Breaking Down Barriers to Women in ICT

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Executive Summary

This report was developed in 2005 under the Researching Careers in IT project. The term “new immigrant” was used as it was the terminology in use at that time. In 2006, ICTC changed the term to “Internationally Educated Professional (IEP)” instead of “new immigrant”. Some of the data reflected in this report has changed. Please visit ICTC’s website for updated Labour Market Intelligence reports.

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Introduction

The Information and Communications Technology Council (ICTC) is a not-for-profit sector council established in 1992. ICTC is undertaking a research project, Researching Careers in Information Technology (RCIT) to address the career awareness, recruitment and retention issues surrounding women and the information technology (IT) sector. ICTC aims to raise the level of awareness about the opportunities available in IT. ICTC will use information from the RCIT project to shape the development of career awareness tools, information and resources about information technology careers for women.

To compete globally, the IT sector will need to recruit from all potential human capital resources. Significant labour market constraints are predicted. Yet, women are significantly under-represented in the industry and when they are present they tend to hold traditional jobs within the sector. While there are several noteworthy pre-recruitment interventions, there are limited recruitment and retention strategies found in the research. More significant is the fact that women’s participation seems to be declining.

In addition to the predicted labour shortages, research supports the link between gender diversity and organizational performance. Employers in the IT sector may be limiting their competitive advantage as well as risking considerable human resource shortages.

Objectives

The “Researching Careers in Information Technology: Women” (RCITW) project initiative is a short-term research project to:
— Provide ICTC with data on the human resource and employment issues for women as recorded in the literature and as reported qualitatively by key stakeholders;
— Point to possible approaches that ICTC could take to increase the engagement of women; and
— Identify best/promising practices in reaching this target group.

Research Methodology

The project objectives were achieved through an environmental scan and targeted focus groups.

The Canadian Career Development Foundation (CCDF) research team carried out the following activities for the environment scan:
— A literature review
  • CCDF researchers actively reviewed a large body of relevant literature. CCDF’s primary focus was national academic research, supported by a cursory review of supporting international research.
  • CCDF also conducted web-based reviews for programs and tools that support women’s entry and maintenance in the IT field.
— Email surveys
  • CCDF compiled a contact list of stakeholders in the following domains:
    – Associations and educators devoted to promoting IT careers to women, understanding the pedagogy of girls and women and breaking the barriers for women studying in IT related programs, and
    – Employers in the IT sector.
— Focus groups with young women in high school (n=16), parents (n=11) and with women who work(ed) in or who are trying to enter the IT sector (n=13).

The qualitative information gleaned in the environmental scan provided insights into potential sources of information, partners and themes emerging from research and personal observations of key stakeholders. The focus groups effectively tapped into motivations, attitudes and perceptions and confirmed, deepened and clarified findings of the environmental scan.

Analysis of the qualitative information gathered in the literature review, surveys and focus groups provides critical information on common issues in human resource management, training and career development relevant to the recruitment and retention of women by the IT sector.

The Target

When it comes to recruiting and retaining women in the IT sector, the “leaky pipe” phenomenon begins early. Research has confirmed that by kindergarten, boys and girls interact with computers differently and this difference is socially constructed not something that is innately gendered. Throughout elementary school, girls are given subtle and not so subtle messages that computers are not girl-toys. In secondary school, young women’s enrollment in computer science courses is on the decline since the IT bust of 2001. Fewer and fewer women
are opting for post-secondary programs that could lead to careers in IT. Many women who enter the field come in via circuitous paths that rely on informal, on-the-job learning and self-instruction rather than formal academic training in IT. These non-academic routes do not tend to be valued in the industry and often limit women’s career growth. Many women leave the sector mid-career as family obligations and working in IT do not mix. Immigrant women who are highly trained face many roadblocks, including: foreign credential recognition, language training and barriers to attaining security clearance. Aboriginal women are virtually invisible in the IT industry.

The Findings

Major barriers include:

— Significant image and perception problems, including the view that the industry is singularly computer-focused, male-dominated, lacking in social relevance and predominantly anti-social
— A gender-bias in computer education
— Lack of career awareness and labour market information that profiles the “real world” applications of IT and the contribution women have made to the sector
— Few visible role models for young women
— Recruitment based primarily on employee referral (mostly male) and does not actively attract highly trained immigrant women
— A workplace culture characterized as an “old boys” club

Key points in addressing barriers:

— Shedding Stereotypes – The sector needs to help girls and young women see the relevance of IT to the “real” world. Career awareness tools that explore the depth and breadth of the sector are needed. Activities, camps and educational programs need to be tailored to the learning needs of girls. Role models need to be visible and have the support of their employers to actively assume mentoring roles. Support materials/strategies need to be developed to support the influencers (teachers and parents) of young women’s career choice.

— Promote Multiple Entry Points to the Sector – Some researchers argue that the failure to include multidisciplinary approaches, to define the fundamental skills (essential, job-specific, soft skills and technical) needed for high demand IT jobs and to identify training and development leading to these skills marginalizes women from the sector (Cukier et al., 2001, 10). More work is needed to delineate the fundamental skills required in IT occupations and where recognized training exists. Widening narrow definitions of IT to be more inclusive of multidisciplinary perspectives is recommended.

— Workplace Policies and Strategies for the Recruitment and Retention of Women – Recruitment and hiring practices are often inequitable and create barriers to advancement and benefits. Recruiting practices that rely primarily on employee referrals (usually male) need to be expanded, with wider promotion of opportunities to women’s networks. In terms of retention, the IT workplace culture needs to become more women-friendly, harassment needs to be addressed and flexible workplace policies implemented.

— Don’t Minimize the Imbalance – Explicit and visible recognition of the current imbalance by the industry sends a positive message to women that the sector is actively seeking to recruit and retain more women. This coupled with strategic partnerships, marketing, targeted career information and a public education outreach strategy will be conducive to encouraging more women to come and stay in IT’s growing and vibrant sector.

Recommendations For IT

In order to plug the leaking pipeline, the sector will need to create a partnership web. Partnerships with industry, women’s groups, post-secondary institutions, teacher’s associations, career development professionals, governments and HR specialists will be critical in increasing women’s participation in the sector.
The partnership web will need to go hand-in-hand with a holistic long-term implementation strategy with specific measurable outcomes and evaluation milestones. Key actions include:

Critical components for implementation: pre-recruitment integration, recruitment and retention

— Pre-recruitment integration needs to be supported by:
  • Accurate and honest labour market and career information that profiles the achievements of women in IT for girls, their parents and teachers;
  • Career matrices that show routes from secondary school course selection to post-secondary entry into and progress within the profession;
  • Role modelling opportunities at all levels of education;
  • Enhanced teacher training and the development of resources to enable the infusion of computer education and technology into the classroom;
    • A trained on-line career advisor to help future workers make sense of opportunities in the IT sector.

— Recruitment of women needs a partnership between the sector and employers to:
  • Identify fundamental skills, routes to obtain training (formal and non-formal routes) and foreign credential recognition;
  • Develop guidelines for recruitment and interviewing;

  • Have a skills-based framework for advertising job descriptions;
  • Profile women-friendly employers and their workplace policies.

— Retention of women in the IT workplace needs to be supported by employers who:
  • Implement equitable benefits and perks;
  • Provide training during work hours;
  • Ensure networking and social activities do not exclude women’s participation;
  • Support women-only networks;
  • Provide flexible work options and on-site daycare;
  • Provide harassment education for all staff and promote a no tolerance policy.

Conclusion

There are many recommendations relevant to an outreach strategy contained in this report. Some need to be undertaken by the sector, industry or occupational associations. A comprehensive implementation plan will require strategic partnerships with education, women’s organizations, employers and the target audience. Effective recruitment and retention will most certainly require the active commitment of employers, who will need to choose the most appropriate workplace policies and organizational development strategies for the size and scope of their companies.

The issues raised in this report are not new to the sector. A holistic long-term strategy with specific measurable outcomes and evaluation milestones is needed to bring about sustainable change. The bottom line for the industry is that women have much to contribute to its growth. As Dr. Wolffried Stucky, President of the German Society for Informatics, emphatically pronounced at the opening address of the Sixth International Conference of the International Federation for Information Processing “IT and computing simply cannot afford to lose 50% of potential human capital in a world where human knowledge and skills become more and more the key sources of wealth and innovation.”(7)
Introduction

The Information and Communications Technology Council (ICTC) is a not-for-profit sector council established in 1992. Together with partners from industry, education, associations and government, ICTC focuses on human resource initiatives and issues that affect information technology workers at all points of their career paths, in all sectors of the Canadian economy.

ICTC is undertaking a research project, Researching Careers in Information Technology (RCIT) to address the career awareness, recruitment and retention issues surrounding women and the IT sector.

Career awareness and skills development are of particular importance to the IT sector especially since the downturn of 2001. In addressing this issue, ICTC aims to raise the level of awareness about the opportunities available in information technology.

After spending the past few years engaging secondary school students through a website (DiscoverIT.org), the Council now believes that ICTC needs to take a broader approach to raise the level of awareness and participation of target groups who are underrepresented in the industry. ICTC will use information from this report to shape the development of career information, tools/resources and/or targeted interventions profiling opportunities in information technology careers for this audience.

Background

There is increasing recognition of the threat of a tight labour market in IT. A shortfall of some 20,000 to 27,000 employees is reported across Canada (CS/RESORS Consulting Ltd., 1999; Swinwood, 2005). Surveys of employers suggest that skill shortages are forcing companies to function at 75-80% of their desired level of IT employment (O’Grady “Part 1” 13). To address these shortages, the industry is seeking to recruit and retain a diversified workforce. According to Statistics Canada, women in the industry account for 23% of its workforce, which is well below the average across industries (Stats Canada, 2004) and there is evidence that this percentage may be dropping. Women are not actively choosing the industry and, of those who do choose it, many leave the industry mid-career as IT is not perceived to be compatible with family life.

