Introduction

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1.   INTRODUCTION

In developing the call for papers for the 7th International Federation of Information Processors (IFIP) Women, Work and Computerization Conference, we sought to cast our net widely. We wanted to encourage presenters to think broadly about women, work and computerization. Towards this end, the programme committee developed a call for papers that, in its final form, requested paper submissions around four related themes. These are (1) Setting the Course: Taking Stock of Where We Are and Where We're Going; (2) Charting Undiscovered Terrain: Creating Models, Tools and Theories; (3) Navigating the Unknown: Sex, Time, Space and Place, and (4) Taking the Helm: Education and Pedagogy. Our overall conference theme, 'Charting a Course to the Future' was inspired in part by Vancouver's geography, which is both coastal and mountainous. As such, navigation plays an important part in the lives of many as we seek to enjoy our environs. In addition, as the first Women, Work and Computerization conference of the new millennium, we hoped to encourage the broad community of scholars that has made past Women, Work and Computerization conferences a success to actively engage in imagining-- and working towards-- a better future for women in relation to computers. The contributions to this volume are both a reflection of the hard work undertaken by many to improve the situation of women in relation to computerization, and a testament to how much work is yet to be done.

It was our hope that the first theme would invite readers to assess the current situation of women, work and computerization, and begin mapping out new strategies for achieving equality in relation to work and computerization in the future. To our surprise, a significant number of papers submitted addressed the continuing absence of women in the profession of computer science, and, the related area (addressed through the fourth theme, 'Taking the Helm: Education and Pedagogy') of training women for information technology careers. Clearly, the absence of women in computer science and related professions as well as in university level computer science programs is not merely a local phenomenon, and much work remains to be done to ensure that women's participation in this increasingly vital area of work increases. Although the absence of women in computer science has been well documented, surprisingly little data exists about factors that contribute to women's success as computer science professionals. Similarly, few examples abound of educational programs designed with the explicit purpose of attracting women as students.

Although the status of women in computer science received ample attention amongst contributors, notably absent were submissions that addressed the computerization of other areas of work inhabited by women (an exception was Harris' paper about the computerization of librarianship in North America). Although teleworking has received some attention, areas currently undergoing heightened computerization such as the health care and financial services sectors were not addressed by contributors. It appears that our collective focus may be shifting from traditional forms of labour to emergent and unknown areas of concern, such as the relationship between a publicly accessible Internet and citizenship, claimed by many of our governments. Past scholarship about the computerization of women's work however suggests that we must remain vigilant in our focus on the computerization of women's paid work, as women sometimes loose hard earned ground with computerization of paid work.

With our second theme, 'Charting Undiscovered Terrain: Creating Models, Tools and Theories,' we hoped to engender discussion about both how the insights gained from women's studies and feminist theory might prove useful in computer and information science, and how the methods and tools of computer science exclude women, and we hoped to inspire discussion about what how computer systems might be more reflective of women's needs in the future. The response to this theme of the call was somewhat greater than anticipated. We are hopeful that the volume of papers that address the models, tools and theories of computer science signals a willingness to grapple with deeply rooted practices of computer science that have, for too long, had an exclusionary effect on women.

Our third theme, 'Navigating the Unknown: Sex, Time, Space and Place' netted fewer papers concerned with the compression of space and time made possible through computerization than anticipated. Women's access to computer resources was addressed by a few contributors, though more often than not in relation to educational experiences of women. As governments throughout the world have begun promoting the use of the Internet to promote good citizenship, authors turned their attention to explorations of computerization, citizenship and democracy. Surprisingly, no submissions addressed issues of virtuality and the body in cyberspace.

Under our fourth theme, (Taking the Helm: Education and Pedagogy), only a few papers addressed the increasing use of computers in education, and the compatibility of such approaches (including on-line education) with feminist pedagogy. In contrast, several papers addressed a range of aspects related to training women to become computer scientists. Nearly absent here (as was the case with theme one papers concerned with the absence of women in computer science) were papers that addressed alternative approaches to computer science education.

In the next few pages, a brief overview of conference papers is provided. Papers are grouped around points of commonality that became evident only when all the conference papers had been received, rather than around the four conference themes. These points of commonality are the absence of women in computing, the nuts and bolts of system design, gender differences in computer use, citizenship, computers in everyday life, women and work, and computers in education.

2. THE ABSENCE OF WOMEN IN COMPUTING

Although the absence of women in computer science training programs and jobs in the information technology sector (especially higher level jobs) has been the focal point of much concern in the past, contributions to this volume suggest that women studying computer science and pursuing careers in computer science still must overcome many obstacles in order to succeed. Contributors have identified several factors that discourage women's involvement in the information technology sector, including the masculinization of computing culture, power relations that characterize computing (which include gender hierarchies), and the negative valuing of what are traditionally viewed as 'feminine' skills.

