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Considering the Context:
The Women's Networking Support Program
of the Association of Progressive Communications

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A Thesis

in

The Department

of

Communication Studies

Presented in Partial Fulfilment of the Requirements
for the Degree of Master of Arts at
Concordia University
Montreal, Quebec, Canada

September 1995

ISBN 0-612-10813-9

ABSTRACT

Considering the Context:
The Women's Networking Support Program
of the Association of Progressive Communications

Justine Akman

Fewer women than men are engaged in the realm of new communication technologies, including computer networks. This thesis suggests that it possible to redress this imbalance, but that the way one understands the relationship between women and technology has important implications for prescriptions for change in this area. It is proposed that one must acknowledge the political/ideological, economic/structural and socio-psychological context within which this relationship occurs in order to develop an appropriate analysis of this problem. This is referred to as a "contextual analysis". Further, prescribing to this perception of the problem when addressing it is called taking a "contextual approach" to the issue. To demonstrate what taking a contextual approach to improving women's involvement with technology means, this thesis draws upon the experience of the Women's Networking and Support Program (WNSP) of the Association of Progressive Communications (APC). The APC is a global computer communications network which started the WNSP in an effort to bring more women's groups on-line. The APC's contextual approach is demonstrated in various aspect of their strategy, including their overall mandate, their training and outreach programs, and computer-based initiatives.

This thesis is dedicated to my mother
for her support, and for being my primary
and continual source of inspiration.

"It's easier to teach political people to be
technical than it is to teach
technical people to be political."
-Gisell Mills (APC trainer)

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INTRODUCTION

At present, fewer women than men are engaged in the realm of new communications technologies at all levels (developers, users, policy makers, etc.). It has been found that this trend holds true for one of most widely used new technologies: computer networks[1]. This inequality could be detrimental to women for a variety of reasons. A great deal of work has been done in recent years discussing and explaining why it is necessary for women to be involved in and have access to communications systems (see, for example, Perez-Victoria 1994). Following this literature, this thesis argues that this trend can be reversed. More importantly, it discusses a method of doing so.

It is contended in this thesis that the way one understands the relationship between women and technology will determine how the problem described above will be addressed. It is argued that one must take into consideration the political/ideological, economic/ structural, and socio-psychological context within which this relationship occurs to develop an accurate understanding of women and technology. This understanding is referred to throughout the thesis as a *contextual analysis* of this dynamic (this is explained in more

[1]See Chapter Four, under "Gender Discrepancies in Science and Technology" for statistics on female versus male use of the Internet (a global network of computer networks).

detail later in this chapter). Further, adhering to this perception of the problem of women and technology when trying to alter the situation is called taking a *contextual approach* to the issue. This is further explained in Chapter Two.

This thesis draws on the experience of the Women's Networking and Support Program (WNSP) of the Association of Progressive Communications (APC) to bring questions relevant to this issue forward. The Association of Progressive Communications is a worldwide partnership of member computer networks. (See Appendix I for a map of APC networks.) The common mission of the APC member networks is to establish an informational system that allows for geographically dispersed groups who are working for social and environmental transformation[2] to coordinate activities on-line at a much cheaper rate than can be done by fax, telephone, or for-profit computer networks.

Initially, the APC concentrated on being a service provider for environmental and peace activists. However, they found that women were underrepresented in their membership in most

[2]The APC networks are designed for use by non-governmental organizations (NGOs), other non-for-profit organizations, and individuals who communicate with NGOs. These include: United Nations agencies, research organizations, government departments, educational institutions, and activists. Some of the issues which are given particular attention by users of the network include: peace, human rights, environmental issues, social justice, economic justice, indigenous rights, women's empowerment, labour movements, public health, population issues, development, poverty, nonviolence and demilitarization.

parts of the globe.[3] Because of this, and with the impetus of facilitating communication between women's organizations in preparation for the 4th World Conference on Women in Beijing (1995), the APC established the Women's Networking Support Program (WNSP) in 1993. This project will be analyzed in terms of the APC's understanding of the relationship between women and technology, and how this has affected their attempts to get more women on-line. Training, outreach, and technical initiatives established for this project will be examined. It is contended that the APC's efforts at adjusting their services to match experiences of female users within specific situations constitutes taking a contextual approach to this issue.

TECHNOLOGY AS SOCIAL PRACTICE FROM A GENDER SPECIFIC POINT OF VIEW

This thesis contributes to a body of literature that sees technology as social practice, from a feminist, or gender specific, point of view. Much of this literature is meant to counter dominant discourse of technological "revolutions", in which technology is almost always associated with progress.[4]

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[3]During a speech to the "Reframing Frontiers" meeting in Austin, Texas (February-March 1995, organized by Telemanita) Sally Burch, the APC Women's Program Coordinator, said that only 25% of users on the Institute for Global Communications (the United States APC member network), were women.

[4]This will be discussed further below.

In brief, the counter-argument states that technologies, and their uses, cannot be separated from the social conditions into which they are introduced. Therefore, any technology in use will embody or perpetuate the social relations and conditions within which that technology operates. Martin Allor (1985: 135) describes one technology in this vein: "Beyond any instrumental use, computers embody a set of social relations and work to rearticulate existing social practices." (Other authors who agree are Carey 1989:113-141 and Finnegan 1989). Therefore, the introduction of new technologies can not constitute a "revolution" except in the purely mechanical sense. The importance of this argument for studies of communication technologies is the realization that social biases may influence the process of their development and introduction.

For feminists, the proposition that technology must be seen as social practice, comes from the assertion that technology has come to be gendered (see Hacker 1989: 5, Smith Keller 1992: 29), and that most existing accounts and perceptions of technology are seen from a "masculine" perspective. Over time, certain technologies have come to be associated with men, and others with women. Cynthia Cockburn (1985) traces the history of technology, and women's position in relation to it, arguing

that women were, in fact, the first technologists[5]. She claims that it was only through time, with the development of class and patriarchal societies, and the increased division of work along gender lines, that technological skills came to be predominantly associated with men. This is despite the fact that women continued to be engaged with technology in various ways. According to Cockburn, women's contribution to technological development throughout history, has been largely discouraged, neglected, or overlooked due to relations of power and ownership of the means of production. Autumn Stanley (1983) also suggests that women have essentially been hidden from the history of technology. She says that if there were a greater focus on women in history, "...the very definition of technology would change" (Ibid: 5) as we would see that they have been involved in technological practice in various ways throughout time, which differs from men's engagement with technology.

It was this line of reasoning that led feminist theorists to move away from concepts of technology as an autonomous object. Women started to question *whose* technology, or technique,

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[5]She says, "Under pressure of nutritional stress, caring for both self and young, females are the more likely sex to have invented the digging stick, the carrying sling bag, the reaping knife and sickle, pestles and pounders, methods of winnowing, washing, detoxifying and preserving food. It is well established that women were the first horticulturalists...They may well have invented and used the hoe, spade, shovel and scratch-plough" (Cockburn 1985: 20).

should be considered to be important, and *what* sets of historically specific social conditions would encourage its emergence and acceptance. Most of this literature therefore defines technology as a method, technique, or practice that is socially and culturally constructed. Pam Linn, for example, takes issue with object-oriented views of technology in the following passage:

> The focus has been on technology, on hardware, on fixed capital. But there is more to technology than hardware, more than inert matter. On its own, matter is nothing at all. For us it never exists in that asocial sense. It is always constituted in the social practices of language and other forms of representation, in traditions of use, with associated techniques and training procedures, in domains of knowledge, and in relations of production and consumption. In short, technology is a cultural product. (Linn 1987: 128-129)

Technology, then, is seen as diverse methods of organizing our world or accomplishing tasks, within a specific predefined set of social relations.

Ursula Franklin's (1990: 11-32) influential distinction between "prescriptive" and "holistic" technologies also contests a simplistic object oriented definition of technology. Holistic technologies normally associated with craft, imply a level of worker control and engagement with a particular process of creation or work. Over time, holistic technologies have been replaced with prescriptive technologies, which are associated with specialization, the

division of labour (introduced with the Industrial Revolution), and increased worker alienation from the process and product of work. By delineating types of technology in this way, social practices are seen to be the defining influences behind technological development. Franklin (1984: 8) also argues that women's values are in conflict with "...the operational principles of the technological order" that is dominated by prescriptive technologies. The implications of these two ideas are; (i) that technological practices are subjective and can take many different forms, and (ii) that technological development, and definitions, would be different if female work practices were incorporated into them.

Defining technology as social practice enables an incorporation of women's influence and opinions into methods of technological development and use. It necessitates a focus on the social processes that led to the development of a particular technology, rather than on the technology itself. This understanding of this issue stands in opposition to analyses of women and technology that use either restrictive definitions of the "nature" of technology, or of the "nature" of women.

THE "NATURE" OF TECHNOLOGY

Studies that do not consider technology in its context treat the existing form of the technology as being predetermined, or what I have referred to as being in its "natural" form. They then analyze social changes that occur in relation to that technology as determined by the supposed objective state of the product in question. At its extreme, these authors treat technology as an autonomous agent, attributing potentially revolutionary social changes to the object itself. This is seen in the work, for instance, of Marshall McLuhan (1967) who describes communication technologies in their material form as extensions of mind and consciousness. In his famous statement, "the medium is the message", the message, which shapes social life, is considered synonymous with its technical or material form. Similarly, Elizabeth Eisenstein (1979) attributes revolutionary changes in social relations to the introduction of the printing press.

As Jennifer Daryl Slack points out, less extreme treatments of technology as autonomous cause include "impact studies" where technology is "still the cause, and effects are still inevitable, but the nature of those effects is mediated by any number of possible social forces" (Slack 1984b: 85). Falling into this category would be James Carey's study of the

telegraph's influence on society.[6] From a gender perspective, studies that claim that technology has had an impact on women, such as Corlann Gee Bush's call for a "feminist assessment" of the "effects" of technology (1983), or Cockburn's explanation of women's displacement in the workplace by technology (1985) fall into this semi-autonomous category. These analyses do not focus on the factors that led to the development of a particular technology in a particular way. The portrayal of technology as the problem does not allow for an analysis of other possibilities in the development of the technology. This makes it difficult to identify how gender biases in technology have come about.

THE "NATURE" OF WOMEN

A contextualized analysis of women and technology also negates theories that men and women relate to technology differently because of inherent or "natural" differences between the genders. The debate about what a "feminist" science would look like, often routes back to Evelyn Fox-Keller's *Reflections on Gender and Science* (Fox-Keller 1985). In this work, Fox-Keller discusses how societally shaped notions of men and women have over time strongly influenced the way science is done. Fox-

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[6]Carey argues that there are "consequences" of the introduction of the telegraph, and how it "...altered the spatial and temporal boundaries of human interaction" (Carey 1989: 204). In other words, it is the telegraph which is seen to have an influence, as opposed to the social phenomena which brought the telegraph into being.

Keller argues from a psychoanalytical standpoint that men's world is seen to be rational, objective, and quantifiable, while women's is emotional, subjective, intuitive and qualitative. She contends that it is masculine qualities that have come to be associated with scientific truth.

Fox-Keller's feminine/masculine dichotomy too stagnant: she identifies these traits with women under all conditions and at all times, rather than as the result of a specific set of historical consequences. One of the consequences of such an essentialist interpretation of women's nature is that women are viewed as handicapped by their very nature, unable to handle the hard rational technical world of men. This interpretation moves the question away from choices inherent in technological development, placing the problem in women themselves, rather than in the structural causes of women's alienation from technology.

If one implies that there is something different in the inherent ability of men and women to use computer communications, the temptation is to identify and define the source of that difference. In order to avoid reverting to deterministic arguments like those above, some theorists will limit their analyses to the way "feminists" are assumed to work. Margaret Lowe Benston, for instance, calls for the "Embody(ment) of Feminist Values in New Technology" (Lowe

Benston 1989: 217), defining feminism as incorporating a "collective" "caring" and "human-centred" world view. The implication of this delineation for women's computer use is that there should be a way of developing computer systems more in line with these assumed feminist values.

This approach puts extreme limitations on prescriptions for technological development. The APC would not want to make the assumption that they must develop computer systems more in tune with predefined "feminist" values in order to entice women and women's groups to get on-line. The understanding of this issue that I am proposing (which is also consistent, I believe, with the APC's line of reasoning), avoids such limitations. It starts by acknowledging that women's relationship with technology has *in general* been different from men's. However, it is also seen that the precise social context that leads to this difference, and therefore the nature of the problem, changes according to space and time. For this reason, while it is understood that women and men interact with technology differently, assumptions are not made about what women need to engage in this realm. This issue will be revisited in detail in Chapter Three.

CONTEXTUAL ANALYSIS OF THE RELATIONSHIP BETWEEN WOMEN AND TECHNOLOGY

A contextual analysis of technology alone may be done in a variety of ways, ranging from what I will refer to as "macro-level" to "micro-level" studies of technology. An example of the former would be an approach described as "structural causality"[7] (Slack 1984b: 102) which is advocated by Slack. This approach begins with a notion of a totality that is "constituted of interrelated levels or instances... characterized traditionally as the economic, the political, the ideological, and the theoretical". Elsewhere, Slack (1989: 331) refers to these interrelations as "articulations"[8], defined as "a nonnecessary connection of different elements that, when connected in a particular way, form a specific

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[7]This is opposed to "expressive causality" which is seen in the work of Raymond Williams. She explains that, "[e]xpressive approaches to understanding the relationship between communication technologies and society conceive of the context within which technologies emerge as an entirely interconnected totality... (which) is imbued with essence. Every manifestation of the totality, every phenomenon, is an expression and an enhancement of that essence" (Slack 1984b: 100). Slack takes issue with the necessity in this approach for every part of a social structure to be reduced to the essence, or connectedness of experience, that is part of that totality. She says, "The reduction of complexity in this manner to an expression of essence...truly selects from technologies only those elements whose correspondence can be demonstrated, while disparate elements are not seen as part of the totality" (Slack 1984a: 78).