The recruitment and retention of women will be critical to the industry’s ability to compete globally. The industry is highly competitive and fast-paced. At the Welcome Address of 1997 Sixth International Conference of the International Federation for Information Processing (IFIP), Dr. Wolffried Stucky, President of the German Society for Informatics emphatically pronounced that “IT and computing simply cannot afford to lose 50% of potential human capital in a world where human knowledge and skills become more and more the key sources of wealth and innovation.”(7)

Objectives

The “Researching Careers in Information Technology: Women” (RCITW) project initiative is a short-term research project to:

— Provide ICTC with data on the human resource and employment issues for women as recorded in the literature and as reported qualitatively by a small group of key stakeholders;

— Point to possible approaches that ICTC could take to increase the engagement of women; and

— Identify best/promising practices in reaching this target group.
The project objectives were achieved through an environmental scan and targeted focus groups.

**Environmental Scan**

Environmental scanning is the acquisition and use of information about trends, events and relationships in an industry’s external environment, the knowledge of which can assist in strategic planning and action (Adapted from Choo, 2001).

Environmental scans are valuable for:

— Detecting scientific, technical, economic, social, and political trends and events affecting the human resource issues in the sector;
— Defining the potential strengths, weaknesses, opportunities, threats or projected changes for the sector implied by those trends and events;
— Alerting sector leaders to the convergence, divergence, speed and growth of trends as observed by key stakeholders involved in the sector; and
— Promoting a future orientation in the thinking of stakeholders in the sector (Morrison and Held, 1989, n. pag.).

The CCDF research team carried out the following activities for the environmental scan:

— Literature Review
  - Identified relevant HR, labour market and sociological studies/surveys carried out in the last 10 years across Canada and internationally.
  - Reviewed the studies for issues that currently face the industry with respect to the recruitment and retention of women.
  - Identified programs, resources, outreach strategies, promotional campaigns and career development interventions and their impact.

— A massive body of literature exists in this field, making this component of the study both highly rewarding and challenging. CCDF’s primary focus was national academic research, supported by a cursory review of supporting international research. CCDF also conducted web-based reviews for programs and tools that support women’s entry into the IT field.

— E-mail Survey of Key Stakeholders
  - Compiled a contact list of stakeholders in the following domains:
  - Associations and educators devoted to promoting IT careers to women, understanding the pedagogy of girls and women and breaking the barriers for women studying in IT related programs; and
  - Employers in the IT sector.
  - Using the emerging themes from the literature review and information objectives for the project, CCDF created targeted survey protocols for each stakeholder group.
  - Introduction letters were developed to explain the project and invite participation.
  - Each stakeholder was contacted by telephone and/or sent advance documentation outlining the goals of the project and inviting their input.
  - Surveys were disseminated via e-mail (supplemented by fax and/or in-person contact in cases of limited access).
  - Follow up contact was made in all cases, providing reminders as needed, thanking participants and confirming that those who have requested it will receive a summary of our report and recommendations.
  - As needed, in depth telephone interviews were conducted with key stakeholders to expand on e-mail responses.
  - Data was compiled, synthesized and analyzed for patterns, trends and key findings to complement, illustrate and/or extend results of the literature review.

The following associations and educators submitted completed surveys, sent the survey to their Boards/networks and/or submitted relevant contacts/research documents for review and integration:

— A Commitment to Training & Employment for Women (ACTEW)
— Canadian Coalition of Women in Engineering, Science and Technology (CCWEST)
— Carleton University (Ottawa Carleton Institute for Mechanical and Aerospace Engineering) & International Network of Women Engineers & Scientists (INWES)
— Division for the Advancement of Women in Engineering and Geoscience (DAWEG)
— Explore IT & SCiber MENTOR
— Gentech (UBC)
— Inventive Women Inc.
— Ms Infinity
— NSERC (Ontario Chair)
— Saskatchewan Institute for Applied Research and Technology
— Society for Canadian Women in Science & Technology (SCWIST)
— University of Alberta, Department of Chemistry
— University of British Columbia, Department of Computer Science
— University of British Columbia, Department of Electrical and Computer Engineering
— University of Ottawa, School of Information Technology and Engineering
— Wired Woman Society
— Women in Scholarship, Engineering, Science & Technology (WISEST)
— Women in Sciences and Engineering (WISE)

In addition, three secondary school educators (Chesley and District High School) completed a tailored version of the educators’ survey.

Twelve employers submitted completed surveys. Participating employers included:

— Private sector corporations, ranging from small up-starts with fewer than 10 employees to large industry leaders;
— Publicly funded agencies, such as hospitals and government departments;
— A wide range of functions across the IT sector, including software development, communications solutions for multiple stakeholders, fixed and mobile broadband networks, applications and services, networking/tracking systems, graphic design, training solutions and more.
— Firms based in Ottawa, Iqaluit, Owen Sound, Durham, Toronto and Vancouver.

Focus Groups

Focus groups are designed to gather information on the perceptions and views of representatives from a defined target group. A skilled facilitator leads a relaxed discussion guided by broad open-ended questions and themes. Participants often interact and share their ideas and perspectives. Focus groups differ from group interviews in that their success depends to a great extent on expert facilitation which results in interaction within the group. New ideas and a better understanding of underlying motivations and perceptions often emerge from this type of open and interactive discussion.

Focus groups are particularly useful in exploratory research or in adding depth and clarity to quantitative results. Trends, popular opinion and reactions to specific programs, services, products or sectors are often extrapolated from focus groups. Finally, focus groups can also lead to further research questions or hypotheses.

The CCDF research team carried out the following:

— Identified women from the follow sub-target groups:
  • secondary school students;
  • post-secondary students;
  • unemployed adults; and
  • women previously and currently employed in the IT sector.
— Prepared facilitator notes, with guiding questions
— Contacted prospective participants to provide background information and invite their input;
— Distributed guiding questions to focus group participants before the sessions to stimulate thinking and more in-depth discussion of issues and recommendations;
— Facilitated the focus groups, taking comprehensive notes;
— Compiled, synthesized and analyzed the data.

The first focus group was comprised of 16 young women from Chesley and District High School. The school was extremely supportive and enthusiastic and the lively session produced rich data on their relationship with technology, their perceptions of IT, and how they make career decisions.

A second focus group was held in Ottawa with women currently/previously employed in IT and/or studying in IT related programs. Thirteen women participated (eight in person; five via e-mail). Participants were generous with their time and perspectives, sharing their views of the sector, its challenges and strengths.

In addition, a focus group was held with 11 parents. Knowing that parents are the most significant influencers of teen career decision making, this element was added to our methodology. The parents talked about their hopes for their daughters, the role that they as parents play in influencing their career futures and the tools/supports that would help them in this role.

The qualitative information gleaned in the environmental scan provided insights into potential sources of information, partners and themes emerging from research and personal observations of key stakeholders. The focus groups effectively tapped into motivations, attitudes and perceptions and confirmed, deepened and clarified findings of the environmental scan.

It is important to note that the samples used in our qualitative analysis were small and, therefore, were purposively selected. While they cannot be considered statistically representative of the whole group being studied, they add depth and personal perspectives to the research.

Analysis of the qualitative information gathered in the literature review, survey and focus group provides critical information on common issues in human resource management, training and career development relevant to the recruitment and retention of women by the IT sector.
Women's participation in the sector is decreasing

The IT sector workforce worldwide is predominately male (over 77% as reported in Statistics Canada’s 2004 Labour Force Survey). The reasons for this gender imbalance are complex and numerous. From an educational standpoint, there are significantly fewer women than men pursuing educational paths in IT. Fewer young women than young men attend computer science courses in secondary school. Out-of-school camps such as Carleton University’s Virtual Adventure Camps mirror this discouraging trend, with female participation at less than 20% (McDill, Mills and Henderson, 2000).

Low interest or participation in technical and science courses is a trend for women that seems to begin as early as elementary school. Cheryl Gorman (OCRI) notes that while female enrolment in related programs appeared to be increasing in the late 1990s, since 2000 there has been declining participation. Interestingly, low interest or participation does not appear to be a result of lower ability as young women who do take science and computer courses in secondary school tend to perform better than their male counterparts (Anderson, 1996; Myers, 1999).

Perception about the IT sector is a major challenge in recruiting women

It would appear that ability is not the barrier; rather perception is at the root of the trend. There are many stereotypes about the industry influencing women’s participation. The “geek” and “hacker” stereotype has had a negative impact on how young women view the IT workplace. Many view it as isolating and anti-social. Many young women perceive computers as “a boy thing.” All the young women and parents in the focus groups confirmed that young women use the family computer as much, if not more than their male counterparts. Yet, young women do not translate their use of the home computer into interest in related careers. They seem to see work in the industry as irrelevant to the “real world” and characterized by long hours and a lack of flexibility in workplace policies. In short, many see IT jobs as a way of life instead of a way to make a living. Older women are also influenced by these perceptions and perceive the industry as not conducive to balancing life roles, especially those that include family responsibilities.

The digital gap is a factor

Women’s access to key tools and skill development are also an issue. In a recent Canadian survey of university students, 48% of females versus 37% of males said that they have inadequate computer hardware and 42% of females versus 34% of males reported inadequate access to the Internet. Half of the women surveyed said that they feel constrained by the lack of skill to use academic software and other advanced IT programs. This suggests that women may be limited in access and skill to participate in the programs that would assist their entry into the sector (Rajagopal and Bajin, 2003). Women in general tend to have lower access to computers and the Internet than men. This imbalance can be traced to a lack of financial resources (cost of hardware and software, internet connection), available time, availability of equipment near one’s home, broadband access, training and skill development opportunities, technical support (often more difficult for women in rural and remote areas) and a low priority when sharing a home computer with a spouse and children (Pollack, 2003). Access to computer and internet resources is limited based on a woman’s economic, social and cultural disenfranchisement. The irony of the digital gap is that increased access can lead to skill development and information that can, in turn, contribute to empowerment.