Van Oost demonstrates how the masculinization of computing culture is rooted in metaphors introduced in the 1950s and 60s. She argues that while other symbolic readings of computers were possible, such meanings were not as strong as the male metaphor of computer as brain. Törpel discusses

the construction of power relations in computing, including gender hierarchies in the development and use of computer systems. She discusses power relations in relation to three concepts (objectification, appropriation, and meaning/purpose) from activity theory.

Pringle, Nielsen, von Hellens, Greenhill, and Parfit report results from interviews with 10 women information technology (IT) professionals. They suggest that 'feminine' skills, while viewed as useful in the IT industry, may actually work against women's advancement to upper management. Peiris, Gregor and V suggest that the cycle of women's omission from computer science (as students of computer science, then system designers) can be broken at the interface design stage, through consideration of 'the female perspective' at the design stage. After reviewing literature related to the cycle of imbalance, the authors focus on gender differences in human computer interaction.

3.   TRAINING AND CAREERS

Suriya and Panteli look at women's representation in computer education and employment in three countries, and consider what influence national culture has on women's participation in these areas. Miliszewska and Horwood consider factors that influence women's entry into computer science at an Australian university, and conclude that barriers continue to limit women's involvement in computer science. They suggest that much work is to be done in identifying the nature of barriers that deter women from pursuing computer science. Chan, Stafford, Klawe and Chen surveyed Canadian secondary school students about their interest in information technology careers, and found that young women had substantially lower interest in computer science, engineering and physics than young men. They also found that both male and female students had little knowledge of the skills and personality traits required for information technology careers.

Concerned with similar issues, Symonds investigated why young women did not want to pursue careers in IT. She found that they believed that IT required little communication (a social skill they valued), which deterred them from pursuing IT careers. Durndell, Haag, Asenova and Laithwaite look at computer self-efficacy among Scottish and Romanian students. As was the case for students in Craig and Stein's sample, gender differences in efficacy were found. So too were differences in efficacy levels of Scottish and Romanian students, although no gender differences were evident here.

Much has been written about problems women encounter in information technology training and careers, and it has frequently been argued that both computer science education and jobs have a masculine bias. Few examples

exist of computer or information science programs designed to attract women. One such program, the Alternate Routes to Computing (ARC), is described by Klawe, Cavers, Popowich and Chen.

4.   THE NUTS AND BOLTS OF SYSTEM DESIGN

Concern with system design ranges from how epistemological issues influence design approaches, to problems with user representations in the design process. Adam begins her paper by asking what has happened to feminist research about information systems, which was a thriving research area in the late 1980s and early 1990s. Adam makes a plea for more feminist inspired research about information systems (IS), as well as a plea for the IS mainstream to stop ignoring such research (a concern shared by Sherron), which Adam argues is highly relevant to the emancipatory ideals of IS. Along with Adam, Sherron considers epistemological issues. She considers the ties between epistemological issues concerning kinds of knowledge and concerns about how minority voices may be marginalized in artificial intelligence (AI) projects. Like Adam, she argues that the failure to consider a diversity of views within AI projects is ultimately detrimental to AI projects.

Kuosa analyzes the masculine bias in computer science by looking at how computer science professionals see the world. Crutzen and Gerrissen discuss object oriented programming approaches through an analogy with film, and in doing so make the argument that objects cannot be representations of humans or act in the same way as humans. Rommes writes about the creation of user representations in the design process of information and communication technologies (ICTs), and the effect they have on choices made in the development of an ICT system.

Soriyan, Marsi and Korpela discuss problems associated with the absence of women in information systems design methodology based on Activity Theory, using a Finnish-Nigerian project designed to produce a made in Nigeria information systems design (ISD) methodology. They argue that ISD methodology should attempt to alter existing power inequalities between men and women. Turner and Stepulevage conduct an analysis of student design projects, and found that while most students considered the local in relation to people and practices, few showed an awareness of values. In spite of an intellectual awareness of the local, interfaces constructed by students showed little awareness of the local.

5.   GENDER DIFFERENCES IN COMPUTER USE

Gender differences in how computer resources are used is addressed by Fisher and Craig, McDonald and Spencer and Owen. Fisher and Craig, concerned with electronic commerce, argue that if the world wide web is to be used successfully for e-commerce, e-commerce site designers will have to be aware of the preferences of different groups and types of users. Responding to a need for data about web preferences of women, Fisher and Craig conducted a pilot study in which women and men viewed web sites and subsequently responded to questions about them. They found that male and female users perceived sites differently, and brought different expectations to their site exploration.