[8]This term is originally derived from the work of Louis Althusser. See in particular: Althusser, Louis (1971). Ideology and Ideological State Apparatuses, *Lenin and Philosophy*. London: New Left Books. It is also used in cultural studies theory. See, for example, Stuart Hall (1986).

unity"[9]. Technologies, then, emerge through the interaction of these elements. Structural causal interpretations are also historically informed. Communication technologies would be, for example, "seen as being overdetermined in particular historically constituted configurations" (Slack 1984b: 103). Slack's approach to contextualizing technology, therefore, corresponds to our previous definition of technology that sees it not as object but as process, developed in historically specific contexts.

The problem with Slack's method of analyzing technology is that a concept of individual agency or difference between groups is often neglected because of the concentration on macro-level phenomena. This becomes especially evident when dealing with the question of gender. Weakness appears in Slack's critique as she focuses on the problem of inaccessibility of software and the exclusivity of its construction due to its monopolistic development in a capitalist system (1984a: 95-137). Her prescription for change is to eliminate patent laws, the pillar of capitalism that has led to this situation. However, this proposal does not address many other important issues related to the exclusivity of software development. For instance, it does not account for general male domination over software development, which has

[9]She even refers to the possibility of looking at connections between "technology and gender" as one particular set of articulations (Slack 1989: 331).

been argued to lead to women's psychological alienation from information technologies (Turkle 1988). Slack's main focus on the "social whole" (i.e. macro-level structural phenomena) can lead to a neglect of various other perspectives in the analysis.

One response to this problem of over emphasis of macro-level phenomena found in Slack is to construct a deeper social analysis by concentrating directly on the dynamics related to specific technologies. This approach is seen in Carolyn Marvin's historical account of electricity and telephony (Marvin 1988) in which there is a concentration on social dynamics as they shifted around the introduction of these technologies. However, Marvin's approach leads to an exaggerated focus on the technology itself. In her analysis of telephony and electricity, she does not provide an analysis of the socio-economic situation of the bulk of the population during this historic period at all. She only discusses groups directly engaged with the development of the technology, that is, engineers and the state. The technology ends up defining pertinent social phenomena to be discussed. Without a greater understanding of the *social whole*, it is difficult to recognize less obvious phenomena that occur in relation to technological innovations. For instance, while Marvin refers to groups affected by the technology such as women, the uneducated, or cultural minorities, she does not analyze the

technology from their perspective. This would demand an analysis of these group's positioning in the social environment.

Analyses of communication technologies from a gendered contextual perspective can help bridge this gap between overly general structural-causal accounts of technology, and narrow technology-led accounts. The "social-whole" can be analyzed with a concentration on women. This would accomplish two objectives simultaneously: i) to take a step *outwards* from the technology-led approach in order to recognize more obscure social phenomena (i.e. analyzing women's general social positioning and then their interaction with technologies); and, ii) to step *inwards* from an overly generalized concept of the "social whole" by focusing on a specific set of social relations: those that affect women in particular[10].

This type of analysis also constitutes a contribution to feminist studies that does not attempt to prescribe any predefined characteristics to the notion of "women". While gender is accepted as a differentiating variable in technology analysis, there is no assumption about what those differences might be outside of a specific conjuncture. To determine difference necessitates a careful study of the context that

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[10]This could be done with any number of specific social groupings: men, various cultural groups, age categories, etc.

shapes women's relationship with technology during any particular historical and spatial juncture. Thus, while statistics and casual observation have shown us that women's interaction with computer networking is different from that of men's, understanding and addressing that difference will necessitate recognition of its source in any particular setting.

Margaret Gallagher provides one example of what a study from this point of view may look like. In her article, "Redefining the Communications Revolution" (Gallagher 1987), she studies the conjunction between the social position of women and the introduction of new communications technologies, looking at the political, ideological, socio-psychological, and economic issues pertinent to this issue. Within this framework, Gallagher studies developments in new communication technologies from a variety of angles (including their cost and design, control over production in the new media, and changes in content) and what the implications of this are in terms of women's social position. By placing her analysis firmly within this context, Gallagher avoids falling into the trap of portraying communication technologies as if *they* had agency, or impact. She describes her chapter as follows:

> This chapter has tried to outline some of the fundamental relationships which do exist between the position of women in society and the development and application of new communication technologies. Some of these interconnections are more obvious than others. To grasp their *[i.e. the interconnections]* implications, and anticipate their impact in specific national or local settings, it is important that women locate new communication trends within a framework which acknowledges the increasingly global economic and political interests which are in play. (1987: 34)

This focus on *interconnections*[11], rather than on the objects of technology, are important for Gallagher's allegation that "technological development is not simply about systems but about people". Gallagher's approach shows that the focus should not be on technology, but on the way people interact and construct their environments, and technology's role in that.

A contextual analysis of women and technology provides the background against which the APC's project for women takes place. While the APC does not itself conduct such an analysis, they adhere to the view that both women and technology must be seen within their context. In other words, they implicitly recognize the significance of the political, ideological, economic, and socio-psychological factors which shape the relationship between women and computer communications. This

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[11]This corresponds roughly to Slack's notion of "articulations", described above.

is what is described in Chapter 2 as the APC's "contextual approach" to this issue. It is the practical manifestation of the theoretical view that social phenomena can only be understood with reference to their contexts.

Chapters three, four, and five, will examine the ways in which the APC's contextual approach has influenced their understanding of and way of addressing the dynamic between women and computer communications technology. In Chapter Three, the rationale of the WNSP will be examined. It will be shown how the mandate of the APC counters the current public discourse of the technological communications revolution, and sees the ideology implied in it as a factor contributing to the alienation of women from computer communications technology. In the dominant discourse, technology is presented as an objective force, with a will of its own, rather than as a social construction that reflects human interests and values. According to the WNSP, the result is that women's needs are not taken into consideration in the discussion.

Chapter Four will focus on the APC's training and outreach initiatives for women. The discussion will be placed against a background of literature about education for women in science and technology. The WNSP will be seen to differ from many attempts to get women into science education. First, they ensure that training is altered to meet each particular groups

needs. Secondly, training is only one part of a comprehensive strategy to adjust the network to suit these needs. Essentially, the APC training project stresses altering the technology to meet the needs of the women it will serve, as opposed to forcing women to change to meet the predefined characteristics of the technology.

Another important part of the WNSP has been to alter the very nature of the computer networking system in such a way that it will be suitable to the experiences of female users. Chapter Five will take a closer look at the contention that technology is socially constructed. It will discuss the process of software and interface development, pointing out alternatives suggested by programmers themselves to make computer technology more suitable to the needs of the users (as opposed to always prioritizing technically coherent designs). Finally, it will be seen how the APC has shaped its service at the technical level to match the experiences of female users.

The final chapter, the conclusion, will review the consequences of ignoring the context in an analysis of women and technology. It will also reiterate how contextual analysis translates into practice. Finally, comments are made about the contribution a project like the WNSP can make by setting an example for getting more women involved with new communication technologies.

METHODOLOGY

Data for this project was collected through interviews and a review of relevant documentation. The research period expanded over six months, from February 1995 to July 1995.

Research techniques:

Interviews: In Canada, interviews were held with APC employees and trainers working on the WNSP project. In the United States, three APC employees/trainers were interviewed, and one APC employee/trainer from Latin America was interviewed. Interviews conducted in each region included the project managers in charge of each sector of the WNSP. The Latin American interviewee was also the global APC Women's Program Coordinator.

A questionnaire was developed for guidance during the interviews. Each interview was approximately one hour in length. The interviews were informal, although they were structured around relevant issues. The women's networking support program and the APC in general were discussed. The goal of the interviews was to specify what is different about the WNSP from other APC projects, and, in particular, how the APC is striving to meet women's computer communications needs through this project.

Initially, another questionnaire was developed for trainees of the WNSP with the intention of conducting trainee interviews. The goal was to obtain the perspective of the female users of the APC in terms of how useful and effective they have found this project. During the research and writing process, it was found that collecting this information was unnecessary in order to answer the theoretical and practical questions pertaining to women's use of computer networking technology. These interviews would have amounted to a detailed evaluation of the WNSP. While it is useful to know that this project has met with success in terms of an increase in the number of female users of the APC, the goal of this inquiry was to focus on a methodology and the thought process (or "theory") behind this project, rather than on an evaluation of its results.

Documentation: Several documents describing the APC and the WNSP, as well as APC user support documentation, were reviewed. A full literature research on the issue of women and technology was also conducted for the theoretical sections.

Recording Options: A loose questionnaire was used for the interviews in order to follow major areas of inquiry. The interviews were recorded on audio-tape, and notes were taken.

Interpretive Design: Data collected were used to show in what ways the APC acknowledged the context of women's relationship

with technology through various elements of the WNSP. Different parts of the project, as well as observations of the women working on this project, illustrate how contextual analysis can translate into practice. Further, this information helps to illustrate what technological development and use for women may look like using this analytical framework.

Limitations of the Research: Due to financial and time limitations, interviews conducted cannot be seen as a fully representative sample of the activities included in the WNSP. Interviews were only conducted in three of four activity areas of the WNSP: Latin America, Canada, and the United States. GreenNet, the European node (based in England) also has conducted training and outreach in Africa as a part of the WNSP.

Finally, there is a bias in terms of the *numbers* of interviews that were conducted in each region. This in part reflects the current structural reality of the APC, and of computer communications in general. While there are two employees of the APC working on the WNSP in Canada, and several "partner" trainers in the United States, there is only one APC employee coordinating the WNSP in all of Latin America. While she has assistance with training, these people could not be interviewed. More detailed information about the WNSP in Latin

America would be necessary to have a thorough understanding of activities in this region.

CHAPTER 2

A CONTEXTUAL APPROACH TO WOMEN AND COMPUTER COMMUNICATIONS

Identifying the context that shapes the relationship between women and computer networking in a particular space and time is clearly complex. As was stated in the introduction, political/ideological, economic/structural, and socio-psychological issues which factor into this issue need to be taken into consideration. In order to clarify what is meant by "the context", this chapter will discuss some of the phenomena that fall into these broader categories. These phenomena all have an influence on the global women's outreach project of the APC. First, however, an explanation of the WNSP's "contextual approach" to addressing women's use of computer communications will be explained. The WNSP never overtly analyzes the contextual issues referred to above. However, their projects demonstrate that the significance of these issues is implicitly recognized.

A CONTEXTUAL APPROACH TO WOMEN AND TECHNOLOGY

Unlike conducting an explicit *analysis* of all the factors that affect women's relationship with technology, a contextual *approach* to dealing with this issue only involves implicitly recognizing the significance of these factors. It is contended in this thesis that this is what the WNSP does. This

contention comes from an examination of the way that the APC conducts its projects. In Chapters Three to Five, it will be seen that the APC is flexible in its approach to altering women's use of computer networks, adopting a variety of methods to ensure that the WNSP is relevant to the different groups with whom they are working. In other words, the APC has recognized that the relationship between women and technology changes according to space and time. They ensure that they are sensitive to the needs of women in different areas because they acknowledge that the *context* of the development of technology, and the experiences of women, are different in each region in which they are involved.

The APC, therefore, operates from a perspective whereby the notions of "women" and "technology" are not considered predetermined. Instead, women's experiences vis-a-vis technology are seen to vary according to different situations, and the definition of technology is seen to depend on socio-historical practice. The WNSP recognizes that the connection between women and technology is not linear. Rather, it is a function of various complex social processes. This perception of the problem differs from causal theories of social phenomena that try to narrow the problem down to one or two variables. The difference between the WNSP and other projects which attempt to address this issue will be drawn out in following chapters.

While it is not necessary for the WNSP to know exactly what contextual issues have led to the problems they are addressing, for the sake of clarity it is useful to hypothesize what some of these issues may be. This will be the topic of the next section[12]. It should be noted that the following treatment of the contexts is limited. Most of the following issues were identified from studies of women and technology conducted in Western industrialized countries. While we can assume that political/ideological, economic/structural, and socio-psychological issues all play a part in this relationship around the globe, their manifestations differ in space and time.

THE CONTEXT OF WOMEN'S RELATIONSHIP WITH COMPUTER NETWORKING TECHNOLOGY

There is a broad range of literature about women and technology that is relevant to the inquiry about women and computer communications. This literature may be loosely broken down into the three areas mentioned above: (i) the political/ ideological impetus behind the development of the communications infrastructure; (ii) economic/structural issues; and (iii) socio-psychological issues. The goal of this section is not to provide a thorough treatment of the literature in any of these areas of interest. Rather, it will

[12]Various contextual issues will be referred to throughout the thesis.

be to review some of the concepts that have relevance to the APC's WNSP.

(i) Political/ideological impetus behind the development of the communications infrastructure

One can demonstrate the ideological impetus guiding the development of the global information infrastructure by examining the descriptions of this process in the mainstream media, in government promotion documents, political speeches, and other public fora. As was mentioned in the introduction, this language is fraught with the image of a "revolution", whereby technologies themselves are predicted to radically alter social existence in most parts of the globe. The examples are countless, however the thrust of the discussion is demonstrated in the following quotes from official government papers on the "information highway" in Europe:

> The information society is on its way. A "digital revolution" is triggering structural changes comparable to last century's industrial revolution with the corresponding high economic stakes. The process cannot be stopped and will lead eventually to a knowledge-based economy. (European Union 1994)

In a similar tone, the agenda to an industry meeting on the information highway in Canada is introduced with the following analysis:

> The Digital Revolution: Some say it has already taken place. Others claim it has only just begun. All experts unanimously agree, however, that modern societies are experiencing a great upheaval triggered by the sweeping spread of digital technology.[13]

There is a sense in this discourse that it is the technology itself that will bring about social change, and that the technology will determine the characteristics of this change. Further, technological change is necessarily associated with progress. The question is, who is advancing or profiting from this supposed "progress"?

In her book, *Fastforward and Out of Control* (Menzies: 1989), Heather Menzies argues that social issues have been taken off of the political agenda in the period of techno-economic growth since the 1970s. Instead, economic imperatives take precedence in the debate over the form of technological infrastructure which will be developed. This would certainly appear to be the case for the current development of the communications infrastructure, which is being dominated by business and industrial interests across the globe. Gallagher (1987) argues that Western nations see rapid development of a communications infrastructure as a way of escaping the economic crisis of the 1980s. For this reason, they promote

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[13]Taken from the agenda of, *Communications 94: Third International Meeting on Communications Culture and Technologies*, Montreal, May 24-27, 1994. Sponsored by, Qui fait Quoi.

the idea of the "communications revolution" to the public through the mass media, justifying state support for industry to develop communications technologies due to their presumed benefits to users.