There is a gender gap among occupations in the IT sector

While there is an over-representation of men in the industry broadly, there is also a gender gap in specific occupations. Survey responses and focus groups suggested that men gravitate toward development, while women are more visible in service. For instance, men are more present in the technical and managerial positions in the industry (Wolfson, 2002 13). Women in engineering and information sciences make up 10.3% of the management group (CS/RESORS, 1999). In technical occupations, women are mostly in: database analysis and data administration (42%), systems testing (41%) and web design (33%) (Habtu, 2003 8). Of women engineers, 11.9% are in computer engineering which is the lowest percentage of all engineering sectors. (McDill, Mill and Henderson, 2000, Cukier et al., 2001). In IT occupations as a whole, women are over-represented in technical writing and training (O’Grady “Part 2”, 2002, 26). This is a reflection of their over-representation in the service side of the sector.

Those occupations with an over-representation of men tend to be: better paying, have more status and have a lower unemployment rate (Wolfson, 2002; Habtu, 2003). Occupations in the industry where women are more present tend to reflect traditional gender-typing (content writers, librarians and teacher/trainers) and, in the case of web development, often demand longer work hours (Habtu, 2003, 10). Lower earnings in traditionally female IT may be attributed to their slightly lower full-time status and the almost 10% difference in education (Habtu, 2003, 8). However, the gender split between occupations points to the possibility of systemic inequity.
Employer recruitment by employee referrals may be a factor

Employers in the sector tend to rely heavily on employee referrals (81%) to recruit (O’Grady “Part 1”, 2002, 8). Since men are dominant both in the workplace and educational institutions, this recruitment strategy more than likely further contributes to barriers to women trying to get their foot in the door.

Women in the industry have diverse backgrounds

Women in IT have higher levels of education than the general population of employed women. (Habtu, 2003, 8) While many women in the industry have completed post-secondary education credentials, their first degrees and diplomas are often not in IT related fields. In Technology with Curves, which profiled 57 women identified as movers and shakers in the industry, most had liberal and performing arts backgrounds (Napier et al., 2000). Women tend to move into the sector from other sectors and report that their computer/IT skills were self-taught or attained through short courses (Cukier et al, 2001, 10). Research suggests this informal learning does not have the credibility of formal learning and is a barrier to career growth. In the 2001 Wired Woman Survey, members reported experiencing “discriminatory work practices as a result of being women and due to not being [formally trained] engineers or computer scientists” (Cukier et al., 2001, 12).

Few role models in the IT sector

The IT workforce is young and there are limited late-career women in the sector. In 2002, the average age of a computer technology worker was 37.1 years old, nearly a year younger than workers in all other industries (Statscan, 2003). Supervisors are overwhelmingly male. Only 3% of the mature scientific workforce (55 years of age and over) are women and women who are managers in IT tend to be self-employed (CS/RESORS, 1999). In fact, women working in the high technology sector are twice as likely to be self-employed as those working in other industries (CS/RESORS, 1999). This could suggest that in order for women to progress into management positions they feel the need to leave their current workplaces and start their own businesses. However, moving to self-employment removes women from the workplace where they could be assuming important roles as leaders and mentors in an otherwise youthful and predominantly male sector.

The lack of female role models and supportive networks has an impact on the retention of women (High Tech Workforce Resource Centre, 1998). Women who choose careers in sectors with an over-representation of men may have difficulty in receiving help or guidance from male co-workers or managers, in dealing with sexual harassment and in gaining access to the “boys-club” networks (CS/RESORS, 1999; Trauth et al., 2003; HRSDC, 2002; Canadian Committee on women in Engineering, 1992).

Workplace ethics are a factor in retention of women

Workplace ethics in the IT sector are cited as a common reason for women leaving (Frize, APEC 1998; Myers, 1999; CS/RESOR, 1999). The quit rate among women is 14% which is considered high. (O’Grady “Part 2”, 2000, 13). Performing work that matches one’s values was cited both in the literature and in the focus groups as paramount. Consulting and self-employment were presented as a mechanism for gaining control over the work content and environment. Workplace ethics, organizational culture, benefits and social and equity policies have enormous impact on the retention of women in the IT workplace, especially for women mid-career who may be considering a family.

The barriers faced by immigrant women constrain a significant potential source of human capital

When considering the barriers and challenges of women in the IT sector, it is important to consider the differences among women. Immigrant women, for example, constitute more than 8% of IT workers which is comparable with that in all occupations in the general population (9%) (Habtu, 2003, 9). Immigrant women are present in the same gender-typed occupations in IT as the general population of women. Yet, they tend to have more traditional computer and engineering training than other women (Slade, 2004, 6). Immigrant women often bring with them foreign credentials that are not recognized in Canada. This was repeatedly cited as their most significant barrier to employment.

These women also expressed difficulty in accessing support from women’s organizations (Butterwick, 2003). The focus on increasing numbers in post-secondary training programs in engineering and technology may be leaving immigrant women who already have these credentials out of these organizations’ advocacy goals. Another common road block for immigrant women is their difficulty in acquiring a security clearance which is needed in many IT projects (Butterwick, 2003). Their immigrant status, especially post-911, makes it almost impossible to attain these clearances.

Limited research on other women

There is very little written specifically on aboriginal women in IT. The Native Women’s Association of Canada (NWAC) recognizes the potential for empowerment through the use of and the ability to develop ICTs. Currently, NWAC sees that access, stereotyping, education, training and cost are the biggest barriers to Aboriginal women participating in IT or simply using the Internet (Duncan, 2003).
Advantages of a career in IT for women

The industry has much to offer women. Ninety-four percent of all jobs in IT are permanent, with tenures that are lengthening (Wolfson, 2002, 19; CS/RESOR, 1999). Women in the IT sector tend to make higher incomes on average (Stats Can, 2001; 2003). It is a growing sector of the economy with good prospects and has considerable potential for developing new start-up businesses or for self-employment (CS/RESOR, 1999; Swinwood, 2005). It is also a growing sector for women despite the traditional over-representation of men. Employment growth both for women with university degrees and women with non-university post-secondary certificates was higher than that of men in the computer technology industry (Vaillancourt, 2003). The perceived growth and opportunities in the sector were echoed in a study of women graduates in British Columbia. Thirty-seven percent stated career opportunities, and especially the potential of a good job market, as their main reason for taking computer studies (CS/RESORS, 1999). This finding was echoed in the women’s focus group.

Young women in the high school focus group saw the industry as offering the flexibility to work from home which they believed would be advantageous if one had a family. They saw it as a sector with potential to use one’s creativity and believed project-based work in IT would provide variety. One young woman commented that, “computer programmer just sounds impressive.” IT workers, they believed, would have access to free computers and “cool” software to play.

Some participants in the women’s focus group who have worked in the industry in excess of 20 years said that they remain energized by the problem-solving focus and fast-paced nature of the sector. They spoke about their appreciation of the continuous learning environment in IT. They spoke of it as being a “clean” industry with attractive working/professional environments. One woman commented that in the over 30 years she has been in the industry, she has never had a problem being a woman. The women’s focus group also spoke about the thrill of developing a program or tool that helps others. For example, one woman said that she loved programming, but wanted to do something that helped others. She ended up managing the development and distribution of a computer interest inventory/career planning tool. The positive connection between ICTs and the ability to create something for the benefit for others was found in the review of the literature and anecdotally through the focus groups. On a similar note, Monique Frize commented in her paper to the APEC Committee on Gender, Science and Technology that “associating the problem-solving aspect of engineering to subjects in the life sciences [where there are more women than men], and showing the human aspects and applications of these fields will help to redefine the image of what engineers and scientists do, and will succeed in attracting more young women to these careers” (Frize, APEC 1998, 216). These connections need to be made more strongly and explicitly by the IT sector.

Threats to the industry if women continue to be under-represented

By not actively recruiting women or by not partnering with post-secondary institutions to develop female graduates, employers in IT are effectively cutting themselves off from 50% of their potential human capital pools. In addition to the predicted labour shortages, research supports the link between gender diversity and organizational performance. Firms where women hold the majority of senior executive positions show the largest sales growth (Oser, 2000). Employers in the IT sector may be limiting themselves from a competitive advantage, as well as risking considerable human resource shortages.

The reasons for the under-representation of women in the IT sector are complex and numerous. They are intertwined and often overlap. This report outlines the main systemic issues for women’s limited participation in the IT sector which emerged from the literature review, surveys and focus group results. This list of issues is not exhaustive, but represents the most significant barriers to girls’ and women’s full participation.
Image Problems: The Boy-Hacker Stereotype

“I don’t want to sit behind a machine all day.”
–Female High School Student in Focus Group

Technology is not neutral. Technology is socially constructed and tends to reflect the same gender bias as in the broader society. Technology is male-dominated and tends to be viewed as anti-social and “geeky.” Few see it as contributing to real world “issues”; many believe the industry is driven by technology for technology’s sake. The IT industry has also been accused as being characterized by long work hours with limited opportunity for a social or family life for its employees. While there are differences among girls, generally there does not appear to be a lack of potential skill or confidence when it comes to computer technology. Rather, girls appear to be turning away from careers in IT because it does not satisfy significant values; particularly the desire to contribute to society and make a difference. As one post-secondary student said in her survey, “medicine requires working hard (long-hours), yet it does attract a lot of girls.”

In fact, in the focus groups both high school students and parents reported that young women spend at least an hour on the Internet daily. Parents said that their daughters have requested gaming equipment and MP3 players as gifts. A groundbreaking Norwegian study found that it wasn’t women’s ability or fear of math or computers that was at issue. Gente Rasmussen, the researcher behind the Norwegian study, found that “when the girls are not playing with the computer, it is not because they are afraid or find it too difficult. They are simply not interested and want to do other things; talk with their friends and family. They want to have a future where they do work “to help people”; they do not want to sit behind a machine (1997, 385). Similarly, Margolis and Fisher in Unlocking the Clubhouse: Women in Computing, found that “the rub for women in computer science is that the dominant computer science culture does not venerate balance or multiple interests. Instead, the singular and obsessive interest in computing that is common among men is assumed to be the road to success in computing. This orientation shapes assumptions regarding who will succeed and who “belongs” in the discipline” (70-71). Many scholars argue that “the reason that many women actively resist participation in masculinized technologies like computers is because it directly ‘threatens their identities as feminine’” (Jenson et al., 2003, 562).

