
6. Support and encourage young women to continue their studies who are not in the top 10% of their class when it comes to math and science courses.
7. Expose girls to role models of women working in scientific and technical fields in elementary school, and have the women talk about what they do at work and the training they received to prepare for their jobs.
8. Teach children and youth where to find job-related information, and teach them the skills to access it. Market the available resources and make sure career counselors have copies of printed materials and access to other types of resources.
9. If a well designed, easy-to-use, and comprehensive resource does not exist for information about jobs, the job market, salaries, and education and training required, develop one.
10. Take young girls to work so they can see for themselves what a day on the job entails, and teach them skills while they are there, like how to use the Internet.

11. Increase the awareness of young women of post-secondary schools offering technical programs, so that those who want practical, work-related skills can make an informed choice when deciding on a post-secondary institution.
12. Increase the opportunities for young people to get aptitude testing and thorough approaches to career counseling.
13. Post-secondary institutions should market to women, defined as being pro-active in welcoming women students and encouraging them to ask questions, apply for programs, and then ensuring they feel comfortable and like they belong once enrolled.
14. All post-secondary scientific and technical programs and fields of study should have co-operative education work term placements.
15. As a way of informing the general public, provide the media with information about the progress women have made in entering certain fields and their success in and satisfaction with those fields. Foster widespread general discussion of the positive aspects of the issue.
16. Provide information on private sector companies to women who have started their careers at public post-secondary institutions and to students in university.
16. Inform employers about successful implementations of alternative work arrangements and flexible scheduling in organizations similar to their own.
17. Encourage employers to provide these options to employees wherever it is feasible, and encourage them to be creative and work with their employees to discover how to make it feasible.
18. Provide information and support to women who want to bring alternative work arrangements and flexible scheduling to their organizations.
19. Develop guidelines for employers on desirable employment equity practices so that women hired under employment equity policies don't experience resentment and reduced credibility at work.
20. Identify jobs where advanced degrees are now required that could be competently assumed by women with equivalent experience and encourage employers to include equivalent experience in the wording of job ads.
21. Provide information to employers and employees on equity in the workplace.
22. Support and expand the work of organizations such as SCWIST, DAWEG, and APASE to help bring about these changes.