Within the discourse of the technological revolution lies the ideology of liberal individualism which assumes that people are equal, leaving distribution of goods and services to be worked out through the marketplace. Several authors have argued, however, that the interests of various groups, including women, are not met through this free interplay of market forces. Special consideration needs to be given to particular groups if their interests are to be met in technological development. However, this concept of choice is hidden in the rush propagated in the language of technological determinism. Menzies says:

> The real crisis facing Canadians in the current rush of techno-economic restructuring is one of choice, or perhaps more accurately, of forgetfulness that choices *are* being made, for us, if without our input, in the guise of the determinisms of economic restructuring. (1989: 39)

Ruth Finnegan also points out that questions such as, "who controls the organization and distribution of a particular form of communication,...whose interests it is used to serve, (and)...who has access to it" (Finnegan 1989: 115) must be asked in order to control the shape technologies will take.

As the debate concerning communications infrastructure is being dominated by business interests, a wide range of concerns, including those of many women, are therefore excluded. Gallagher points out that the control women have gained over communications (such as the content of mass media messages and women's employment in the communications field) will be lost if women's needs are not taken seriously (Gallagher 1987). It is true that issues such as access and affordability are often mentioned in government documents on the information superhighway.[14] Normally, they are discussed, however, within the general framework of economic imperatives. A hint about what this type of access means is found in a quote that suggests that there will be an increase in on-line shopping in the United States because "more women are coming on-line".[15] Is the motive of getting women on-line here really to give a diverse selection of women increased access to computer communications in a way which suits their needs, or is it to provide business with increased access to female markets through commercial networks?

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[14]See, for example, Chapter Four in, CRTC Offices (1995). *Competition and Culture on Canada's Information Highway: Managing the Realities of Transition.* Public Works and Government Services Canada, Catalogue No. BC92-53/1995. Access URL: http://www.crtc.gc.ca

[15]Press, Larry (1994). Commercialization of the Internet, *CACM* 11. Access URL: http://insect.sd.monash.edu.au/infobahn.html#Press

These concerns apply to the process of development of electronic networking tools across the globe. Women's particular interests and needs (which will be further discussed in following chapters) have not been taken into consideration in an overt manner by the vast majority of networking service providers. It is therefore not a surprise that there are fewer female than male users of computer communications. Chapter Three will discuss how the APC addresses this problematic ideology which currently governs technological development.

(ii) Economic/Structural Issues in women's relationship with technology

A great deal has been written about women, technology, and the workplace[16] (see, for some examples: various chapters in Zimmerman 1983 and 1986; Rothschild 1983; and McNeil 1987; Hacker 1989 and 1990; Cockburn 1985; Strober and Arnold 1987). The basic premise in much of this work is that throughout history women have been actively excluded from the use of technologies in the formal workplace. This has been shown by Cockburn, who, in a study of technologies of production (mostly in industrial settings) argues that, "Men controlled the technical knowledge that governed the instruments of labour and the work processes of other men and of all women...Women were actively excluded from technological

[16]Some of this work crosses over with the social-psychological approach, for e.g., Perry and Greber (1990).

knowledge, acted upon by the technology and not interactive with it" (Cockburn 1985: 9). In particular, the differential relationship of the genders to technology was, according to Cockburn, exacerbated during and following the technological revolution, with the increased gendered division of labour.

The issue of the division of labour addressed by Cockburn is normally described as technology displacing women in the workplace. When new technologies are introduced, often it is men who are given access to them, promoted to higher levels in the employment hierarchy than women. Sally Hacker, suggests that "automation is having fairly major effects on the division of labour and the sex stratification of the labour force across the board. In labour-intensive industries, women and minorities are displaced from the work force without clear prospects of alternative employment" (Hacker 1990: 172). Several authors discuss the phenomena of the introduction of computer automation into the workplace (Lowe Benston 1983; Strober and Arnold 1987; Perry and Greber 1990). The finding of such studies is that while women are using computers in low-skill, low-paying jobs, they are still heavily under-represented in jobs that involve high level mastery of the machines.

The problem with this idea of displacement *by* technology is that social changes in the workplace are attributed to the technology itself, thus seeing it as autonomous cause. For example, Barbara Gutek refers to the "Potential impact on women" of office automation (Gutek 1983: 164). In a review of Cockburn's book, *Machinery of Dominance* (1985), Maureen McNeil wages a similar critique of Cockburn's simplistic association between technology and power, arguing that "...the relationship between knowledge, power and technology is far more complex than this statement indicates" (McNeil 1987: 194). The overall social context of women's employment needs to be examined to make these observations about technology and women's work meaningful.

This literature does, however, have important implications for our discussion of women and computer communications. Understanding women's position in the labour force can provide insights into how they may negotiate use or lack thereof of a particular technology. Studies on the increased marginalization of women with the introduction of new technologies may help us understand why women use computer communications less than men. Further, several projects to give women technological training have found it crucial to understand where women stand in the labour force in order to structure appropriate courses. For instance, when women leave the formal job market for extended periods of time (eg.

maternal leave), they often need to update their training. These issues are further discussed in Chapter Four. The implications of these issues for the APC women's training project are clear. In each specific region, the organization needs a sense of where women have stood vis-a-vis technology in their professional lives.

Another implication of the "division of labour" thesis is that women's isolation from technological processes have resulted in technologies that have not been developed to meet women's needs or experiences. Elsewhere, Cockburn argues that technologies are designed with a specific gender in mind. In most cases, men's needs have taken priority over women's needs. She says,

> When a new technology arrives in the workplace it is already gendered by the activities and expectations of its manufacturers and its owners. It may even be ergonomically sex-specific, scaled for the average height or anticipated strength of the sex that is to use it...The computer was the brainchild of male engineers and it was born into a male line of production technology. (Cockburn 1985: 170)

The way in which this phenomena is manifested in computer communications technology is the topic of Chapter Five. Interface design and communication options have largely been decided upon without the input of women or without consideration of women's needs.

When looking at economic or structural issues that provide insight into women's interaction with technology, one must also consider their general economic condition of existence. Women's comparatively lower economic status has been well documented. The official United Nations document pertaining to "women and poverty" prepared for the Fourth World Conference on Women states that, "Indeed, there is more and more recognition that women are disproportionately represented among the poor. It has been explicitly recognized that poverty has a gender dimension" (UN 1995: 47). Gallagher points out that women's relative poverty and their access to new communication technologies are related: "The economic differential between the two sexes...partly explains why men are the main users of the new communication technologies" (Gallagher 1987: 25). With the costs involved in accessing many communication technologies, economics will be a greater barrier for women than men in accessing these technologies in many parts of the world.

The relative poverty of women's organizations when compared to the APC's members in general has been an issue within the WNSP from the start. Women's groups in North America often do not have access to new modems, or powerful enough computers to easily sustain computer communications systems. Economic conditions in Latin America are probably the major determining factor in terms of access to computer communications. While

not uniquely an issue in the Latin American women's program, it has certainly been one of the major concerns of this project.

In Chapters Three and Four, the APC's recognition of issues related to women's economic conditions of existence will be discussed. Through a combination of training and outreach initiatives, and through adjustments made to the actual process of technological development, the organization acknowledges women's general alienation from the technological realm that is, in part, a result of their economic status within the global landscape. For example, they have found out that many women and women's groups cannot afford high-end computer equipment, and have had to adjust their service accordingly. The APC has purposely ensured that the network can be easily used on simple, text-based computer systems.

(iii) Socio-psychological issues in women's relationship with technology

What I am broadly calling the "socio-psychological" approach to studies of technology and gender refers to a body of literature that identifies the barrier women have to technology as being rooted in the fact that the social construction of technology is anchored in values most often associated with men (Turkle 1988; Rasmussen and Hapnes 1991; Sproull, Kiesler and Zubrow 1984). It is not that women are

not able to use computers, but as Sherry Turkle points out, women have "computational reticence". She says, they "want to stay away because the computer becomes a personal and cultural symbol of what a woman is not" (Turkle 1988: 41). Many women have pointed out how they are simply not comfortable or at home using many technologies.

One danger of some of the work on women and technology from this perspective is the tendency to imply that women have a particular "nature", necessarily different from that of men. Not only does this make assumptions about what the nature of women and men is, but as has been pointed out by Liesbet van Zoonen, the statement that women are psychologically disadvantaged when dealing with technology leaves few options for them other than to be oppressed by these technologies. She says, "The supposedly rare female person who has managed to master and enjoy technology, must suffer from a split personality and false consciousness: her use of technology is at odds with her 'true' feminine nature, and makes her collaborate in her own oppression" (van Zoonen 1992: 18). Women have learned how to use a variety of communication technologies with great success, when given the space to do so. The socio-psychological approach sometimes does not leave much room to account for these cases.

It is possible and important, however, to account for socio-psychological factors in technology analysis as long as the contexts that have led to this difference are overtly acknowledged. Women's and girls' traditional lack of exposure to technology, for example, can lead to discomfort around machines. Also, because most technologies have been built for men, women may lack the motivation to use technologies that do not suit their needs and interests. If certain technologies embody a specific "way of knowing and thinking", which have a male gender bias, these technologies are uncomfortable for women (Turkle and Papert 1990). Using a contextual analysis, this discomfort does not refer to women's natural psychological inability to use machines, but to the result of circumstances whereby women were not encouraged to use technology, and whereby it was not developed to meet their needs or interests. These issues are seen to be particularly important in Chapter Four on training and outreach.

SUMMARY

The above descriptions are a limited example of what I mean by "contexts" in this thesis. However, to reiterate, taking a contextual approach to altering women's dynamic with technology does not necessitate conducting a thorough analysis of the context. It refers more to a perception of this issue that acknowledges that various political/ideological, economic/structural, and socio-psychological factors (such as

those mentioned above) have shaped the way women interact with technology. Working from this perception, the APC does not assume to know what women need in order to enhance their use of technology. Instead, they consult with women to acquire a better understanding of their needs in any particular instance. How this is done will be the topic of the following chapters.

CHAPTER 3

RATIONALE OF THE APC AND THE WNSP

Since the MacBride Report on global communications was submitted in 1980, there have been repeated calls from around the globe for the democratization of communication systems. This chapter will briefly outline the thrust of these discussions, concentrating on their significance for the dominant discourse surrounding the most recent technological developments in the communications field. In essence, by calling for unhierarchical, local, or "democratic" communications systems, these discussions highlight the existence of human agency in technological development. In doing so, they expose the economically driven agenda of these developments. Specifically, those promoting the democratization of communications systems argue that the current developments in information technology are monopolized by corporations based in the northern industrialized countries. Because of this, technological development will not amount to a "revolution" -- it will reproduce existing structures of inequality in access to communication resources.

The APC and WNSP are a direct response to these calls for change in the way communications systems are being developed. Adhering to the notion that technology is the product of socio-historical choice, the APC works towards providing

communications systems for as wide a range and as diverse a representation of people as possible. Further, in recent years, global fora have paid attention to women's specific role in and access to communications. The WNSP has responded to these discussions by focusing on women's needs when developing their computer networking system. By explaining the APC within the framework of these discussions, it is shown that their entire mandate is influenced by their contextual approach to women and technology.

COMMUNICATION TECHNOLOGIES AND DEMOCRACY

The submission to UNESCO in early 1980 of the MacBride Report on a New World Communication Order has been seen as a milestone in global debates that have ensued since that time over the structure and nature of global communications.[17] A complete discussion of this report is beyond the scope of this paper.[18] What is important here is to recognize the critique that this report formally waged on the increasing corporate control over communications systems around the globe. The contention of the report was that this was a major factor contributing to the unequal global economic development.

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[17]While this report is often sited as the starting point for modern discussion of democratic communications, it should be noted that as early as 1957 a UNESCO report made reference to the global communication disparity, referred to as the "information famine". (Hamelink 1990: 102).

[18]See Singh, Kusum and Bertram Gross (1984) in their article, "The MacBride Report: The Results and Response", for a good overview of the content of this report and reactions to it.

Particularly pertinent to understanding the environment in which the APC grew, were the MacBride Report's comments on the "Democratization of Communications", and the "Technological Dilemma". In an extensive discussion of various communication technologies, the Commission members recognized the conflicting possibilities for the technologies to either break down, or to strengthen communication barriers between people in various regions of the world. They argued that communication technologies could have dangerous consequences due to "...less availability to Third World countries (131-132), greater control by foreign transnationals (160), more obstacles to popular control in exercising democratic activity (167)" (sited in Singh and Gross 1984: 449). They also recognized that there existed a crucial relationship between the ways in which these technologies developed and the process of democratization. They argued that there was a risk of the process of democratization being halted because of "technologies controlled or understood only by a few" and to "the exclusion of disadvantaged groups (164-174, 265-267)" (Ibid: 450). These observations were a major contribution to the more general understanding of the element of choice involved in the nature of the development of new communication technologies.

Similar discussions to those pointed out in the MacBride report have ensued since the time of its writing. Recently, taking as his starting point the idea of the "new world order of information and communications", Hamid Mowlana outlined the global disparity in access to information and the means of communication that continues to exist between countries of the north and south. Looking at inequalities in access to computer communications specifically, he sites the statistic that "95 percent of all computers are in the developed countries" (Mowlana 1993: 23). Contributing to the disparities in access to information and knowledge, according to Mowlana, is the tendency towards privatization and monopolization that characterizes the development of telecommunications systems. Mowlana contends that the notion of public space in telecommunications is shrinking, and that services provided will only reach an elite few:

> By directing scarce resources to modern telephone-switching computers instead of the expansion of basic urban and rural networks, a private, corporate community-building is being privileged at the expense of citizens' participation. (Ibid: 25)

Mowlana's concerns are expressed again in the "technological dependence" thesis. Geoffrey Reeves (1993) provides an overview of this theory that contends that the "technological revolution" as it is currently evolving will simply reinforce the present international division of labour and existing relations of power and inequality between the north and south.