Possibly in an effort to preserve their “feminine” identity, girls and women reject the computer culture before the culture rejects them. Tellingly, an exchange in the focus group of high school students began with one young woman recommending that in order for the sector to recruit more women they would need to “create women-only organizations with pink iMACS for everyone.” Another young woman suggested that “buff” men be allowed in these organizations, but only as secretaries. Then, another added that an appropriate slogan for the sector could be “more women and hot-coffee boys!” This reverse stereotyping may be a protective strategy in response to perceived bias in the industry.

The myopic view of the sector has its roots in math, computer science and engineering. Many mainstream computer science researchers have started to question the scope of the sector and comment on the shift in the industry from technology to human/user centered contributions. This has contributed to a broadening of the definition of IT in which the application of technology matters. Linking technology to its positive impact in the world may well open the door to being more inclusive of women.

To enhance inclusion, the industry will need to pay attention to what work gets valued and what entry points are legitimized. The Association of University Women suggests that multiple points of entry must be respected. “Different children will encounter different entry points into computing – some through art, ..., some through design, some through mathematics. The multiple points need to be respected and encouraged, while we remain sensitive to activities and perspectives that are appealing to girls and young women” (AAUW, 2000, xi).

Rasmussen, in her study, clearly states “women may be recruited to computer science when we stop asking what is wrong with women and start asking about their interests in computer technology. In order to recruit women from their interest,
computer science would have to work on a new image for itself” (386). The “geek” stereotype may shift as the sector emphasizes communication technology rather than an emphasis on programming. Rasmussen adds that “the application of technology and its use is more important, and it seems that different computer scientists than the technology-fascinated nerd will be needed in the future” (Rasmussen, 1997, 386). One of the post-secondary students surveyed said, “In IT, specifically computing, we are freer to investigate the relationship that humans have with computers and how that relationship can be improved to favour human cognitive and perceptual behaviour. We NEED (her emphasis) women for this…”

Gender Bias in Computer and IT Education

“The main reason (for the gender imbalance in IT) is in the educational institutions. As girls are given dolls, they are receiving explicit and implicit messages that say “computers are for boys.”

–Educator/association survey respondent

If learning how to use a computer or the mastery of technical skills was all that was called for in order to participate in the sector, there would be no gender imbalance. However, as stated above, technology and related education is not gender or culturally neutral. Research suggests that the gender divide in learning technical skills and using computers begins in kindergarten. (Bryson et al., 2003; Margolis and Fisher, 2002). The literature suggests that there remains an implicit gender bias which generally pervades classrooms and supports a gendered response to computer learning and use (Sadker, 1999). “Research has repeatedly demonstrated that boys dominate technology use in the context of integration and regular classroom use and that teachers have proven reluctant and unable to integrate computers into the K-to-12 curriculum” (Bryson et al., 2003, 192). Much of the research speaks about the inadequacies of teacher education that prepares teachers to have technology in the classroom, but not how to fuse it into the curriculum. This issue becomes very critical when looking at the over-representation of women as elementary teachers in Canada. By increasing elementary (chiefly female) teacher competency with computers and developing sound pedagogical strategies for infusing technology into the curriculum, the sector could be taking great advantage of an over-representation of women in one sector to equalize gender representation in another.

The focus group with female high school students was conducted in a small rural Ontario town. The night before the focus group took place, the facilitator interviewed parents about their perception of the IT sector and their daughters’ access to computers, games and other computer equipment. No discernable limits to access were found. When the facilitator asked how access was for students in the high school, unexpectedly the teachers reported that it was good. A tour of the computer lab confirmed this response (there is a 1:3 student computer ratio at the school). While the teachers admitted to dominating male “computer wizards” hogging stations, generally, one teacher said, “everyday at lunch I have a balance of males and female students finishing tasks – it’s a very welcome environment.” They also have both male and female teachers leading computer related courses at the school and the most direct IT course was taught by a female staff member.

The female high school students who participated in the focus group were in a computer/business applications course. The class was 76% female. Many signs pointed to an equitable playing field in computer education at the school. Yet, the focus group participants were very limited in their knowledge about IT occupations. When the facilitator of the focus group mentioned that computer animators were part of the sector, the students became engaged and very interested in knowing more. More career information, hands on trial experiences and compulsory courses that are not graded were solutions raised by the participants to increase awareness of the field.

While significant improvements may be evident (such as those noted in the school described above), the traditional lack of access and the systemic bias surrounding computer education may account for the fact that women tend to not go directly into the field and report a convoluted and lengthy path to their career of choice. Many women attribute this long road to IT to the lack of adequate career information on non-traditional jobs for women and lack of opportunity to determine career options through experience during their childhood and teen years if they had a talent and interest in non-traditional work (CS/RESORS, 1999, 78). Furthermore, the lack of information or misinformation on the academic requirements for many jobs in the sector is cited as a barrier to women’s access to the field (CS/RESORS, 1999).

What do people in IT do exactly?
Career Information Wanted

“I love Shrek. It cracks me up. Computer animators must have a wicked sense of humour.”

–Female High School Student in Focus Group

Prepared by Canadian Career Development Foundation
No Role Models to Support the Journey

“It’s a catch-22 – more women in role model positions would increase the number of girls pursuing IT, but first more girls have to pursue IT to become those role models.”

~Association/Educator Survey Respondent

In 1996, Anne Van Beers studied female and male engineers in the Vancouver area to discover what made them choose certain careers. Women often choose a career, she found, when it already contained a high proportion of women. Role modeling becomes crucial in supporting young women to choose non-traditional fields. Role models can act as a travel guide to careers in the field, providing key insider information on how to get a foot in the door that is difficult to open and advising about training and skill development. Role models can demonstrate that it is possible to have a career in the sector and act as a support and network contact along the journey. Positive role models and mentors have been shown to increase self-confidence and academic achievement. One of the key recommendations made to the World Summit on the Information Society was an emphasis be placed on promoting role models and mentors for women in science and engineering – in school, in post-secondary education, in the workforce and among high-tech business owners and executives.” (GAB, 2002, n.pag.)

Faulty Recruitment Strategy: Recruiting from Within and Ignoring Immigrant Women IT Professionals

“To be hired for my last job, I took four years of experience off so I could get my foot in the door (again!).”

~Focus group participant who immigrated from Russia eight years ago

As mentioned above, one of the most common recruitment strategies for IT employers is employee referrals. There are often “bonuses” for those employees who recommended someone who is eventually hired by the company. While recruitment strategies based on employee referral are common across all sectors, this method may be inadvertently blocking women from equitable entry. The over-representation of men in the workplace and in IT-related education programs and the isolation of women in these places limit access to qualified women through network recommendations.

For immigrant women, the situation is compounded. Additional barriers for immigrant women to getting employment in the industry include: access to information about the IT labour market in Canada, Canadian work experience, cost and availability of training, foreign credential recognition, bias and discrimination. For some immigrant women engineers, licensing and professional association membership exclusions are additional barriers to entry. In its Final Report, the Canadian Coalition of Women in Engineering, Science and Trades and Technology, recommended that “new systemic approaches and partnerships are needed between the federal government, provinces, professional associations and others working on labour market integration, to fast-track credential recognition of immigrant women, provide upgrading and retraining and to bridge into jobs.” (CCSWETT, 2004, n.pag.)

An Old Boys Club: The Systemic Exclusion of Women IT Professionals

“Unfortunately, women are also “mothers” – this may seem chauvinistic, BUT if they have children this tends to interrupt their ability to complete the work on time… this is particularly true of single mothers. Business is business when contracts and/or sales are dependent upon communication and creativity; the work has to get done.”

~Respondent from the Employer Survey

Research suggests that the more unequal the representation between men and women in the workplace, the more unwelcoming and sometimes hostile the workplace becomes for the gender who is in the minority. Both the literature and the focus groups point to the existence of an “old boys network”, a rigid work ethic, lack of flexible workplace policies, harassment and exclusion from the decision making process.

One woman in the focus group said that “understanding sports analogies/metaphors” was one of the biggest challenges she faced as she felt constantly excluded by the need to know all aspects of male culture. The isolation that women who work in the industry feel is well documented (Frize 1993; Inch and Frize, n.d.; Hill, 2005). In fact the “clubhouse” culture of the workplace isolates women from themselves. Frize (1993) has shown that some women do not want to be seen as helping other women for fear that they will experience backlash from other men. Young women do not want help from older women as it will draw attention to their not belonging.

Both in the literature and in the focus group, women in IT speak of the challenges in getting advancement training (“opportunities go to men who were willing to work all night” “I had one boss who questioned whether we could send a 23 year old woman on a business trip to Toronto because he thought she couldn’t handle the logistics of traveling.”) and promotions (“My husband has the same training as me but he’s making five times as much”). The “clubhouse” culture limits women’s inclusion in important networks which could contribute to career advancement and participation in decisions.
Kimberly Hill in “Why Women Leave IT” states that “many of the networking and training opportunities for IT professionals occur in the evening hours. Men are much more likely to attend these than women. They also are more likely to be able to leave town for days of training” (Hill, 2005).

At its worst, women have reported leaving the IT sector because of harassment. The degree to which it occurs in the IT workplace is not documented. Certainly, there is anecdotal evidence (RCCWE, 1992) and research confirms that traditionally male environments report higher levels of harassment than gender balanced ones (Welsh and Gruber, 1999).