McDonald and Spencer are also concerned with gender differences in computer use. Their paper reports results from an experiment designed to identify gender differences in web navigation. Their results suggested that although there were no gender differences in web navigational efficiency, that male participants were significantly more confident in their ability to navigate the web than female participants. Owen considers the gendered nature of on-line communication in her paper. After reviewing literature that has addressed gender differences in on-line communication, Owen outlines the result of a study of communication patterns in e-mail discussion groups, and discusses the implications of study results for inclusive on-line education.

6.   CITIZENSHIP

Roberts outlines the potential of the Internet as a new arena for women's participation in civic society, and she reminds us that we must focus on the social contexts surrounding use of new technologies to ensure their success. Ekelin and Elovaara outline the Swedish discourse about citizenship and the information society, and illustrate how feminist reinterpretations of dominant values are possible. Tuuva explores how two women use and understand information technology in rural Finland, through which she depicts two different ways that information technology becomes a part of women's everyday lives. Shade outlines efforts that have been made to target women as on-line consumers, and discusses tensions between ideas about women as on-line consumers and women as on-line citizens.

Related to themes of citizenship are questions about the accessibility of computers to women: who has access to computers, where, and for what purposes? Craig and Stein discuss differences in home access to computers (a topic also addressed by Håpnes and Rasmussen), and patterns of use of

male and female students entering university business and computing courses. Craig and Stein conclude that while access to computers at home has improved for women, differences in use patterns of home computers between men and women persist.

7.   COMPUTERS IN EVERYDAY LIFE

Green and others are also concerned with the use of home computers by girls and women. Green argues that rather than assuming that new technologies will become substitutes for existing activities and means of communication, that we need to look at how new technologies in the home are used to augment or supplement activities and types of communication and social interaction. Green brings together literature that focuses on the ways in which gender relations impact upon the use of information and communication technologies for leisure within domestic spheres.

Also concerned with the use of computers in everyday life were Håpnes and Rasmussen, who used participatory observation and interviews to learn about how adolescent girls use computers and how their use of computers fit into their lives and interests. In a second paper, Håpnes and Rasmussen look at girls' access to home computers in relation to their parents' educational backgrounds, type of occupation and work. Suggesting that the purchase of a home computer is not only a question of finances, but also is affected by values and identities, the authors also consider the place computer technology occupies in parents' masculinity and femininity projects.

8.   WOMEN AND WORK

Although considerable attention has been placed on how computerization has influenced women's traditional paid work in the past, few submissions this year have addressed how occupations traditionally dominated by women are changing as a result of computerization. An exception to this is Harris' paper, which addresses changes to librarianship related to computerization of North American libraries. Harris argues that the predominantly female labour force in libraries is particularly vulnerable to displacement and deskilling in the wake of technological change. Harris points out that librarians (especially women) have had little say about technological change in the libraries, which reflects their marginalization in the social relations of technological change in libraries.

Pugh considers the interaction of sleep, work and family in the age of computerization, which has for many been accompanied by increasing time

pressures at work, which have an impact on families in general, and women in particular. As computers continue to make it possible for women to engage in many forms of paid employment from home, attention has remained focused on the advantages and disadvantages of teleworking. Both Fulton and Bryant explore the use of computers to work from home. Fulton interviewed employees working from home via computer, and found that they had less organizational support than their at-office counterparts. To compensate for this lack of support, teleworkers adapted home environments to meet work needs, blurring the boundaries between home and work in the process. Among those Bryant interviewed, gender differences between women and men working from home via computer were evident in how the often-competing demands of unpaid and paid work in the home were addressed. For example, Bryant found that women were much more likely than men to intersperse unpaid work (such as cooking, laundry and childcare) with paid work.

Wood considers how small businesswomen in Australia have used computer networks. She argues that the potential of computer networks for small business women lies in the capacity of computer networks to supplement 'real world' connections in ways that influence how women approach and organize their personal lives.

9.   THE USE OF COMPUTERS IN EDUCATION

As the use of computers in education has increased, contributors have turned their attention to what increased use of computers for the delivery of education will mean for women. For example, Chegwidden explores the fit of feminist pedagogical ideals with the 'Acadia Advantage' program, that requires all in-coming university students to use laptops in the classroom and for assignments. Richardson and French begin their piece by asking what on-line education has to offer women. Along with Owen, they consider how women friendly on-line learning environments can be created.