Reeves points out that,

> The ability to produce the basic means of modern communications is concentrated in corporations throughout the advanced capitalist world...Certainly the technical criteria of the communications/ telecommunications technologies employed in "Third World" countries are largely determined by the dominant external producers and suppliers of hardware and software, even if they are adapted to local usage. (Reeves 1993: 126)

Reeves mentions several reasons for countries of the south to be concerned about their dependency on northern countries because of their clout not only in the manufacturing side of the information industry, but also because of their enhanced ability to produce, store, and retrieve information.

Discussions about the democratic usage of communication technologies have not only been held at the global level. There is also an active discussion about access to these technologies within countries. These analyses claim that social issues must be taken into consideration in any discussion of how these technologies should be developed. David Hakken explains the goals of one organisation in the United States, Computer Professionals for Social Responsibility, and its efforts to intervene in the process of development of the information infrastructure in that country:

> ...the highly politicised character of this attention (*on the information infrastructures*) has made it somewhat easier than in other circumstances to direct attention to at least some of the social choices which are necessarily part of their creation...it is the hope of CPSR to intervene in this process of social choice or social construction, so that the range of interests and opinions participating in the discourse of choice is as broad as that to be conveyed, hopefully, by the networks themselves. (1995: 3)

Hakken sites a series of policy recommendations made by the CPSR to the Information Infrastructure Task Force in the United States that identify the social issues that need to be taken into consideration. These include: the social impact of the NII[19] development; guaranteeing equitable and universal access to network services; and protecting public space on the net (Hakken 1995: 7).

Advocates of democratic communications around the globe argue for different ways for new information technologies to be developed. Hakken, who has experience in the dialogue about the information infrastructure in Norway, criticizes the CPSR view for placing its concerns within the framework of an economic discussion to which social concerns are attached. "As long as NII is seen as primarily an economic development, the call for having it equally controlled by 'democratic values' will sound weak" (Hakken: 9). Hakken argues that for the CPSR

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[19]The National Information Infrastructure, or NII, is the expression used to describe the communications infrastructure being planned for development in the United States.

to meet its stated goals, the NII would have to be cast primarily as a social issue, rather than as an economic issue in which private corporate interests are prioritized over public interests.

In Europe, the Foundation for the Progress of Humanity (FPH) and Transversales Science Culture (which both campaign so that scientific and technological progress is used for social and cultural development), recently presented a declaration concerning the development of new communication technologies to the public and the press in Brussels.[20] They call for the integration of "social and cultural dimensions" from the design stage for developing new systems.[21] In Canada, several groups have examined the commercial nature of the development of the new communications infrastructure, and the consequences that this will have for democratic access to the technologies. Two of these groups are the Public Information Highway Advisory Council (PIHAC) and the Internet Public Interest Research Group (IPIRG). They are working to raise public

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[20]This was presented February 24th, 1995, the day before the G7 summit about new technologies. Europe's 1994 action plan for the information infrastructure can be found in the following document: European Union (1994). Europe's way to the Information Society: An Action Plan Commission of the European Communities. COM(94) 347 final. *Communication from the Commission to the Council and the European Parliament and to the Economic and Social Committee and the Committee of Regions.* Brussels, 19.07.1994. Access URL: http://www.earn.net/ec/bangemann.html

[21]The declaration is called: "Multimedia: the Channels Towards Social Control", Brussels, February 24th, 1995. Access email: rg33@cornell.edu

interest in information and communication policy, and to lobby for the availability of community-oriented services on the information highway (see Stevensen and Searle 1995 and Yerxa and Moll 1995).

The push for democratized forms of communication has been reflected in declarations and official resolutions around the globe. An example includes resolutions pertaining to communications made at the United Nations Conference on Environment and Development (Rio 1992). One document to emerge from the Global Forum was the "Communication, Information, Media and Networking Treaty", which declares the right of communication as a basic human right. Communication rights were also listed in the Rio Declaration and in Chapter 40 of Agenda 21, two of the principle conference documents.

Both at the global and national level, groups are calling for a move away from the economic concerns that currently dominate discussions about the information infrastructure, to a consideration of democratic and social principles such as equality, access, and diversity. Each of the groups mentioned above share the view that social choice, as opposed to technological determinism, will play a major part in determining the nature of the information infrastructure. It is the contention of these groups that it is both possible and desirable for these technologies to be made available to a

greater range and variety of people--their fear is that presently this discussion is dominated by business/economic interests.

ELECTRONIC NETWORKING AS A DEMOCRATIZING FORCE

Computer or electronic communications was, from early stages of its inception, recognized as one new communication technology that could meet the requirements of a more democratic communication system. Carlos Alberto Afonso celebrates electronic networking as bringing the ability to communicate and participate in discussions to thousands of non-governmental organizations in a way that was unimaginable just ten years ago. He describes the developments:

> The gigantic leaps in digital technology during the 1970s and the 1980s have resulted in an accelerated democratization of telematic power, as the home computer of the late 1970s has become a powerful data processor and communicator, thus bringing main frame power of the mid-1970s to the hands of the family or university student in the Northern hemisphere, and the small organization worldwide, at the cost of home appliances.
>
> Besides an accelerated development of data carrier networks, telematic technology has also benefitted from revolutionary advances in signal processing devices and software. This has opened up the possibility of connecting two microcomputers using standard voice phone lines as well as high-speed error-correcting modems capable of data compression, to exchange data at speeds of hundreds of characters per second thousands of kilometers apart from each other... (Afonso 1990: 51)

Once these technical innovations were available, the possibilities for small local level organizations to make use

of this technology to respond to their communication needs quickly was realized. While acknowledging that the will to use this technology in a democratic, participatory way was a prerequisite, Enzo Puliatti points out that, "..low-cost technologies for communication are available today...Developed in the last forty years and applied by industry and government in many areas, these techniques can now be applied to regional and global problems with the direct participation of the countries and organizations most concerned" (Puliatti 1990: 60). Unlike many communication technologies, the simplicity of use and relatively low cost of computer networking meant that many envisioned broad and relatively unrestricted access to this form of communication from the start.

At the same time, people contemplating democratic usages of computer networking systems were well aware of the constraints to the spread in use of this technology. The initial costs of networking equipment, the access to the networks and the telecommunications infrastructure means that there are still the communications "haves" and "have nots" as far as this technology is concerned. In 1990, Puliatti pointed out that while commercial networks were available in a wide range of countries, their prices were prohibitive to many organizations working on global issues, particularly those in the "developing" world (Puliatti 1990: 61-62). A 1992 study sited by Ruth Stephen and R.R. Ronkin confirms their contention that

"...e-mail technology has followed the path of many other technologies--wealthy nations are quick to utilize it and gain benefits, while poor countries must wait" (Stepen and Ronkin 1992: 4). The study shows that three-fourths of the countries of the world (half the world's population) have what was characterized as "poor" or "nonexistent" services.[22]

THE APC AS A RESPONSE

It is against this background that the birth of the APC must be seen. From the organization's inception, it recognized that the way the communications infrastructure was being shaped would mean that many people would never be able to take advantage of these new technologies. The ideology of the communications revolution was one of the essential contextual factors that would lead to the perpetuation of the gap between the "information poor" and the "information rich". For the APC, all that was needed was the consciousness and will to develop computer networks in such a way that the largest number of people (including non-profit sectors) could take advantage of them. Indeed, a defining factor of APC projects is that technology is viewed as socially constructed.

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[22]"Poor" services refers to countries with access to one of four major connectivity services, whereas "no service" means that countries are unable to connect using the simplest equipment. "Excellent" in this study referred to countries with access to four services.

The history of the APC is based in the period between 1982 and 1987 when several independent, national, nonprofit computer networks were first being developed. Contrary to the notion of a "technological revolution" that would bring this technology to people through the logic of the market, the founders of the APC priorized the creation of a system accessible to a wide range of groups, particularly those working on social issues. Susanne Sallin describes the thinking behind the APC:

> A major impetus behind the creation of the APC is the perception that technology had traditionally prevented many groups, especially in the non-profit and non-governmental sectors, from participating in significant policy debates in the U.S. and abroad. The APC is committed to filling an information niche for these communities by providing timely, quality information that serves the public interest. (Sallin 1994: 2)

While I take issue with Sallin's characterization of *technology* as preventing various groups from communicating (thus prescribing agency to the technology), the message that the APC recognized that the way that these technologies were constructed was discriminatory is clear. The APC's commitment to serving groups that may not normally have access to these technologies is further reflected in the APC's mission:

> ...to develop and maintain the informational system that allows for geographically dispersed groups who are working for social and environmental change to coordinate activities online at a much cheaper rate than can be done by fax, telephone, or for-profit computer networks.[23]

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[23]From the "APC Networks" promotional pamphlet.

Many of the APC's users, and their constituencies, would not be adequately served by the existing commercial networks. The non-governmental organization (NGO) sector, their primary users, have widely been recognized as representing the voice and interests of marginalized sectors of society around the globe.[24] As such, the APC responds to the calls by proponents of democratized communication systems to serve a greater diversity of interests, from a wide variety of socio-economic backgrounds. One of the first APC networks to develop was the United States based Institute for Global Communications (IGC). Sallin pointed out that, "A founding principle of the IGC (and later the networks of the APC) has been to empower local, indigenous organizations by transferring expertise and capacity in computer networking" (Sallin 1994: 13). IGC offered its expertise in the area of computer communications to help set up other APC networks, including those in Brazil, Nicaragua, Russia, and Mexico.

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[24]Both Sjef Theunis (1990) and Carlos Afonso (1990), for example, suggest that a greater mutual communication and networking between NGOs would lead to a more participatory, democratic, development process. Theunis describes such NGOs as meeting the following criteria: "They do not depend on governments or donors, that is to say they decide on their own policy on the basis of their own decision-making processes. They are aware of the structural causes of poverty. They wish to change the existing social order in a democratic manner. They regard human rights as a key concept. They ask for active participation from marginalized groups. They attach great importance to cultural values in the development process" (1990: 42).

From the start, IGC focused on the application of low-cost and small-scale advanced computer technology. It developed a micro computer-based system to operate a service that could accommodate electronic mail, computer conferencing and on-line database services. Using communications software developed by the IGC and Community Data Processing (another non-profit organization), a communications system was developed that was much cheaper than comparable mini computer-based systems. Puliatti explains that:

> The APC system was designed with low-cost, standardized, mass-produced equipment. This became possible because of the tremendous increase in processing power of microprocessors and their operating system software. (1990: 62)

Puliatti points out many advantages of the system developed by IGC for users, particularly those in the south. He explains that one micro computer-based system can serve a limited region, but each system can interconnect with any other region. Previously, electronic mail users needed to connect with computer systems in the United States or Europe, which was clearly very costly for users outside of these regions. Using the locally based micro-computer, only local calls were needed, but messages could still be sent internationally. Another advantage of this system was that regional systems could be tailored individually to serve the specific interests and needs of users. Systems could accommodate different

information infrastructures, different languages, and need for different information.[25]

In 1987, IGC began collaborating with GreenNet, now the APC node in England. The IGC newsletter stated that,

> These two networks started sharing their electronic conference material and demonstrated that transnational electronic communications could serve international, as well as domestic, communities working for peace, human rights and the environment (*IGC NetNews* Vol. VII, No.5).

By late 1989 networks in Sweden (NordNet), Canada (Web), Brazil (AlterNex), Nicaragua (Nicarao) and Australia (Pegasus) were also exchanging information. In 1990, seven of these networks founded the APC to coordinate the operation and further development of this global network of networks. The APC now has eighteen member networks and at least thirty-eight partner networks[26].

The APC today is an international non-profit organization dedicated to facilitating progressive social change. The computer networks of the APC are cooperative, independent, and locally-based in their host countries. Because APC networks developed through different channels, they each reflect the unique characteristics of the social, political, economic and

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[25]See Appendix I for map of APC networks.

[26]For a definition of member networks and partner networks, see map of APC networks, Appendix I.

cultural environments in which they have grown.[27] This is a major diversion from the corporate controlled style of communications criticized by Mowlana, which may be insensitive to local differences and needs. It is also notable that over half of all APC member networks are located in the south, and the APC provides the only computer networking, or electronic mail service in some countries.

The structure of the APC network reflects its goal to provide an alternative, more democratic system of communication. Sallin (1994) provides a detailed explanation of the organization's structure. Briefly, the APC is governed by the North American Regional Office in the United States, the APC International Secretariat in Brazil and the APC Coordinating Council. The structure has remained flexible and open, encouraging stakeholder participation that has helped facilitate the development of new member networks. The directors of all of the member networks are members of the APC Coordinating Council. This guarantees that networks of any size can participate in the decision-making processes pertaining to the APC. All Council members have a vote on major decisions such as new policy, acceptance of new members, and re-structuring the fees rate.

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[27]Sallin provides a good comparative description of various APC networks (Sallin 1994).

When a network becomes a member, they must be committed to outreach, training, and user support. The Charter, to which members abide, also requires member networks to charge the lowest possible price to users without compromising their responsibilities. These policies help ensure that a wide variety of groups, including those not normally inclined towards technology, will be able to gain exposure to electronic networking.

The APC has been recognized in several fora as being the most important and influential structure serving the goals of democratic communications in the area of electronic networking. The APC now provides improved communication and cooperation opportunities between universities, NGOs, development organizations and individuals around the world[28]. The primary goal is to enhance social justice, respect for human rights, concern for the environment, and foster sustainable and participatory democracy.[29] Mowlana describes

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[28]According to Mowlana (1993) there were over twenty thousand subscribers in ninety countries at that time.

[29]It should be noted that, like any organization, the APC has run into problems in meeting these goals of providing a truly democratic communications system. Some examples of this are that the network still reaches by far more individuals in northern countries than southern countries, those able to afford access to the APC in Southern countries may be considered information "elites" in their own environments, and the prominent language of networking is still English (with some Spanish, but no non-European languages are sustained). The point of this description, however, is not to evaluate the work of the APC. It is to discuss the organizational mandate as opposing the ideology of the communications revolution, and how that has generally translated

the impact of the APC:

> By providing a low-cost, appropriate solution for NGOs, groups and individuals, under certain historical and socio-cultural conditions, they increase social, political and even economic cohesion across national boundaries. (Mowlana 1993: 24)

While the daily communication that the APC facilitates is clearly its most important contribution to democratic social change, the APC's contributions to the efforts of the United Nations system are also worth noting. Not only do a wide range of United Nations projects make use of the APC networks, but the APC has also been chosen as the information provider for several United Nations conferences since the 1992 United Nations Conference on the Environment and Development (UNCED).[30] For each of these events, APC provides tools to facilitate communication before, during, and after conferences to make sure that the progress made at the conference continues on-line after the event is over.[31]

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into the APC's addressing the issue of democratic access to networking technology in their organizational practice.