The pace and long hours were mentioned by women in the focus group as being significant challenges to working in IT and responsible for their choice to leave the sector or to become independent consultants. Statistics on the number of overtime hours is not consistent. O’Grady (2002) reports that only a small minority of workers, especially in computer systems design, report working overtime. Anecdotal evidence from women in the industry suggests a very different story. Women in the focus group spoke about male workers treating overtime like a “badge of honour” rather than an indicator of poor time management techniques. Other women in the focus group referred to job ads that stipulate that employees must work over time for which they do not get paid. One woman said that she started her own business as a positive alternative to the “overtime” expectations in IT organizations. Self-employment may be appealing to women who choose or are forced to find alternative ways of employment in an industry that is unsupportive to women’s family roles. But, in doing so women give up key benefits (i.e. employment insurance) that could support them and their families in times of need.

Constant learning and the need to update skills is also challenging for women. “Skill obsolescence is the number one issue for IT workers [and] women are forced to balance not only job and family, but also...challenging and rapid, successive skill acquisition” (Butterwick, 2003, n.pag.). In his general analysis of the IT sector, John O’Grady concurs that “burn-out” and skill obsolescence may be important factors driving the exit rate from (IT) occupations” (O’Grady “Part Two”, 2000, 18).

The biggest obstacle for women in the sector appears to be the lack of opportunity to balance an IT career with family life. Women continue to be primarily responsible for their family’s child and elder care. The focus group with women was unequivocal in its assessment that working in IT and having a family do not mix. When asked to point to one reason for the under-representation of women, almost all spoke to IT’s incompatibility with family/multiple life roles. A study of women in hi-tech fields in science and technology in BC said that “none of the respondents (employers) said on-site day-care was available to employees of their company or paid maternity leave, over and above basic federally legislated benefits.” (CS/RESOR, 1999, 73) Supporting women who have families should be of particular concern for employers since this chiefly affects women (more so than ever before) in mid-career – when their careers are well established, they have become important to the performance of the organization and provide important leadership to other women in the organization.

In general, women in the focus group talked about the need for more flexible work options such as telework to accommodate family life. In “The Cottage or the Sweatshop?: Gender and Home-Based Work on the Information Highway,” Susan Bryant found that “the flexibility sought by women who decide to do paid information work from home generally involves increased control over the management of their own work and, very importantly, additional control over the relationship between that paid work and their family life” (2000, 282). While holding the promise to increase women’s flexibility to create some life-work balance, it also puts her out of the employer’s view. Women in the focus group said that employers count the number of visible hours an employee is in the workplace, as much as the quality the product/project.
Key areas of focus for the recruitment and retention of women in the sector include:

**Shedding Stereotypes**

A significant challenge for the sector will be to promote positive images of the sector in order to shed many of the negative perceptions held by girls and women about IT careers.

- **Call it “Oceanography” and They Will Come (AAUW, 2000)**

As confirmed by the review of the literature and the focus group with teenagers, young women view IT professionals as nerdy, antisocial males. But even when they see it positively – “you need to be smart and creative to work in IT” – they do not see it as a career that would be meaningful to them. The literature suggests that the sector should focus on promoting “real world” connections to working in the industry. Laurie Harley, Director of Diversity and Workplace Programs for IBM Canada, says that “…if you want to change the world, information technology is where it is going to be, especially in areas like telemedicine and education” (Ramsay, 1998). Positive messages such as this need to be communicated directly to girls and young women, their teachers, guidance counsellors and parents.

Programs, marketing and career resources directed at young women should focus on what real female IT professionals do to change the world, what got them excited about the sector, their best and worst days at work and what percentage of the time they “sit behind a computer.” Efforts made to develop games, tools and web sites to promote the industry should be done with girls in mind. “When given the opportunity to describe their “ideal” computer game, (girls) talk about how they would value games that involve simulation and identity play.” (AAUW, 2000, 8) Interestingly, research indicates that boys adopt more to “female” design features in their game designs than vice versa, and demonstrate far more variability in their game preferences than is recognized in commercial models of “boys’ games.” (AAUW, 2000, 32) Appealing characteristics for both boys and girls include:

- Rich narrative and intricate multi-level games;
- Engaging characters;
- Ample opportunity for communication and collaboration;
- Roles involving positive social action;
- Challenge at the appropriate level of difficulty;
- Social interaction both on-screen and between players – opportunities to build new relationships;
- Opportunities to design or create;
- Strategy and skill requirements (AAUW, 2000, 32).

- Career information should show the breadth and depth of the industry

Show the world of careers in the sector, not just those where women are mostly present. The sector needs to increase understanding of the breadth of careers in IT. One way of doing this, and one which was specifically requested by the parents interviewed, was the provision of career pathing resources for women in the sector, their teachers, guidance counsellors and parents. It is evident from the research that the sector needs to do a better job explaining what IT professionals do.

Emphasize the positive in career literature. Talk about what women find exciting about the industry, the opportunities for growth and the financial rewards. When developing career resources, work with experts in their creation and include women working in IT as advisors to their development. Resources need to speak directly to the values that drive career decision making. Ideally, resources developed for young women should be either developed by them or with their active involvement.

- Focus not only on what appeals to girls, but also how girls learn best

Out-of-school science and engineering promotion activities can be used to peak the interest of young girls in science, mathematics, engineering and technology. It is important to note that in the mixed gender programs, boys respond more strongly than girls to: summer science and engineering camps, industrial tours, a secondary school camp for high achieving students (Shad Valley), and ‘Science Olympics’, a competitive science activity. Girls respond more positively than boys to public lectures, but equally to open houses and to presentations in schools by role models. (Frize, 1998, 215-216) It’s also important to develop programs that invite girls to tinker and to emphasize the artistic and creative aspects of working with code. Structure, content, and gender composition of the activities affects both sexes. Attention needs to be paid to gender-balanced participation in all programs and a well-designed marketing strategy must take into account gender (as well as race and class) issues.

- Profile women in the industry (role modeling)

The Association of American University Women (AAUW) in their commission on Technology, Gender and Teacher Education stated that to “change the public face of computing – women role models are needed who can highlight the human, social, and cultural dimensions and application of computers, rather than the technical advances, the speed of the machines, or the entrepreneurial culture surrounding them” (AAUW, 2000, xii). To increase the visibility of women in the sector, the sector will need to partner and collaborate with women’s organizations.
and programs devoted to recruiting women into science, engineering and technology. Many of these programs do extraordinary work, but they are often not visible or accessible to a diverse population of girls.

- Influence the Influencers

1. Teachers

Teachers need training on how to effectively infuse technology in the classroom. Teachers at all levels need training in both formal and informal education and in gender sensitivity, which would allow them to better assist students in overcoming gendered barriers and eradicate biases which may be inherent in their own actions.

The American Association of University Women in their commission report “Tech-Savvy: Educating Girls in the New Computer Age” illustrates that educators who increase their computer literacy and gender analysis were able to equitably increase computer literacy for both girls and boys. Their recommendations to support tech-friendly and girl-friendly classrooms include:

- Infusing technology across disciplines and subject areas;
- Redefining “computer literacy” to include literacy, numeracy, cognitive science, problem solving, analysis and logic which are as integral to computer expertise as facility with machines and programming;
- Designing for equity – for example choose engaging and relevant subjects and undertakings, develop more content applications, personalize technology application, develop appropriate assessment tools;
- Designing and redesigning group work so that girls do not take on traditional tasks;
- Encouraging multiple approaches to learning: reciprocal, project-based, self-explanation, collaborative learning, computer-based manipulations, and construction environments to support learning and more fully include girls; and
- Providing teachers with written guidelines for acceptable student behavior and ‘etiquette’ when using information technology, especially the Internet (AAUW, 2000, 25).

Other strategies that teachers can employ to help support computer education and girls’ participation in IT education include:

- Making alliances with teachers who are interested in recruiting more girls in their classrooms or with teachers who have many girls in their classes who could benefit from knowing computing but who rarely take computer science classes;
- Forming a Gender Equity Committee at the school to address issues of gender bias and promote a culture of equity;
- Talking to the community, parents, principal and guidance counsellors so they can support your efforts (Margolis and Fisher, 2002).

2. Parents

Parents need support to understand careers in the sector and how to access them, strategies for bias free use of technology in the home, information on how to select girl-friendly software and web sites and lists of programs and information on work tasting opportunities in the sector. The AAUW recommends creating something similar to a “Caldecott” award for software (AAUW, 2000, 37). The Parent’s Choice Foundation (http://www.parents-choice.org/) in the US grants awards for the best videogames, software and web sites.

Parent councils and organizations should be involved in the development of resources about the sector. As parents continue to be the number one influencer of teen career decisions, they can become an important distribution and implementation arm for sector resources.

Promote Multiple Entry Points to the Sector

The research project: Women’s Alternative and Informal Learning Pathways to Jobs in the IT Sector, headed by Dr. Shauna Butterwick at UBC, found that women do not tend to follow traditional routes to careers in IT. Rather, women’s pathways look “like a game of Snakes and Ladders.” (WAILP, 2005, n.pag.) Women’s learning pathways tend to involve a mix of formal and informal learning. The informal learning (through certificate programs, workshops and on-the-job learning) is often not recognized by employers. As mentioned earlier in this report, a book highlighting about 60 of the movers and shakers in the field noted that almost all of these women learned their technical skills outside of formal contexts and their formal learning was not in math or science. Some researchers argue that “the failure to include multidisciplinary approaches, to define the fundamental skills (essential, job-specific, soft skills and technical) needed for high demand IT jobs, the sources of those skills, and recognized training and development marginalizes women from the sector” (Cukier et al., 2001, 11)

Some business analysts argue that it also hurts the development of the industry as a whole.

Adult learning also provides important options for enabling women to enter the fields of science and technology (APEC, 1998, A-12). Immigrant women’s pathways to the sector need to be eased and recognition of foreign credentials needs to be undertaken as well.
Workplace Policies and Strategies for Recruitment and Retention of Women

In the proceedings of the APEC Experts’ Meeting on Gender, Science and Technology, they recommended that workplace policies include “those directed at recruitment, such as guidelines for gender balance in interviewing techniques, as well as open advertising of vacant positions. Policies and strategies can also focus on retention, including promotion, training and capacity building, pay equity and re-entry, especially after maternity leave” (APEC, 1998, A-12-13).