[30]Among the more major events the APC has worked at are the 1993 World Conference on Human Rights (WCHR), the 1994 U.N. International Conference on Population and Development in Cairo, Egypt; the 1995 U.N. World Summit on Social Development in Copenhagen, Denmark; and the 1995 Fourth World Conference on Women in Beijing, China.

[31]Taken from "The United Nations and the Association of Progressive Communications", information pamphlet. Access email: support@web.apc.org

WOMEN AND DEMOCRATIC COMMUNICATIONS

Like the APC in general, the WNSP was established in response to wide calls for changes in the way communication infrastructures are being developed and used. Here, however, the issue was that women's interests and needs were not being served even with a communications infrastructure that would accommodate increased local level access to communications systems. A recent UNESCO publication, *Impact of Communication Technologies on Women* (Perez-Vitoria 1994) concludes that women's access to new communication technologies is likely to be limited as it has been from similar technologies in the past. Yet, communication has long been recognized as necessary for women to influence the process of national and international development[32]. One can conclude, therefore, that if the development of new communication technologies has a gender bias which excludes women, the new technologies will have negative implications for this group.

While there is a great deal of discussion about women and the media, and women and technology, it has only been in recent years that the conjunction of these issues has been addressed directly. Gallagher provided one of the earlier and most

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[32]Heather Royes (1990) provides a good summary of this movement. She sites the First World Conference of Women Journalists in Mexico City in 1969 during which the issue of women's employment in the media and images of media were brought forward. Following this event, there were a number of United Nations conferences on women and the media during the Decade of Women (1975-1985), and several women's gatherings at communications conferences.

thorough discussions of what the latest developments in communication technologies may mean for women. She places her discussion within a critique of the current pattern of development of these technologies by western governments, which is cloaked in the language of the "communications revolution". She states,

> Development of new communication technologies is frequently justified in terms of their presumed benefits to users--increased choice, encouragement of interactive and participatory approaches, reflection of minority and community interests. The technological cornucopia thus appears to promise a new world, in which electronic democracy is assured by the availability of thirty or so television channels which, between them, will offer 'something for everyone'. The magic carpet of the communications revolution has, according to enthusiasts, the power to transport us to this world. But just where is this magic carpet leading women? Are we in fact 'going along for the ride'? Or are we simply being taken for one? (Gallagher 1987: 21)

This observation has been repeated from various perspectives. Heather Royes is worried that while women have been focusing their efforts on traditional and "lightweight" media (simple print media, slideshows, video, audiocasettes, posters and traditional folk media), they have "missed the boat" on new communication technologies. In particular, women have been completely outside of the policy making area in this realm. She says,

> But while women were concentrating on these issues, they were neglecting larger changes in the communication and media field. Communication is not the same as it was 20 years ago....Not only has high-technology communication become the province of the wealthier countries, but it has fallen almost totally under the control of men. Those formulating the major national and international media policies are all men from the circles of science, technology, broadcasting, telephony and telegraphy. (Royes 1990)

Royes' concerns have been clearly reflected through the dearth of information about women's perspectives and needs in fora where new communication technologies are being discussed. While major policy documents on the development of the information infrastructure in Western countries have vaguely mentioned issues of "access", women's specific needs have never been seriously addressed.[33] This issue has even been neglected in the vast majority of the literature (discussed above) that addresses the question of enhancing forms of democratic communications.

Women's relationship with new communication technologies has especially been noticed in recent public fora and conference resolutions pertaining to women and communications. At the international "Women Empowering Communication" conference held in Bangkok (January 1994) there were several resolutions pertaining to women's access to new communication technologies, including, "train women in networking skills and

[33]See, for example, European Union (1994); and CRTC Offices (1995).

systems", "stress the need for women to have appropriate new technology to address global changes", "campaign for democratic access to new technology", and "seek funding to promote women's access to media".[34] Soon after this event, the "Declaration of the Latin American and Caribbean Regional Meeting on Gender Communication" (Quito, April 9-10, 1994) called for women's "right of access to new communication technologies, as tools that favour more horizontal and democratic communications." Finally, access to communication technologies is a major issue of discussion among women involved in the United Nations Fourth World Conference on Women. Resolutions on the media that have been submitted for official documents coming out of this conference include the statement:

> Women demand equal access to all media, including information and communication technologies, particularly in the area of policy-making, financial decisions, production resources, and education.[35]

More and more, then, women activists are recognizing and insisting in a more direct manner their right to access these technologies.

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[34]Taken from "A Communication Action Plan for the Decade", Special Report, Women Empowering Communication Conference (Bangkok: 1994). Hosted by the World Association for Christian Communication (WACC).

[35]Published as a resolution by the Women's Environment and Development Organization. Access URL: gopher://gophr.igc.apc.org//00//gs/wedo/wedo.un/wcw/reg/1ECE: NGO Priorities on Media

THE WNSP AS A RESPONSE

The WNSP can be seen as a direct effort to counter the dominant discourse of the technological revolution, which has been found to exclude women. In 1994, the Women's Area of the Latin American Information Agency (ALAI), the group which hosts the Latin American WNSP, presented the document, "Global Communications and Access to New Technologies: A Democratic Right for Women"[36] (see Appendix II for a full copy) at a preparatory meeting for the Fourth World Conference on Women. In this document, ALAI outlines an analysis of the development of new communication technologies that explains the rationale of the WNSP. They say,

> New communication technologies...democratically employed, constitute powerful instruments that could secure the advances made by civilization, such as gender equality. Nonetheless, at a global level, transnational communications corporations, controlled by international business monopolies, exert autocratic power in cyberspace, while there is a total absence of regulatory, ethical or legal measures that establish the rights of women and citizens' groups to use this space.

[36]"Global Communications and Access to New Technologies: A Democratic Right for Women", found in the media.issues conference on the APC. Subject: Gender, Communications and New Technologies; Sender: iamcr@alai.ecx.ec

> Similarly, at national and local levels, the increasing concentration of power and the monopolistic ownership of the communications media by transnational corporations or local elites, limits the exercise of the citizens' right to free expression and their access to diversified and pluralistic information; this particularly affects women whose actions, interests and movements fail to be recognized and potentialized through communications processes.[37]

In this statement, the issues discussed in old debates about the democratization of communication are revisited. It is pointed out that communication technologies are not by their very definition democratic, but conscious choice is needed to use them in this way. Currently, this democratic potential is being blocked by the contradictory pull of concentrated power over these technologies by corporate interests with a purely economic agenda. What is added to the debate here, however, is the aspect of gender, and the fact that more women relative to men are adversely affected by these non-democratic tendencies.

The WNSP's goals are to encourage communication between women that will further their work in the realm of more equitable social change. Sally Burch, the APC Women's Outreach Program Coordinator, wrote in the WNSP bulletin:

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[37]Ibid.

> One of the most dynamic social groups developing networking, in recent years, has been the women's movement. Women's groups are highly active in organizing internationally around issues such as poverty, domestic and sexual violence, legal rights, health, education, peace, the environment, and so on. (Burch 1993)

By putting networking tools at the disposal of women's groups, the APC is supporting women's initiatives, which should contribute to the social change expressed in the mandate.

From its initiation, the WNSP focused on providing networking resources for women in southern countries, again addressing inequalities in access to new technologies. In reference to preparations being made for the Fourth World Conference on Women, the APC states,

> Our aim is to offer a global forum for women's NGOs to exchange information, coordinate actions, and discuss proposals and positions. In particular, we will put emphasis on ensuring information flow to and from less developed countries[38].

In order to do this, the WNSP is able to take advantage of the APC's network structure that provides local access points for effective and affordable means of communication.

For Burch, enabling women to use networking tools means that they will be able to participate more fully in global debates

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[38]Taken from *Women in Networks (APC Women's Program Liaison Bulletin)*, No.0, October.

that are affecting their lives. She said that the question of how women approach new technologies and integrate them into their work:

> ...is fundamental in the present context of globalization, where social, economic and political issues have increasing cross-frontier implications. Networking...has proved to be an appropriate means for citizens to take action on these issues and help to form public opinion on the importance of global action[39].

All of the work of the various WNSP branches, therefore, is done with the goal of empowering women. As Burch stated, making networks accessible to women is one way of ensuring that their voices are heard in the fora in which decisions that affect them are being made.

SUMMARY

It has been seen that both the APC and then the WNSP have essentially been working from the position of a "counter-ideology", which operates in opposition to that of the dominant notion of the "communications revolution". What this means is that rather than allowing the logic of the market to determine who will be able to use the technology, this project makes a conscious effort to ensure that new technologies are used to fulfil a democratic potential. In doing so, both the APC and WNSP have used a variety of tactics to ensure that the technology is available to groups and individuals in regions

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[39]Burch, in a letter written May 26, 1994.

that would not normally have this access. Further, they have consciously targeted groups that are promoting progressive social change in their work, essentially contributing by proxy to the process of democratization in which these groups are involved. Finally, the WNSP has recognized the more extreme process of technological marginalization that exists among women. The APC and WNSP can therefore be seen as a good example of a response to the calls that have been made to put new communication technologies to democratic use. The APC recognizes that new technologies cannot create social change. Instead, social actors must use technology in particular ways to create the desired results. In the following chapters, there is a detailed discussion concerning the actual activities used by the WNSP to ensure that women are not excluded from the advantages to be gained from this new communication technology.

CHAPTER 4

TECHNOLOGY TRAINING FOR WOMEN: ELEMENTS TO CONSIDER

The vast body of literature that documents and discusses the inequality between female and male participation in education in science and technology vary in the reasons/explanations given for lower female involvement in these fields. These analyses can be categorized into three main approaches. First, a minority group of analysts place the root of women's lower participation in the sciences in their biological make-up. Second, a majority group discusses, from various angles, socio-psychological reasons for women's alienation and displacement from technology. Third, are analysts who consider the context when addressing this issue. Each of the models of understanding gender discrepancies in science achievement will be discussed, as will be the prescriptions for change that are associated with them.

In the final section of this chapter, the APC's outreach and training projects for women will be discussed in relation to this literature. The WNSP will be seen to differ from many attempts to get women into science education because both training and the technology are altered according to user's needs, rather than making the user change according to the constraints of the technology. As such, it will be argued, the

WNSP is a model of a project that takes a contextual approach to the relationship between women and technology.

GENDER DISCREPANCIES IN SCIENCE AND TECHNOLOGY[40]

Gender differences in learning and using computers has been documented at all age and education levels, in several countries. In the United States, Pamela Kramer and Sheila Lehman (1990: 158-159) site research that shows that three times as many boys as girls are likely to use computers at home through the postsecondary years. Other studies show that only thirty percent of all employed computer specialists are women, and these women are disproportionately concentrated in lower-paid, less prestigious jobs. Alison Kelly concludes that girls' under-achievement in science is a "common phenomenon, particularly but not solely in the Western world" (1981: 13). Her statement is based on a survey of science education in nineteen countries in which boys achieved better than girls on science tests in all countries.[41] Without doing a comprehensive review, a global trend of girls' and women's lower participation and achievement in the sciences clearly is identified.

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[40]While some authors choose to treat "science" and "technology" separately (Smith Keller 1992), here the terms are often used interchangeably as the two are interrelated and parallel practices.

[41]She sites the following IEA survey: Comber, L.C., and J.P. Keeves (1973). *Science Education in Nineteen Countries*, Almqvist & Wiksell.

It is difficult to come across comprehensive statistics on female versus male use of computer communications. One study by Nancy Tamosaitis (1995) found the following percentages of male users on various Internet service providers based in the United States: Compuserve 92%, America Online 65-75%, GEnie 77%, Delphi 90% and eWorld 90%. Another study done by the Georgia Institute of Technology in April and May 1995, found that women comprise 15.5% of users of Prodigy (one of the largest commercial Internet providers in the United States) (Kapica 1995). However, preliminary data from a general survey of Internet users by O'Reilly and Associates found that women make up 34% of users[42]. While these statistics may not be completely accurate, there is a decisive trend that indicates that women use computer networks far less than men. In the following sections, suggestions to address these types of findings are discussed.

BIOLOGICAL EXPLANATIONS

Some authors have argued that the statistical findings on differentials between the genders in science achievement are innate. One example of such an argument can be found in Jeffery Gray (1981) who's thesis is that these differences can be accounted for by genetics, suggesting that males have superior spatial ability due to their genetic make-up. The contention made by Gray is that spatial ability is closely

[42]Access URL: http://www.ora.com/survey

linked to achievement in certain fields of science, computer sciences included.

Several criticisms have been waged against Gray, and similar arguments based on a notion of biological determinism. The scientific basis behind the argument in this article is itself shaky, the author himself stating that, "At the moment...the status of the X-linked hypothesis is uncertain" (Ibid: 50). Gray, however, basis his assumptions about humans on the existence of sex differences in animals. The biological determinist's assumption that inferences about human behaviour can be derived from the behaviour of rats has been criticised on several grounds. Various authors (Saraga and Griffiths 1981; Bleir 1986) have asked if a parallel drawn between the abilities of rats and humans is appropriate from the outset. Esther Sarag and Dorothy Griffiths (1981: 88) question the oversight of the influence of other factors, such as human capacity for learning and language that do not apply to other animal groups, but which influence human's social environment.

Other critiques have focused on important social factors not taken into consideration in the biological determinist's argument that affect female achievement in science. For example, some authors argue that lower female achievement in spatial ability and mathematical tests is due to social factors such as expectation and socialisation of females in

these areas (Kramer and Lehman 1990, Swarbrick 1987). Sarag and Griffiths question the very basis of the hypothesis that there is a simple and direct relationship between spatial ability and scientific thinking (1981: 86). They mention "...anxiety, expectations, motivation, girls' negative attitudes to science" to name a few of the reasons why females may underperform in the sciences (1981: 87).

There are also authors who have critiqued this position by focusing on the science side of the equation. Marianne Whatley calls for the development of a critical approach to the scientific method in general as a way of staving off biological deterministic arguments. She questions the predominant faith in experimentalism taught in schools, pointing to the need to recognize subjectivity in scientific explanations, whether they are feminist or antifeminist. One way of doing this, she says, "...is to help students develop alternative hypothesis, to see the roles social, cultural, and political factors can play in what appear at first to be biological issues" (Whatley 1986: 186). In essence, she is calling for a contextualized approach to science in the classroom.

Finally, biological determinism leaves little in the way of a solution to the issue of women's lesser involvement in science and technology. Gray asks, "What, then, should be done about

the sex differences in science achievement....? The answer is, nothing" (Gray 1981: 52). Clearly, this response is not satisfactory for females who want and need access to technological knowhow. Equally important, this defeatism is not substantiated considering that given certain circumstances, women excel in science to the same extent as men. Some of the conditions that have facilitated female's higher achievement in the sciences will be discussed below.

SOCIO-PSYCHOLOGICAL EXPLANATIONS

The majority of work done on increasing girls' and women's involvement in the fields of science and technology through education adhere to socio-psychological explanations of this phenomena. In this work, there is a tendency to neglect study of the context that leads to the development of psychological issues in women's interaction with technology, and which influences this relationship in many ways. The result is that while providing useful insights into this issue, much of this writing has the tendency to fall into one of two camps: either the "nature" of technology is taken for granted (i.e. it is seen as autonomous), or women themselves are seen to have certain characteristics by their very "nature". Van Zoonen has separated this work into two useful categories: "liberal feminist" and "ecofeminist" responses to technology (Van Zoonen 1992).

Liberal approaches

What Van Zoonen calls liberal feminist approaches to enhancing women's use of technology refers primarily to a group of initiatives (mostly in Western countries) aimed at increasing the number of women involved in science related fields of employment. These initiatives focus on educational institutions as the primary agent of change in this area. Because these structures have been disassociated from the general social environment, the prescriptions for change that come out of these initiatives have tended to have short-term results.

Some examples of these initiatives include WISE year (Women Into Science and Engineering), GIST (Girls into Science and Technology), and WIT (Women into Information Technology Campaign). Van Zoonen also mentions a campaign by the Dutch government to persuade girls in higher education to opt for "hard" science courses (Van Zoonen 1992: 13). The main goal of most of these projects was to increase the number of females participating in the science and technology realms by simply setting up programs that would encourage them to do so. WISE (1984)[43] initiatives which focused on information technology included projects for girls' school education through to education for women returning to paid work after a career

[43]See Swarbrick (1987) for more information.

break. GIST[44] was an "action research" project that explored the reasons for girls' avoidance of physical science and technical subjects, and tried to reverse this. WIT (1987)[45] was a campaign to encourage information technology employers to hire more women due to a shortage of qualified IT employees in England. It worked in conjunction with educators and trainers to interest more female students in IT. These are only a few of these types of projects that have been conducted in Western developed countries.

Creating change through these initiatives has meant, for the most part, encouraging women through information campaigns about their opportunities in the sciences, and removing barriers to women's entry in the sciences that are embedded in the education system. Some of the projects only focused on the former element, paying no attention to the latter. Ailsa Swarbrick criticized many WISE initiatives as being "...women-oriented exercises in publicity, advice and counselling, to promote existing open-access courses whose recruitment had been predominantly male. Generally the emphasis was on improving the promotion rather than redesigning the product" (Swarbrick 1987: 259). More thorough projects acknowledged women's position in the labour force and recognized their needs for non-traditional training options. These projects

[44]For more information see Whyte (1986).

[45]See Virgo, Beech, and Pearce (1991) for more information.

attempted to create science courses that would suit women's time restraints (Vigo, Beech and Pearce 1991), or would alter entry criteria so that more women would qualify (Baroness Platt 1991). Finally, other initiatives have concentrated on changing "attitudes" within the school system that would create barriers to female entry into the sciences (Whyte 1986; Lewis 1987; and Cottrell 1992).[46]

The difficulty that runs throughout these initiatives is that the narrow focus on the education system has led to a simplistic understanding of women and technology. Because the broader environment within which this relationship occurs is not discussed, the concept of technology itself is not questioned in these initiatives. Instead, women are expected to adjust their own means of working to the dominant modes of technological and scientific practice. Van Zoonen, in discussing these initiatives, points out that,

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[46]In evaluating the GIST project, Judith Whyte identifies the following barriers which create a "virtually impenetrable barrier to girls in science and technology": "a belief in biological determinism; a belief in 'cultural' determinism; denial that a problem exists; traditional views about sex roles; apprehension that boys will suffer from positive discrimination for girls" (Whyte 1986: 229).

> A liberal feminist analysis of gender and technology such as the above runs into a number of theoretical and strategic problems that are connected to its conceptions of technology, gender and culture. To begin with, technology itself is never questioned. Women are considered the problem because of their reticence, reluctance or outright refusal to become involved in technology. Consequently, women are supposed to change and adjust themselves to technological practices and values. (Van Zoonen 1992:14)

According to Van Zoonen, these projects have attempted to treat all individuals as equal vis-a-vis technology. There is little conception of broader socially-constructed historical realities that have led to differences between the genders. Moreover, the governments that have been establishing these projects have often simultaneously promoted policies consistent with the ideology of the "technological revolution", and do not, therefore, acknowledge the need to consider different conceptions of technology for women. Because the nature of science and technology as it is presently taught is not questioned, these programs have been limited in their success.

Eco-feminist approaches

A major accomplishment of eco-feminism is that (unlike liberal feminism) the notion of science itself is questioned. According to Van Zoonen, eco-feminists say that the rupture between women and technology is caused by women's inherent connection with nature-- a connection that leads women to

interact with science and technology differently from men. She says, "Fundamental to ecofeminism is the idea that women are closer to nature than men, and that technology in its present form is a result of men's desire to dominate and exploit nature" (Van Zoonen 1992: 15). The assumption is that women's capacity to give birth causes them to strive for a more cooperative relationship with nature than men. Women then use technology and science in ways that are appropriate given this view. "Care, emotionality, intuition and co-operation--features usually ascribed to women--are said to be at odds with the premises of technology" (Ibid: 16).

Using a socio-psychological framework, several authors have developed similar conclusions to the eco-feminists in terms of how women relate to technology, and, therefore, how science and technology should be taught to women. A great deal of work that argues for alternate learning and teaching strategies in science is based on Carol Gilligan's book, *In a Different Voice* (Gilligan 1982). Based on research into women's reasoning, Gilligan argues that women tend to view the world in terms of connectedness and relationship. She says that men work better in situations of autonomy whereas women are threatened by isolation. Further, men are said to be more comfortable with environments of violence and competition than

are women.[47]

This concept of separate versus connected knowing has been used by authors writing about computer education for women who have called for teaching methods more in tune with "women's ways of knowing". One author says:

> The research would suggest that women approach a computer wanting to express a richness of texture and acceptance of diversity. Women acknowledge the variety of life's experience and want to use the computer to help create and maintain the space necessary for the link between the individual and the community. (Eastman 1991: 44-45)

The assumption made is that incorporating these more "feminine" values into science education for women, would lead to an improvement in women's achievement in these fields. However, research on how to go about this is weak, and prescriptions for change can be based on biased speculation.[48] Gilligan's finding have been said to have "intuitive fit" (Lewis 1987: 274), but there is little rigorous work on how these findings can be implemented in science education for

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[47]Her conclusions come from what she describes as male's essential separation from the mother for the development of masculinity (which females do not experience)(Gilligan 1982: 8).

[48]For example, several authors have called for the creation of a more cooperative environment in the classroom by changing seating arrangements into circles rather than rows (Canada and Brusca 1991: 47; Carmichael 1991: 69). Considering that women have always learned in rows up until this time, these assumptions about women's craving for community, and how to accomplish this, may create as biased and as "uncomfortable" a means of presenting science than methods previously used.

women, leading to some dangerous assumptions about female versus male ways of working and knowing.

Other work on information technology suggests that the culture of computing is itself, for similar sociological reasons to those described above, alienating to women. The computer environment is dominated by what authors have described as the "hacker culture" (Turkle 1984, Sproull, Kiesler and Zubrow 1984, Rasmussen and Hapnes 1991). This is an almost completely male culture where the user is immersed in computer technology, hiding in the security of the rational operations of the machine. According to Turkle, it is a culture of "mastery, individualism, nonsensuality. It values complexity and risk in relationships with things, and seeks simplicity and safety in relationships with people. It delights in ambiguities in the technological domain..."(Turkle 1984: 223).

The depersonalized and dehumanized mode of working associated with hacker culture is seen to be particularly alienating for women. In two articles, Turkle (1988, 1990) argues that girls' and women's means of learning and working are at odds with dominant modes of computer use and education. Basing her argument in part on Gilligan's notions of psychological sex differences, she argues that girls have "computational reticence" because they are not risk takers, they do not want to have a personal relationship with the computer, and they do

not like working with "formal" systems. This leads Turkle to argue that there is a need for increased openness to different ways of working in the computer sciences, or for an "epistemological pluralism" in the sciences.

Given the different treatment of males and females vis-a-vis technology throughout history, there is certainly reason to believe that the way in which women and men will interact with technology would be different. These arguments draw out the contextual issue that technological design and operation has been male dominated, making it clear that what is presently defined as technology may be at odds with women's work patterns. It is a strong argument for altering the way science and technology is perceived and taught through educational initiatives.

The difficulties in these studies come, as was explained in the introduction, when attempts are made to define precisely what is meant by a female science or teaching science according to "women's way of knowing". Taken to an extreme, these theories resemble biological determinism in that they attribute essential features to social phenomena. Women's way of knowing is normally associated with more "feminine" traits such as being social, co-operative, and emotional. Turkle contends that girls' means of programming emphasizes negotiation as opposed to male's command over the computer

(Turkle 1988). Others have argued adamantly, but without concrete evidence, that women's way of learning is more "holistic", while men's is more "rule-based" (Brecher 1989).

As Van Zoonen points out, these generalizations and assumptions are problematic insofar as they propound a static notion of culture and a universalist notion of gender. She says, "Such a conviction is easily countered by pointing at the multitude of feminists *(and other women)* that are not easily reconciled with the 'true' one of ecofeminism and that vary according to ethnicity, history, class, sexuality, and so on" (Van Zoonen 1992: 18). In the example of the APC training project, one finds that rigid assumptions about the nature of women do not fit the variety of experiences encountered by the target groups. It is necessary to analyze more thoroughly what any group of women's experiences are in any particular situation.

In summary, socio-psychological analysis such as Gilligan's and Turkle's are interesting in so far as they make us think about the need to be more open to various interpretations of science and technological practice due to different socialization of the genders. These theories are problematic, however, in that they generalize the experiences and resulting psychological differences of the women under their study to all women, stopping short of providing an analysis of the

process of socialization *itself*. While acknowledging the importance of work based on the assumption of different socialization between the genders, Saraga and Griffiths say, "...much of this work is purely descriptive, and does not examine the basis of particular patterns of development. Socialization can therefore appear to be arbitrary, and open to change through little more than a campaign to change attitudes" (Saraga and Griffiths 1981: 89). Without more analysis of the basis of socialization, we are left ill-equipped to understand how these theories may be applied to the practical teaching of science for females in a variety of different social contexts. We need to know more about how to identify, or analyze women's experiences as they pertain to learning about science and technology. This is what the following approach proposes to do.

CONTEXTUALIZED APPROACH TO TECHNOLOGY TRAINING FOR WOMEN

An acknowledgement of the importance of contexts allows for the recognition of difference in women's involvement in the technological realm. Neither characteristics of technology nor of women are essentialized. Linn calls for such an approach to this issue when she says that she is concerned that, "...feminists are sometimes too presumptuous about the uniformity of women's experience and the politics that results from such presumptions. The *specificity* (sic) of the needs of

women...must be acknowledged and integrated into our politics" (Linn 1987: 6).

Linn elsewhere describes the difficulty and necessity of improving our understanding and definition of "women" in feminist studies. She says,

> All women occupy and suffer various inferior status positions. But the specificities and relativities of these inferiorities are so diverse that the commonality of "women" keeps slipping away, with only a resort to biology as a defining difference. The categories of male and female are constantly changing, from context to context, and through time. We can have no fixed taken-for-granted assumptions about these constructs..." (Ibid:133).

In the case of the global APC project, the impetus to recognize difference in women's experience is particularly clear due to the vast diversity of the women being trained. While there is no simple way of analyzing the experiences of any particular grouping, a starting point is accepting the theorem that gender, and gender relations, are historically and socially constructed. Van Zoonen says, "An acknowledgement of the historical specificity of current dominant beliefs about women and men opens up new ways of thinking about gender as constructed" (1992: 19). She points out that even the notion of men as "political and rational" and women as "personal, emotional, and inclined to nature" has been traced as having historical specificity. Historical and social

analyses are tools to explore the myriad of alternate characteristics in women's relationship with technology.

Therefore, unlike determinism which posits a single cause, this approach is multicausal. It says that the political/ideological, socio-psychological, and economic/structural contexts that shape a particular gender construction need to be acknowledged when addressing the issue of women and technology.[49] Understanding how this translates into practice is slightly more complex. One example of operationalizing this theory is given by Swarbrick. She describes how inferences from an analysis of women's position in the labour force, and women's education in the technological realm (i.e. the context that shapes women's use of information technology, or "IT",) were used to construct appropriate IT training courses for women. Elements of the courses, including group work, an early supportive learning environment, and group solidarity, were included as a direct response to these issues.

[49]What this is doing is essentially explaining further what was meant by "socialisation" by the socio-psychologists, and by doing so, accounting for differences in the socialisation of women that may occur. Saraga and Griffiths say, "Male domination and socialisation are not arbitrary...they relate to women's position in society...and they should be examined and explained by reference to the underlying economic, social and political forces which structure them" (Saraga and Griffiths 1981: 89).