- Recruiting

Recruitment needs to begin by remodeling computer education at the elementary and secondary levels. The sector will also need to review current recruitment strategies which rely heavily on employee referrals. As most employees are male, this strategy could be contributing to the systemic over-representation of men in the industry. Working with women in the industry and with women’s organizations to open up recruitment strategies may be one solution. Another strategy is to collaborate with immigrant groups to advocate for the recognition of foreign credentials as a way to ease immigrant women’s entry in the sector. Having women interviewers on selection committees was also noted as a key strategy.

- Improve the Workplace Culture

Employers and the sector need to examine how workplace culture contributes to the recruitment and retention for women. Frize (1993) states “the exclusion of women from informal socialization, such as beer after work on Friday or golf on Saturday morning are not necessarily comfortable for women, so there is a certain amount of self-exclusion there; but if these activities because ‘luncheon Wednesdays’ or other choices which are more woman-friendly, then more women would gladly participate.”

Workplaces will also need to examine serious issues like harassment and “provide education on what it is and how the firm will be dealing with cases that occur. Support from the top and training of all employees will go a long way in reducing this problem.” (Frize, 1995)

Organization sponsorship of a women’s network coupled with organization-sponsored social events could also help the isolation women feel in a male dominated industry.

- Flexible Workplace Strategies and Support for Family Leave

Inflexible and unpaid overtime hours were cited both in the literature and focus groups as key reasons women leave or choose not to go into IT. Research confirms that men and women tend to opt for part-time work for a similar number of years and take similar career breaks. For women, this occurs mid-career for child and elder care reasons and for men it occurs towards the end of their careers. Women typically are delaying having children until the mid-years when they are well established in their careers. Retraining of mid-career employees who take breaks is an asset to the company. Retraining women in mid-career could be particularly important in this sector as senior female employees are needed as role models and leaders (Schwarts, 1992). The Department of Trade and Industry in the UK 2003 survey of employers stated that 75% of managers found minimal or no costs involved in introducing family-friendly working practices and 66% of them found flexible work options to be cost-effective (DTI, 2003, 3)

On-site day care, telework and part-time work with benefits are flexwork options that organizations need to explore in order to keep their best people. Frize (1993) states that “companies that fail to recognize the need for flexible policies that allow young parents to balance family and career, will eventually lose their best men and women who will seek firms that are more progressive and forward-looking.”

There also needs to be organizational support so that telework does not impede women’s career progression and advancement. Performance based on quality of product rather than the number of hours spent in development would be a step in the right direction.

Don’t Minimize the Imbalance

Finally, it is recommended that the sector visibly acknowledge the imbalance. The sector can do a lot of positive promotion by recognizing the existence of the imbalance and the lack of equity for women. This coupled with strategic partnerships, marketing, targeted career information and a public education outreach strategy will be conducive to encouraging more women to come and stay in IT’s growing and vibrant sector.
Successful And Innovative Tools/Resources & Programs

There are many excellent resources and programs dedicated to increasing women’s participation in science, engineering, trades and technology. There are fewer IT specific initiatives. The tools and programs profiled below do not represent an exhaustive listing of all the supports available to girls and young women, but they do represent leading innovation and are models for ICTC as they move forward with their strategy to increase the participation of women in the sector.

Pre-recruitment Programs: Best/Promising Practices

- Creating a Tech-savvy and Girl-Friendly Classroom

Carnegie Mellon University hosted summer institutes from 1997 to 1999 for teachers to talk about strategies to encourage girls in the classroom. Two hundred and forty high school science teachers gathered at Carnegie Mellon to learn C+ and to receive training in gender-equity to increase girls’ participation in their courses (Margolis and Fisher, 2002, 109). The male/female teacher ratio was 50/50. The researchers believed that key to their success was coupling the equity component with marketable learning in the field.

“We do know that all the 1997 teachers felt a year later that they had made an average of 2.5 changes in their teaching because of their participation” (Margolis and Fisher, 2002, 126). The most frequent changes cited were an increased awareness of their own behavior, making an effort to call on everyone, personally making an effort to recruit girls, and having more ideas on how to work with girls. Margolis and Fisher (2002) state that preliminary reports also suggest that teacher efforts are having impact on increasing female enrollment in computer science (126).

- In-School and Out-of-School Outreach Programs for Girls

A plethora of research projects, innovative classroom strategies, reorientations of college and university programs and out-of-school activities have been developed to encourage girls’ and young women’s participation in IT. Below is a snapshot of two particularly innovative methods for effective outreach to girls and young women.

1. GenTech: The Brookwood Elementary School Project*

In their 2003 article, “Girl Talk”: Gender, Equity and Identity Discourse in a School-Based Computer Culture, Jennifer Jenson et al. describe a research project where they trained female elementary students and their female teachers to use computers and software in a newly built computer lab in the Brookwood school. The students and teachers, in turn, trained the boys and male teachers how to use the equipment and software. They wanted to record male and female student reaction to the reconfiguring of gender-technology relations. At first, both the boys and girls spoke about the boys’ prowess with technology. Girls who were doing the training spoke about the boys “mostly knowing it all”; girls felt that their teaching was not needed. But, gradually the girls began to realize that, thanks to their training, they were more knowledgeable. The girls began to recognize that their “choice” not to use computers was mitigated by social factors, such as whether the computer lab was dominated by boys or whether their friends were present. What Jenson et al.’s research also shows is that an acquired gender analysis can be important in empowering girls to take steps towards overcoming and participating in a male-dominated culture. Outreach programs to attract more women into the sector may want to consider this element in development. Strategic partnerships with Women’s Studies professors and other researchers who examine both gender and technology may be very valuable in building a holistic awareness and recruitment strategy.

2. Pinocchio’s Nose, A Special Day for Grade 10 Female Students at Nortel

“Pinocchio’s Nose” was created after the lack of success of a series of all-girl events set up by Robert Borden School and Nortel. In the past, these sessions had included job-shadowing activities with groups of two or three students accompanied by a woman scientist or engineer. While not specifically an IT event, the remodeled strategy is worth mentioning because of its overwhelming success with these female students. The first element of the program to be remodeled was having larger peer groups (8 to 10) with only two role models accompanying and guiding them. The purpose was “… to give women a sense that they were in control of their learning for the day” (Frise, 1998). The half day consisted of activities that were very different from each other, but would give a “very complete experience.” The common denominators of all activities were that they had to be fun and interesting. Activities consisted of:

— a 20-minute keynote, with labour market information on the opportunities in certain areas of science and engineering, the courses needed to pursue this career path, how to plan a career, the importance of achieving economic independence and the importance of choosing a life partner as carefully as their career;

* GenTech (Gender and Technology Research Project, http://www.shecan.com) is a “gender, inclusive pedagogy and technology” research project that began in 1994 and continues today. Its mandate is to create conditions in which girls and women have maximum access to, and confidence in, a wide range of new information technologies. The Brookwood project was a partnership between the school district, university researchers and Hewlett-Packard.
— Pinocchio’s nose – groups were challenged to develop a nose that would stay horizontally on a real person’s nose, constructed from a pile of newspapers, tape and one six foot string;
— Radioactive Swamp Game – A whole team of students had to overcome several obstacles and dangers and get to the end point as quickly as possible;
— A visit to the Nortel laboratories.

The whole process took a half-a-day. The impact of this session for the participants was significant. Reported results include: a majority of participants felt they knew more about science and engineering and intend to sign up for science courses in grade 11; 40% said it had an impact on their choice of a career. The school confirmed that the uptake of science courses for those who attended the event was 89% at the advanced level post-conference (Frize, 1998).

**Increasing Women’s Participation in College and University Programs**

1. **Carnegie Mellon University Computer Science Program**

As a result of education reforms made in the computer science program at Carnegie Mellon, women’s enrollment went from 7% in 1995 to 42% in 2000 (Margolis and Fisher, 2002, 129). Reforms were made not in the admission standards, but in the pathways to admission. There were four different ways to enter the curriculum based on an applicant’s experience. There were primer courses for those with lower levels of computers experience (for the most part women) so that they would feel less intimidated. They recruited on talent and potential rather than on specific “programming” experience. The curriculum was neither “… tightly scheduled nor deep in prerequisites, so that students taking an extra semester to gain programming experience would soon “catch up” with other students and have an equal opportunity to take advanced courses” (Margolis and Fisher 130). The emphasis was on quality instruction and training teaching assistants to be aware of teaching practices that discriminate. Computers and their applications were contextualized in the “pursuit of real-world objectives.” Students were also exposed to role models and career information early in the program so that they could imagine themselves as professionals in the field.

In addition to their redevelopment of the computer science program at Carnegie Mellon University, Margolis and Fisher developed a “baker’s dozen” recipe for enriching programming assignments. Their approach is based on what many women find meaningful about computing:

1. Make it useful. Encapsulate the principle being taught in a program a student might want to use (i.e. e-photo database, contact lists);
2. Make it personal or local;
3. Interface with other programs;
4. Focus on ease of use (emphasizing high usability of programs for the general public);
5. Use big data. Problems that are too big to do by hand show students the value of computing;
6. Use real-world data. Have students research it and then turn it into a useful form;
7. Use natural-language text. Students can develop programs that synthesize or analyze large volumes of on-line text;
8. Make it sensory: graphics, audio, animation, manipulation;
9. Make it socially relevant;
10. Simulate! Use real world systems (traffic lights, elevators, emergency response) to bring computers closer to the real world;
11. Include observations of the real world or the program’s behaviour;
12. Bring in experts; and
13. Illustrate how everyday computational object work: ipods, MP3 players, remote controls.

2. Alternative Routes to Computing (ARC) – A Joint Program of the University of British Columbia and Simon Fraser University

ARC is a two-year cooperative education diploma program composed of two four-month terms of industry experience. It began in 1998 and was “intended for highly motivated individuals with a bachelor’s degree in any field, a superb academic record, but little or no programming experience” (from the program’s description on the UBC site) The program includes undergraduate courses, offers participants the option to complete a full computer science degree and consists of:

1. Eight months of first and second year computer science and math courses. ARC students take the same courses and are taught as a cohort in small classes, receiving extra support from teaching assistants to compensate for their lack of background in computing and math;
2. Eight months of paid work experience in a high-tech organization, most of which are financial sponsors of the ARC program;
3. Eight months of third and fourth year undergraduate CS courses, chosen with substantial flexibility and taken with the regular stream of CS students, primarily in large classes (100-200 students).

To attract women to the program, tuition fees are the same as general university tuition fees and students have at least one paid work term. Fifty percent female participation in the program is guaranteed and additional support and mentoring from teaching assistants for the first two terms is provided. Participant must have some math background (grade 12) and have familiarity with basic computer operations.

Overall, the program has been successful. According to Klawe et al., the ARC 1998 program had 50% women enrolled and the ARC group in 2000 had 56% women enrolled (101). The average age of applicant is 32 (101). Twenty-nine people who graduated in 2000 had never considered a career in IT and are now headed for a career in the sector (101).

3. University of British Columbia’s CPCS 101/WMST 201

In order to cast a wider net and recruit more female post-secondary students at UBC’s campus, the computer science program has set up a cross reference credit for computer science students and women’s studies students. While there was no data on the success of the course, the syllabus is comprised of connecting women’s advancements in the computer science field (such as the Aphasia Project – http://www.cs.ubc.ca/projects/Aphasia/) with hands on computer skills training. Research is needed to see if the students in women’s studies enrolled in more computer science courses as a result of this initial interdisciplinary course offering.

- Career Information and Work Tasting Opportunities

From CCDF’s research, we found no IT career information resources specifically designed for girls and women. Mostly, the interventions for this target audience take the form of programs, camps, and work-tasting activities for girls. One of these programs is referred to below. Career resources may help to shed stereotypes by profiling the breadth and depth of work in the sector. These resources could contribute to helping girls understand how careers in IT affect the real world.

ICTC may want to explore how targeted career resources could help them reach this target audience. In developing resources, ICTC may want to refer to GirlTech, a web site that has guidelines for developing girl-friendly web sites (http://girlstech.douglass.rutgers.edu/printfriendly.html). It is important to note that career resources will not overcome stereotypes on their own. They must be part of a larger awareness and recruitment strategy.

Work experience programs can support the determination of career options, develop clarity of purpose and understanding of self, develop job acquisition skills, transferable skills, create an understanding of the world of work and support career planning. Below is an example of a girls-only work experience program that is successful in helping young women consolidate their career planning.
1. The Women in Science and Engineering (WISE) Summer Employment Program

This is an intervention aimed at female high school students, and is designed to address problems of under-representation and lack of support/mentoring systems for women in fields of science, engineering, mathematics and technology. Over the past eight years, WISE (Newfoundland and Labrador) has placed 320 grade eleven female students in paid, eight-week summer research position at Memorial University. Written conference evaluation surveys from 31 students from 1990-94’s Programs revealed that, for 48%, their experience confirmed their career aspirations to be in the fields of science, engineering and computer technology and for 19% the experience had changed their post-secondary choice to one of these fields (Emerson, 1998). In addition to the job experience, there are weekly tours of a variety of science and technology related sites, a “Career and Dessert Choices Evening,” work experience swaps with another student in the program, presentation days where student share their experience and social events.

• Influencing the Influencers

1. Teachers

Beyond the teaching strategies for creating tech-savvy and girl-friendly classrooms referred to earlier in this paper, teachers need career resources/information so that they are aware of and can make connections between classroom learning and the world of work. From CCDF’s research, there were no career resources found to assist teachers in promoting IT career to girls.

2. Parents

In the interviews with parents, most said that resources on career pathing in the sector would be most beneficial. They wanted specific information rather than broad-based materials. For example, they wanted listings of secondary school courses required to take a degree in computer science and information about where a particular degree, diploma or certificate could lead in terms of work in the IT sector.

The only resource CCDF found specifically for parents who have daughters considering science and technology careers is “A Career Awareness Guide for Parents of Teens.” It is available on the Canadian Women in Science and Engineering website. Take-up or promotion of the resource and its impact are not referred to on the site. The authors did not respond to requests for information about the resource.

• Role Model Programs

In Canada, there have been a number of programs and projects to provide elementary, secondary and post-secondary students with visible role models in science, engineering and technology. The following highlights noteworthy programs. While not all of them are specific to IT, they demonstrate universal strategies for enabling women to choose and pursue non-traditional careers. While it is critical that women be role models for other women, this does not preclude men from becoming effective non-sexist role models for other men as well. The NSERC Chairs on Women in Science and Engineering conducted cross-Canada consultations in 1990 to find out why so few women study engineering and work as engineers in Canada. One of the female respondents in the engineering profession suggested that “men students need role models too: young men in the (engineering) program need to see their role models (male) behaving in a non-sexist fashion, by the use of appropriate language and even changes in the curriculum. If the young men perceive that it is acceptable for … [a] non-sexist male to be an engineering role model, stupid jokes or outright harassment disappears.” (Inch and Frize, n.d.)

1. NSERC Chairs on Women in Science and Engineering

Appointed in 1990, in response to the Dec. 6 shooting of 14 women at the École Polytechnique in Montreal, Dr. Monique Frize was the first national chair for Women in Science and Engineering. Based on the recommendation of the 1996 National Science and Engineering Research Council task force, the group was expanded to five female faculty members. As high profile scientists and engineers, the chairs act as role models and devote approximately half of their time to issues that currently limit the participation of women in the fields. The current chairs are: Dr. Cecilia Moloney (Atlantic), Dr. Claire Deschênes (Quebec), Dr. Valerie Davidson (Ontario) and Dr. Anne Condon (British Columbia). The prairie region chair position is currently open. Dr. Deschênes, Dr. Davidson and Dr. Condon have developed programs to encourage young women into the IT sector. Each chair is developing a substantial network, reaching School Boards, teachers, guidance counsellors, parents’ groups, students, Deans of Engineering and Science Faculties, employers of engineers and scientists and professional and scientific associations.

In addition to their academic role, the five chairs are generally involved in developing and/or assessing strategies for the recruitment and retention of women students in the non-traditional fields where job opportunities are plentiful. The chairs have several speaking engagements in their region, nationally, and internationally on the topic of women in science and engineering.
Each chair sets different priorities and develops different strategies for aiding the recruitment and retention of women in science and engineering education and work. Their common strategies have been to:

— Increase the contact between female students enrolled in university or college and females students in elementary and secondary schools; expose the latter to several engineering and science career opportunities which they may not have imagined; emphasize disciplines where there are excellent job opportunities;

— Demystify the various disciplines and present aspects of these fields that make visible and positive contributions to society;

— Profile the achievements of women engineers and scientists, describing their work, their careers and their lives during school presentations attended by both secondary school students and university student volunteers;

— Develop a mentoring mechanism to retain female students who are already in engineering and science by linking them to women in the workplace, graduate students, and faculty members (Frize, Deschenes, Cannon, Williams and Klawe, CWSE web site).

2. SCIberMentor E-mail Mentoring Program
   (http://www.scibermentor.ca)

The SCIberMENTOR program began in 2001 and is an email mentoring program aimed at girls aged 11 to 18 in Alberta. The goal is to connect with girls and young women at a formative stage in their development. The program matches female students who are studying science and engineering with practicing women scientists and engineers. The primary goal of the SCIberMENTOR program is to expand girls’ knowledge of careers, opportunities and of the benefits that exist for women in science and engineering fields. The hope is to provide motivation for girls to continue in math and science through interaction with women role models. The program also aims to provide girls with the opportunity to communicate with mentors from diverse fields, thereby expanding the options for potential career paths. To date, they have matched 500 girls with mentors.

The choice to set up an e-mentoring program was made because: “(1) it is accessible in urban and rural areas to ensure a province-wide program; (2) it allows for easy interaction since both parties do not need to be available and on-line at the same time; (3) research shows that girls are active users of computers and in particular of e-mail (significantly more than boys), so it is a comfortable medium for them; (4) it is cost effective and easy to use; and (5) it reduces the awkwardness of age differences” (quoted from web site).

3. Pathmakers (http://www.carleton.ca/cwse-on/pathmakers/)

This program began in 1986 and is supported by the University of Ottawa, Carleton University, Algonquin College, the Ottawa-Carleton District School Board, the Ottawa-Carleton Catholic District School Board, le Conseil des écoles publiques de l’Ontario, le Conseil des écoles Catholique des langues française and WISE Ottawa.

A Pathmaker is a female post-secondary student who is preparing for a career in science, technology, mathematics or engineering. Teams of Pathmakers from Carleton University, the University of Ottawa and Algonquin College visit elementary and secondary schools in Ottawa-Hull from October to May. They are role models who encourage young people to stay in school, to maintain studies in science, technology, mathematics and engineering, and to explore career choices in occupations where there are significant job opportunities.
Women in Information Technology is a program offered through the Canadian Information Processing Society. They offer a full day of workshops and presentation illustrating career opportunities in the IT field to Grade 9 students during International Women’s Week celebrations. The goal of the WIT program is to put positive role models forward to young women in order to overcome stereotypical images of the computer nerd. They also have an ambassador program to provide positive role models who go into schools to talk to girls and to act as mentors.

Recruitment Programs: Best/Promising Practices

There are relatively few recruitment programs aimed at women outside of the post-secondary context. Microskills (http://www.microskills.ca) was the only program mentioned by survey respondents. Women in the focus group did not know of any recruitment strategies specifically for women. One noteworthy program found through the literature review was Immigrant Women in Science.