The second part of this equation is examining how technology has been constructed in any particular setting. As was argued in the introductory chapter, a contextualized analysis of technology defines it as the product of specific social and historical circumstances. If existing forms of technology are not seen to be the only ones possible, this definition allows space for technology to be altered so that they are more appropriate for women's use and training. Linn states, "Understanding the broad range of social practices that contribute to 'the technological' would enable women trainers to recognize the subversive worth of their work and to challenge, further, technicist definitions of technology"(Linn 1987: 139). This idea is what Swarbrick means by, "redesigning the product" (Swarbrick 1987: 259) when training women in technology, as opposed to simply improving the promotion of courses to women. This may be done through a variety of means, such as using less male oriented teaching materials[50], allowing for different "intellectual styles" to flourish when teaching (Turkle 1988), or actually altering the technology so that it is more interesting and useful to the women using it (e.g., with computer software).

A contextualized approach to technology training for women will therefore utilize a combination of tactics to make the

[50]See Sue Rosser (1990) for a discussion of sexism in textbooks and developing female-friendly teaching materials for women's science education.

learning process more suitable for women. The specific methods used will change according to the particular context. Here, no assumptions are made about the nature of women or technology. Rather, they are both analyzed in terms of the social environment in which they are located. As such, these initiatives attempt to, "*reconstitute* relations of technological practice" (Linn 1987: 138). In this way, technology and training can be altered to meet women's specific needs.

THE APC WNSP TRAINING AND OUTREACH PROJECTS

The training and outreach project of the WNSP is, in many ways, a good example of what a contextualized approach to women's technological education might look like. Rather than make assumptions about what women need in training, they have developed several ways of finding out what particular groups of women need out of their training. They also question the notions of technology normally adhered to, and present it in ways found to be more appropriate for the women.

The instigators of this project will immediately acknowledge that they themselves are in the process of learning how best to train women from various parts of the world in computer communications. Burch describes the WNSP as a pilot project. She says that they are trying to understand "...how to incorporate a gender perspective in training and methodology

in the field of new technologies" (Burch 1995). For the WNSP, developing a "gender" approach to training is primarily done by trying to identify women's needs in computer networking, and by exchanging information on this topic between the different branches of the project. Burch described the process:

> I think this is a process of exploration and discovering what's most effective and exploring with women what their needs are and how they feel about traditional training courses.[51]

A wide variety of tactics have been used in order to discover what women's needs are in this area. The first step has been to encourage a high level of openness and effort to understand how this may best be accomplished. This openness is reflected in the literature of the WNSP. In more than one pamphlet, the WNSP states.

> In order to effectively involve women from diverse backgrounds, APC prioritizes training in computer networking skills as a fundamental component of the program...This will...contribute to broadening the cultural, social and geographic scope of women using the APC networks....(APC WNSP: information pamphlet)

This quote illustrates that from the outset, the APC is eager to recognize diversity. This is already a step away from approaches to technology training for women that assume beforehand the needs of the women.

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[51]Burch, interviewed by author, Tape recording, Austin, Texas, February 1995.

While the APC has not thoroughly analyzed the backgrounds of the women they work with, they have developed means of acquiring an awareness of needs of women from different backgrounds, or "contexts". One method is by simply consulting with the trainees about their needs, interests, and concerns about computer communications. A clear example of this was the Asian Women's Meeting on Electronic Networking.[52] This was a meeting organized by the WNSP which brought together thirty-five women from various Asian countries in order to discuss what electronic networking could mean to their work. The meeting is described in the following excerpt by Karen Banks, the WNSP training coordinator:

> The agenda was collectively and continually revised to respond to the diverse needs of the women participating. Morning sessions were allocated to a sharing of women's stories, women's histories, their experiences of new technologies, specifically communication technologies, their expectations, concerns and visions for Beijing and beyond.
>
> Workshop expectations of participants were as diverse and varied as the women themselves and just a few are mentioned here; "using these technologies to cut across barriers"; "initiate South-North and South-South linkages"; "disseminate resources online"; "explore the impact of technologies on women and their work"; "increasing training skills to allow outreach to other women's groups"; "develop step-by-step fact sheets"; "make informed choices about choice of service providers". (Banks 1995)

[52]Organized by the WNSP in Delhi, January 22-27, 1995.

Another example of such a project is Web's (the Canadian APC node) small group discussions held during training workshops. Questions such as, "How do you envision using electronic communications in your work and/or personal life?", "What do you see as the barriers to women networking electronically", and "What opportunities are presented for women using computer communications, individually and as activists?" are asked.[53] Consultation of this nature has enabled the APC to gain access to valuable information about the women, and how they want to use electronic networking tools. With this information, the WNSP has been able to develop training projects adjusted to meet these stated goals and concerns.

Another method of ensuring that the trainers are "in touch" with the trainees, is by using local trainers who are well informed of their clients' needs. An important part of the Institute for Global Communications (IGC)[54] WNSP training and outreach project has been to establish a network of local training coordinators in various regions. The goal of the program has been to match trainers with local people who need training. The proximity of the trainers to trainees means that trainers will be more aware of local realities.

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[53]Nirv-Web. *Small group discussion questions,* Training Workshop Sheet.

[54]IGC is the United States APC node.

The need for proximity of trainers to trainees can be illustrated through the Latin American program. Here, barriers that women come up against when learning computer networking are extremely different from barriers and needs in most northern countries. For example, Burch points out that all-women training sessions, a common request in the north, are rarely requested in Latin America[55]. Alternatively, language is a major concern. She says,

> In Latin America I haven't personally come across a lot of women that have requested an all women learning environment. What has come up spontaneously is a lot of concern about training materials in English, or materials that are badly translated into Spanish...The translations aren't always that good and the jargon is harder to grasp. There's a whole jargon around computing in English which uses all kinds of expressions, like "yank" which by the time you translate it into Spanish it's quite incomprehensible and unimaginable what it might mean.[56]

To understand the economic realities of countries where communications infrastructure is poor is also crucial to developing realistic ways for people in these regions to use computer communications. One can only imagine the gaps that would exist if one entered these types of training

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[55]Burch's implication is that while this is a common request among North American women's groups, it is not common practice in Latin America.

[56]Burch, interviewed by author, Tape recording, Austin, Texas, February 1995.

environments with a preconceived notion of what women needed in computer training.[57]

It is clear that the general outlook and structure of WNSP training programs is consistent with the goal of gaining an understanding of women's networking needs in various contexts. But this outlook must also be operationalized at the level of individual training sessions. Gisell Mills, IGC's local trainer based in Washington, explains how she acquires an enhanced understanding of her trainees' precise needs before a training:

> Going into an organization I have already talked with this organization, read their literature, identified what their main areas of interest are, look at what they could do starting with e-mail all the way to building a gopher...so that when I come in there I can talk intelligently with them about what are some of the ways they can use this.[58]

It should be noted that these procedures are not followed by all of the APC branches. At Web, the Canadian APC node, apart from the occasional individualized training, resources only exist for networking demonstrations at conferences on women's

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[57]When e-mail was first being introduced into southern countries, trainers would often fly in from the north, set up local partners with their technology, and fly home. Since then, more appropriate software has been developed for southern countries (eg. compacting programs or off-line editors which take up less time on poor and expensive telephone lines in many southern countries), and projects like the APC have ensured the development of a greater degree of local expertise in this area.

[58]Mills, interviewed by author, Tape recording, Austin, Texas. February 1995.

issues. Follow-up is almost non-existent, leaving the new Canadian women users dependent on the general Web support services.[59] However, Web is currently seeking the financial means to improve this aspect of their WNSP.

During this process of development of a training methodology for women, almost all the APC trainers have observed certain elements common to the majority of the women trainees. These were outlined in a WNSP pamphlet:

> Certain words continue to emerge when women share their experiences in this field; **access, mystification and alienation.**
>
> The Canadian Women's Networking Program has found that:
>
> > The largest barrier we've encountered in implementing the project are misconceptions about electronic communications. A need exists for us to confront these upfront in our programming. Common misconceptions include: "it's too expensive;", "it's hard to use;" "why would I want more information;" "it's male technology;" "it's impersonal and will alienate me from others."
>
> Similarly, Sue Mooney of the USA Women's Net at IGC has met with:
>
> > lack of good training materials; continued confusion over electronic tools coupled with technophobia, the money and distance barrier with smaller groups who often need it the most... (Banks 1995)

[59]This consists of a telephone or e-mailing service.

Several of these observations were repeated and discussed in all of the interviews conducted with APC trainers and project coordinators. Women's technophobia and lack of familiarity with computers was mentioned as a barrier by all of the trainers. The most extreme cases are described by Ana Sisnett, an IGC trainer, who explained that many of her clients do not currently use computers for their work, and have no computer skills. All of the interviewees mentioned the poor economic conditions of women's organizations and the individual women they worked with (this, in general, being a greater issue in Latin America than in North America). Susan Mooney noted that the women's groups the IGC works with tend to have less staff and resources, and less equipment available to them than many of IGC's users. Finally, the interviewees mentioned how it is crucial to make sure that computer communications were presented in a way that would be relevant to women's needs. They argued that women do not use technology as "toys" but more as "tools". Mooney said, "Women learn how to do what they need to do on computers, they don't play around...they're too afraid of screwing things up".

Technophobia and fear of the computer may be seen to result from women's historical alienation from technology, and their lack of exposure to technology through the education system. Women's lack of access to computers is a result of their overall poor economic conditions. Women's general desire to

use computers as tools rather than toys relates to Turkle's findings on the different ways women work with technology due to socio-psychological reasons. While a further analysis of these phenomena and their roots may be interesting, for the purposes of this project, acquiring awareness of and acknowledging these issues is a major step towards being responsive to women's needs through training.

Informed by this understanding of women's diverse needs vis-a-vis communication technology, the next question is how does the APC address these issues in their training. The trainers interviewed discussed a variety of strategies used to make sure the trainees were comfortable, taking into consideration some women's reluctance to interact with the technology. Mooney mentions someone who is patient and encouraging and who explains things clearly as important characteristics of trainers. Several trainers talked about developing a supportive environment, or a "buddy system" where the trainer is not identified as a "technologically elite person". Further, most interviewees felt it was important that the trainer be a woman so as to serve as a role model. All trainers stressed the need to constantly relate the technology back to the women's interests. Sisnett discusses focusing on concepts to explain the technology rather than describing technical details. Mills discusses using APC research tools to look up areas of interest to her clients during trainings.

Different skills of trainers are clearly needed in different areas. In Latin America, an ability to simplify confusing and poor translations is clearly important. The main point is that once these symptoms have been realized, they can be addressed. The variety and nature of problems may not have been recognized at all had a general causal model been applied.

As was explained earlier, altering the approach to technology itself is also important in women's training programs. The APC questions the nature of technology and actually alters the computer network technically to make it more interesting to women. (This is examined thoroughly in the next chapter.) Generally, this includes making the technology more useful to women by working on the interface, the organization of the information, and increasing the content which may be useful to women's organizations.

The way the technology is presented in the WNSP training projects is also different from the outset due to teaching materials that are being developed for women. The Canadian WNSP has just come out with the first training manual specifically for women, called *Web for Women*. While explaining basic tenants of computer networking, *Web for Women* includes explanations of why women's groups may want to use Web, barriers for women to using computer communications, lists of resources that may be of interest to women's groups, warnings

for women about language and protocols found on the internet that women may find offensive, and full explanations of how to use Web. What this is doing, basically, is changing the image of the technology. The object may be the same, but its social construction, or the way it is used, has been altered so that it is more pertinent to women's specific needs and interests.

SUMMARY

Without making broad generalizations or assumptions about "women and technology", it is possible to develop training programs that will facilitate women's interaction with new technologies. Furthermore, biological differences between the genders become irrelevant in explaining women's lesser use of certain technologies when one takes into consideration social phenomena that contribute to this difference. As was seen in the WNSP, when the social context is taken into consideration and the technology is made accessible to women, these differences disappear. The WNSP has been able to develop training programs in technology that are more suited to women's needs, and have consequently brought several more women's groups on-line.

CHAPTER 5

WOMEN, THE SOCIAL CONSTRUCTION OF COMPUTERS AND COMPUTER COMMUNICATIONS

In the first chapter, technology was defined as being a function of a particular social environment. Feminist analyses of technology have suggested that most technological development has been male dominated. The result is that women have become alienated from dominant modes of technological practice. The implication of this is that if women's influence, opinions, and needs were taken into consideration in technological design, the product might look quite different.

This chapter will examine more closely this second side of the issue of women and technology, focusing on the social construction of computers. First, the practice whereby computer design is conducted separately from the contexts of users is discussed. This activity often leads to poor software and interface design, which is not user-friendly. This is especially a problem for women, who have traditionally been even more excluded from processes of technological development than men. How this problem is manifested in computer communications will be discussed in section two.

The third section looks at a few examples of computer programmer's suggestions to redress these problems. These recommendations would be beneficial to all computer users, but are especially beneficial for women. This section provides a clear and practical example of what is meant by the argument that technology is socially constructed and can take many different forms. In the final section the link between these ideas to actual computer applications is illustrated. The technical changes that the APC has implemented to make the computer network more accessible to women provides a clear example.

TECHNOLOGICAL DEVELOPMENT VERSUS HUMAN EXPERIENCE

The problem of "user-friendliness" is one of the most serious dilemmas facing the computer industry, including computer network servers. This concept has to do with two related issues: i) simplicity, and, ii) relevancy to a user's needs. Despite extensive and increasing research on how to create good software design and user-interfaces, this field is still severely underdeveloped. As will be explained below, this creates an especially strong barrier to women's use of computers.

Several authors have argued that difficulty in the use of computers has resulted largely from the separation between the computer industry and users' environments. Brenda Laurel, for

example, says that most attempts at developing human-computer interfaces have involved either "micro-level" approaches such as individual user-testing situations, or "macro-level" approaches where systems are developed according to *perceived* task domains (i.e., developing systems according to tasks which need to be accomplished). She contends that both of these approaches have missed the subtlety of how humans react with computers within particular environments. Kari Thoresen (1988) makes a similar argument to Laurel. She says that most computer systems are impractical to use because of their adherence to th "machine" approach to systems design, where designers priorize "technically elegant" solutions, inherent to the computer itself, but not necessarily in touch with users' needs.