1. Immigrating Women In Science (IWIS)

The IWIS mentorship program is devoted to assisting immigrant women into the science, technology and engineering workforce. IWIS is based in British Columbia and supports immigrant women with background training in science and technology. The organization has recruited 350 women currently working in the field to become mentors for 150 immigrant women.

It is part of a program to promote women in general and to link newcomers to areas they worked in prior to coming to Canada. This program is part of a larger project, the goal of which is to increase workplace literacy and enhance employment integration. A paid short-term field placement is being instituted which includes evaluation, identification of upgrading needs and follow-up skills development. The placement will incorporate some unique aspects based on the values and goals of IWIS to advocate for work-life balance in a field of long hours that can interfere with family settlement. The organization will provide ongoing support to the employers and interns collecting information on what worked and what didn’t for each party. The newcomers will be required to keep a journal noting work, discrimination and emotional experiences.

Retention Programs: Best/Promising Practices

Programs to improve the organizational culture or the integration of women after a career break are not well documented. In fact, the women in the focus group struggled to name a single program that supported women in the workplace or helped them create balance between their work and life roles. The only one identified was PANEL – a program at IBM in which women could choose to work part-time in a consultant capacity and receive partial benefits. The IT industry may need to look to other sectors for workplace policies and organizational development practices that contribute to the retention of women.
Recommendations For IT

The road to gender balance in the IT sector needs to address the systemic issues that contribute to over-representation of males in the sector. The current imbalance has been shown in the research to diminish Canada’s capacity to compete globally and to become a world leader in a sector that will contribute to the economic health of the country. Simply stated, it just makes bad business sense to narrow the available pool of human capital. The problem is systemic and requires a longitudinal and holistic approach. The approach needs to begin with girls at a very young age, by giving teachers the tools and the knowledge to infuse computers into a girl-friendly and tech-savvy classroom. Targeted career information needs to be created specifically for young women, their teachers and parents to highlight the opportunities in the sector and to map the roads into and throughout the sector. There needs to be a proliferation of work-tasting and IT “tinkering” experiences for girls and young women and the profiling of successful women across the sector. Support for role modeling and mentoring programs at the high school, post-secondary and workplace levels need to continue. But, the sector needs to go beyond this and get into the workplace. Activities that support social and organizational change in the industry need to be in place so that women are welcomed from recruitment to retirement.

The sector needs to put programs in place with greater stability than has been evident in the last ten years. Bryson and De Castel in their research on gender and the uses of new technologies in the classroom and in non-school contexts state that “from the very start, this research has proven to be a bit like ambulance-chasing: no sooner do we identify an organization that is proactive in pursuing gender equity in relation to technology than it is going out of business, having its funding cut, undergoing reorganization [or] losing its previous administration ..” (2003) Programs and educational policies are set up when the industry is desperate for employees and once the IT bust occurred, programs lost funding to continue their important efforts.

In order to plug the leaking pipeline, the sector will need to create a partnership web. Partnerships with industry, women’s groups, post-secondary institutions, teachers’ associations, career development professionals, governments and HR specialists will be critical in increasing women’s participation in the sector.

There are many ideas for an implementation strategy contained in this report. Some need to be undertaken by the sector, industry or occupation associations. A comprehensive implementation plan will require strategic partnerships with education, women’s organizations, employers and the target audience. It should be a holistic long-term strategy with specific measurable outcomes and evaluation milestones. Effective recruitment and retention will most certainly require the active commitment of employers, who will need to choose the most appropriate workplace policies and organizational development strategies for the size and scope of their companies.

Pre-recruitment Integration

— Ensure comprehensive and accurate labour market and career information is readily available to profile the contributions women have made to the field of IT. Career information developed by the sector should:
  • Show the breadth and depth of the industry;
  • Talk about “changing the world” through IT;
  • Ground the sector in the everyday;
  • Highlight team work and social aspects of working in IT;
  • Speak to the values that guide girls’ career decision making and make IT meaningful to them.

— In addition to the above, if developing a web-based career awareness resource, ensure that there are:
  • Opportunities for communication and collaboration for users;
  • Role models profiled who are involved in social action and with whom users can connect.

— Profile career pathways from secondary school course selection to post-secondary to entry into and progress within the profession.

— Programs and activities for girls to explore careers in this field should be well promoted. A “How to Create a Successful Women in IT Experience for Girls” resource could be developed to support educators, community groups and women’s organizations who might organize events.

— Employers, educators, women’s organization and the sector should look for ways to increase role modeling opportunities at all levels of education (elementary, secondary and post-secondary) and in the workplace. Employers need to consider their support of this role, allocating time and training for women, as part of their job, to undertake role modeling activities.
— Partnerships between education, employers and the sector need to be developed to:
  • Help enhance teacher training in computer education and the infusion of technology into the classroom;
  • Make gender analysis instruction available to elementary teachers and computer science teachers in secondary schools;
  • Develop teacher resources – simple lesson plans for easy infusion
  • Create cross subject lesson plans for integrating IT and computer applications into the classroom
  • Develop fact finding games for elementary/secondary students to discover the wide range of IT occupations related to diverse school subjects.
— Provide easy access to accurate labour market and career information for parents. Parents want to see career paths in IT (profiling skill requirements and recommended course selection). Like teachers, they need resource on how to create bias free use of technology in the home, as well as guidelines for choosing girl-friendly software and web sites.
— Provide a trained on-line career advisor to help potential candidates make sense of career and labour market information, opportunities and entry options.

Recruitment
— The sector needs to work with employers to:
  • Identify the fundamental skills (essential, job-specific, soft skills and technical) needed for high demand IT jobs, the sources of those skills, and recommended training and development;
  • Ensure that academic credentials are recognized equitably across genders;
  • Explore mechanisms to recognize skills that have been acquired through informal means;
  • Have a skills-based framework for advertising job descriptions;
  • Develop consistent guidelines for recruitment/interviewing;
  • Create a guide for business owners of SMEs for how to recruit for success and diversity;
  • Create an online assessment tool so that women can self-assess their skills and knowledge against occupational requirements;
  • Create an online network for women to connect with other women in IT;
  • Provide links to employer associations;
  • Provide direct links to post-secondary institutions that provide training in the IT field;
  • Profile women-friendly employers and their workplace policies;
  • Provide current, specific and realistic labour market information;
  • Facilitate foreign credential recognition and workplace English language development programs for immigrant women;
  • Develop online/self-directed industry training that can be completed any time.

Retention
— Employers need to:
  • Implement equitable benefits and perks;
  • Provide training at times which are accessible to women;
  • Ensure that networking and social activities are women-friendly;
  • Provide harassment education for managers;
  • Consider developing a women’s network and invite new female hires to join at orientation;
  • Provide on-site day care and/or flex work options such as telework and part-time work with benefits;
  • Judge based on quality of output rather than visible presence at work;
  • Become an employer of choice.
Women have much to contribute to the field of IT. Feminist research into the culture of IT training and jobs has revealed that women tend to be the ‘bricoleurs’ using pluralistic, alternative and unconventional approaches to problem solving and development. (Butterwick, 2003) The sector is poised to make significant in-roads in the recruitment and retention of women. The approach must not be piecemeal, however. An integrated strategy involving stakeholders from elementary school through to retirement is key. While creating greater gender balance makes good business sense, it also poses significant challenges. Implementation of an integrated strategy will not be achieved with short-term solutions focused on getting over the next labour market hump. Strategies need to take a long-term, holistic view in order to acquire the necessary results.

The strategy to increase the recruitment and retention of women needs to begin in elementary school. Teachers and parents need to be supported to promote unbiased use of technology. Teachers need assistance in creating tech-savvy, yet girl-friendly classrooms. Both young women and their parents need to better understand careers in IT. Care needs to be taken to promote positive messages about the sector, especially how developments in this field have contributed to the social good. Real world examples, highlighting the social aspects of the work and the visibility of role models will help. Post-secondary institutions and workplaces need to address the “masculine” culture. A pedagogy free of gender-bias and women-friendly workplace polices will help recruit women into IT related disciplines and keep them actively contributing to the sector. Analyzing and creating policies to change a workplace culture that excludes or marginalizes women is an important strategy for IT employers’ to increase retention of women. Workplace policies that support life-work balance and flex options for women with families will also significantly benefit retention.

For immigrant women, foreign credential recognition and workplace English language instruction is needed to bring highly trained women into the IT workplace. More research is needed on how to support Aboriginal women’s entry into the sector. Differences among Francophone and English-speaking women may suggest significant pre-recruitment and recruitment strategies, but more research is needed.

It is crucial that employers be convinced of the value of women to their bottom line. One (male) employer surveyed indicated that he only hires women because, “I believe that women can be far more persistent in getting the results they need than men. I find that women multi-task and help one another more than men. They don’t look at their job description and refuse to do work that is above and beyond.” Greater employer respect for the assets that women can bring to the sector and a holistic, integrated outreach strategy will contribute to rectifying the current imbalance and addressing the sector’s human resource needs.
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The Information and Communications Technology Council (ICTC) is a non-profit sectoral council dedicated to creating a strong, prepared and highly educated Canadian ICT industry and workforce. ICTC is a catalyst for change, pushing for innovations that will provide labour market intelligence, life-long professional development and quality education and training for the Canadian ICT industry, educators, governments and the ICT workforce. We forge partnerships that help develop the quantity and quality of ICT professionals needed to improve Canada’s position as a leader in the global marketplace.

To achieve its goals, ICTC focuses on four areas that are proven building blocks of a healthy, forward-looking sector:

- **Skills Definition** – defining the skills required to be a professional in the ICT sector.
- **Labour Market Intelligence** – providing up-to-date statistics and analyses of human resource developments in the ICT sector.
- **Career Awareness** – providing programs and tools to explore the career possibilities in Canada’s ICT sector.
- **Professional Development** – dedicated to continuous learning for ICT workers so they can maintain and improve their skills sets and increase their opportunities within the sector.

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