This problem of the separation between computer systems developers and users is particularly pertinent for women. As was mentioned earlier, women's working domains have generally not been taken into consideration in technological development (Cockburn 1985: 170). Lowe Benston has pointed out that, "Those who commission new technology are most often businessmen, the military, or government. It is their goals and needs that are embodied in the technologies that are developed" (Lowe Benston 1989: 206). In other words, certain domains that have normally excluded women, have determined the form of the technologies.

Charles Huff and Joel Cooper (1987) convincingly demonstrate that when software is developed, it is usually done for males users. They developed an experiment to find whether or not the expectations that software designers had about users would influence the style of the software they designed. They examined forty-three software designers (thirty-four of whom were female). These people were divided into three groups and then were given the task to developing a simple educational program, one for boys, one for girls, and one for students (with no gender distinction). When the results came in, they found that the packages for boys were mainly like games, and the ones for girls were more like learning tools. Most importantly, the package for students were mainly like games (for boys). In other words, whether the programmers themselves were male or female, they prioritized an assumed male-style of comfort with computers over a female style. This finding supports the contention that female values have generally been ignored in computer development.

In a discussion of women's knowledge of childbirth and office work Lucy Suchman and Brigette Jordan (1988) illustrate how women's methods of working have been undermined and ignored with the introduction of technology. In their study they found that women were rarely consulted when new technologies were introduced. In reference to computer development, Suchman and Jordan argue that the separation between software design and

use means that women's knowledge and experience is often not acknowledged. Ideological commitments, or what they call "authoritative knowledge", defined as "...that knowledge taken to be legitimate, consequential, official, worthy of discussion and useful for justifying actions by people engaged in accomplishing a given task" (Suchman and Jordan 1988: 153) will be applied in the development of computer software, even though women's experiences may contradict this knowledge.

The result of the separation between software and interface design and users is that computer programs are often non-intuitive, necessitating a relatively high level of technological knowledge and interest for use. For women, this problem is serious. Often women are less educated generally or are not educated in the sciences due to socio-historical circumstances, which leads to their reluctance to engage in the technological realm.[60] Here, we find that the other side

[60]Women (more than men) have been found to experience a paralysis when confronted with technology. Laurie Smith Keller explains that many people, and women in particular, have the sense that science and technological terms are both "beyond their immediate understanding" and even "beyond their ability to 'find out'" (Smith Keller 1992: 12). This contention is also supported by a recent study of 13 000 users of World Wide Web by the Georgia Institute of Technology in (April 1995) which concluded that Web is altering the demographics of Internet users. The simple programming language used by the Web is making computer communications easier to learn. (A world wide web site or WWW is a way of looking at the internet that employs graphics and links which allow you to point and click to get information.) The increase of female users on Prodigy (the commercial Internet provider studied) from 9.5% to 15.5% over a six month period was attributed "...almost entirely to the development of the Web--because today, fully 20% of all those who browse the Web are women" (Kapica 1995).

of the problem is that technology has not been developed to meet their needs and interests, increasing the lack of inclination many women have felt towards engaging with various computer applications. The following section will provide an example of how these problems are manifested in one computer application: that of computer communications.

COMPUTER DEVELOPMENT AND USERS' NEEDS: THE CASE OF COMPUTER COMMUNICATIONS

As was stated earlier, user-friendliness refers to the simplicity and relevance of a computer system. If the average software program in public use may be described as slightly intimidating for people unaccustomed to using technology, then on-line systems are terrifying. Most computer communications systems require a relatively high level of technical ability for the initial set-up of the system, and for interaction with the interface. Further, the learning curve for the wide and ever-increasing array of tools available through the internet requires an open-mindedness about technical matters. In a discussion of gender and on-line communications, Hoai-An Truong points out that, "The technical expertise required to establish access to on-line systems, and the interfaces users encounter when they get there can be significant deterrents to on-line participation for non-technical users" (Truong 1993: 4). Ellen Balka, too, in a study of three attempts to create feminist environments on-line, finds that expectations for

users' technological capacity and their ability to manage their on-line communication tends to be out of line with the reality for the majority of female users. She says,

> ...a tacit assumption is made that a potential computer network user will be able to manage the negotiation and purchase of a computer system to meet their networking needs, and further be able to set the equipment up and have it function in a home environment. Experiences with each of these networks,...suggest that such an assumption is inappropriate for women users. (Balka 1995: 24)

In all of the discussions held with women working on the WNSP, the amount of technological knowledge needed for computer communications was sited as a deterrent for the APC's female users. Barbara Ann O'Leary[61], for example, explained that the steepness of the initial learning curve is enough to keep many people from logging on.

Aside from the difficulty of use of these systems, Balka contends that the design of computer communications systems inhibits access for women on a variety of levels. She says that factors incorporated into the software may deter women from engaging in on-line discussions. For example, she argues that due to cases of harassment, many women may not want to identify themselves in open on-line discussions (Balka 1995). However, many systems necessitate the provision of one's name,

[61]O'Leary is the moderator and developer of the WWW homepage for IGC's WNSP. She has also conducted training within the context of the WNSP. Interviews were conducted in February 1995.

and therefore one's gender, to communicate. There are also other choices about the interface one uses for computer communications. For example, many communications software packages use such words as "abort" or "kill" for commands that some people may find offensive.

In the case of computer communications, the types of people using the system contribute to the nature of the technology, and the way it may be used. The type of on-line discussion that occurs is another factor some women have found alienating. In calling for the necessity to "create a cyberspace of our own" Maureen Ebben and Cheris Kramarae (1993) contend that women's access to electronic fora has been limited due to the relative dearth of content of interest to women on the networks. This is closely related to the fact that up until 1992, 95% of computer network users were male.[62] This situation has improved and will continue to improve as more women use computer communications to discuss issues of interest to women. However, one can see that if the majority of communicators on-line are male engineering students (as was

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[62]The study may be found in: Sproull, Lee (1992). Women and the Networked Organization. Presentation to Women, Information Technology, and Scholarship Colloquium, February 12, 1992. Center for Advanced Study, University of Illinois. Also see Tamosaitis (1995). In her article, "Why Don't Women Log On?", she discusses the fact that most of the information on the computer networks has little to do with women. Of the hundreds of Compuserve forums, only nine are found with the keyword "women".

previously the case), this may deter women from engaging in computer communications.

A final important element in computer communications systems design is determining the shape or style of the communication networks. There are several methods of transferring information already in existence, from broadcast systems which are centralized, to more democratic, inclusive forms of discussion such as electronic mail, bulletin boards, listservs, or computer conferences where people participate equally in the provision of information. The point here is not to try to determine what type of communication women or women's groups would prefer. It is simply to point out that choices in styles of communication via computers are made all the time. If these decisions are being made without consideration of women's needs, then it is less likely that the style of communication will meet their interests.

The separation between the technical process governing computer design and user environments inhibits women's use of computer communications technology. The lack of consideration of users' needs has meant that women are alienated because they may not possess the skills needed to use this technology, and the conditions are not created for them to acquire these skills. Additionally, the material presented may be of no interest to women. In the next section, solutions to this

dilemma are described. This discussion supports the claim that viewing technology as socially constructed will engage women.

TECHNOLOGICAL DEVELOPMENT FOR HUMAN EXPERIENCE

Once we understand that women have needs different from men in computer systems design, the question remains as to how to meet those needs. The issues around software and interface development are not simple given the constraints of developing good and sustainable computer programs. However, computer programmers themselves have suggested several creative responses to meeting the needs of women.

In the creation of computer systems appropriate to a user's experiences and needs, the programmer must accept the user's knowledge, or ways of working as legitimate. In describing a strategy for system development that would be more useful to women, Suchman and Jordan say,

> One implication of our analysis is a radical change in the way that we view the knowledge and skills that go into system design; namely, that we view those of the prospective users of the technology as central, and that we incorporate into the design process as sophisticated an understanding of the social world as of the technology involved. (Suchman and Jordan 1988: 157)

The goal of this approach is to adopt technology to users' environments. It is only by a detailed study of users' needs that women's work patterns will be legitimized in the process of computer systems design.

Once it is acknowledged that user's knowledge (or "ways" of knowing or working) must be incorporated into software and interface design, the methods of incorporation suggested will vary. Most authors call for a process of interaction and consultation with users that will inform the shape of the final computer system. Suchman and Jordan describe a process whereby "The interaction between program and environment...must continuously change as designers and users change their relation to the technology and as the software is modified to meet new situations and changing work processes" (Suchman and Jordan 1988: 158). Nathaniel Borenstein outlines a process whereby software engineers are engaged on an ongoing basis with users during four major phases of software design: the definition phase (including a needs assessment), the prototyping phase, the production phase, and a continual maintenance phase that is based on strong communication with users (Borenstein 1991: 166-175). Finally, a particularly interesting and thorough approach to matching computer systems with needs is offered by John Hughes, David Randall and Dan Shapiro (1992) who link ethnographic studies of work with the design of computer systems. The focus is on the social organization of work, and the use of instruments within specific environments.

Lowe Benston provides a useful means of categorizing various levels of interaction or involvement of users in computer

systems design. She argues that science and technology can be developed: "for the people", "with the people", or "by the people" (Lowe Benston 1989: 211). The first is a top down process where scientists and technical people develop computer systems for users according to what they believe are the needs. This describes most computer network services today. Most newcomers to the internet, for example, sign up to commercial, university, or community services with little initial knowledge or understanding of what their communications alternatives may be. According to Lowe Benston, "Such an approach does nothing to remove the barriers to women's participation that present-day science presents" (211). As there is little consultation or analysis, the technicians remain separate from the populations they may be serving.

Science "with the people" describes the types of scenarios proposed by Suchman and Jordan and Borenstein. It involves interaction between technical people and non-technical users. Gradually, users decisions at least have an influence on the technical processes and decisions being made. Lowe Benston says,

> Personal values and ethical concerns can find a place in the technical process through a discussion of goals and values and a search for a technology appropriate to these. As the non-technical people become more generally knowledgeable, the values and assumptions underlying apparently purely "technical" decisions would become more apparent to everyone. The result of the whole process would most likely lead to quite different choices than those made under the present system.(212)

There are, of course countless degrees to which the consultation process may occur. This will be limited by the knowledge of the users themselves, in terms of their ability to make suggestions about what may be useful to them. Borenstein also points out that listening to users all of the time may lead to development of systems that are unsustainable, leading him to urge programmers to "listen to your users, but ignore what they say" (Borenstein 1991: 105-109). Taken to the ultimate extent of user knowledge, one would have the third system of science development discussed by Lowe Benston: science "by the people". Here, there is no separation between users and scientific experts. However, Lowe Benston points out that this, at present, does not exist. It is questionable whether this system would even be desirable as a goal due to the time investment it would require for everybody to have access to "expert" scientific knowledge.

Lowe Benston's delineation of methods of computer system development is interesting to keep in mind when discussing the WNSP. In the final section, it will be shown how the APC has

confronted women's use of communications technology through this program in terms of technical computer-related issues.[63] Through a process of consultation with the women users, a number of efforts have been made to make the computer system more consistent with their needs (even if this has been at the expense of "technically elegant" solutions). In many ways the WNSP has made the APC network a "science with the people" project.

THE WNSP: COMPUTER DEVELOPMENT FROM A GENDER PERSPECTIVE

To ensure that a system of computer communications meets the needs of women involves paying attention to a variety of issues: the structure of the network and communications options available; the organization of the material; and the content. Before looking more closely at each of these elements, the general approach to increasing female membership taken by the APC women's outreach project should be discussed.

The APC has, until now, been what Lowe Benston called a technology "for the people" project in terms of its treatment of women. That is, women's groups were not consulted to determine their needs via the APC. Since implementation of the

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[63]As the APC nodes differ greatly around the world, as does the WNSP, examples given are not meant to be representative of how this project operates globally. Rather, examples are chosen to: (1) show how women's problems with computers can differ around the world, showing that prescriptions for change must be context-specific; and (2) illustrate that women's computer issues can be addressed if the will is there to do so.

women's program, however, the APC has become more of a technology designated "with the people" vis-a-vis women.[64] In the interviews with the APC women's computer communications trainers, each stressed the importance of discussing this technology within the context of women's organizations' overall communications strategies, and as a component of their work in general. In a speech to women's media activists from around the Americas, Burch stated,

> The technology is not what is important. We work with information. What is important is exchange, networks of information, moving our work forward and how to articulate how to use the technology to meet our goals.[65]

Each of the trainer's sessions would therefore start with a discussion of how this technology could be used by the organization. The question, however, remains if suggestions and ideas from the women are translated into changes in the computer system so that it may better meet women's needs.

One of the roles of the women working on the WNSP is to act as the link between female users of the system, and the technical teams. This is one of the ways that women's concerns are met in the development of the computer system. Mooney (Women's

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[64]The APC has been this sort of model for environment and peace groups since the beginning, but, as was stated, at least 75% of the users were male.

[65]Speaking at the "Reframing Frontiers" conference, Austin Texas. February 1995.

Project Coordinator of IGC, the United States APC node) discussed how the technical team at IGC often wanted to introduce advanced communication options that she felt were unnecessary and confusing to users. Her role was to ensure this did not happen by explaining to the technical team what the women's group's needs were. She suggests that the reason computer communications are difficult to use is not because women are not computer programmers: it is because technical people are developing programs for non-technical users.

> I think that (the fact that men are developing the software) is less of a gender thing than a techie/non-techie thing. I think it's important that techies are developing the software and the people who are using it are not, and there's not a lot of interaction between the two. In our organization we have a technical staff and a program staff which works with these groups and what they need to do. We hear what is confusing to them and what is not explained well, and when the tools do not fit their needs. Often the direction the technical team wants to take or figures is high priority, is not at all what our groups need or are asking us for right now.[66]

As Mooney pointed out, even when there are several "technical" alternatives to computer networking that could be implemented by the APC, the network's priority has been to ensure that the system is consistent with the needs of its users. This is exactly what authors such as Laurel call for when she argues that there must be more understanding of users in their own environments for improved interface design.

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[66]Interview with Mooney, February 1995.

The problems of system useability are different in Latin America than in North America. As was previously mentioned, the women's program in Latin America is also concerned that software, on-line commands, and user manuals have all been developed initially in English. Many words that are commonly used in computer communications language have no appropriate Spanish translations. Currently, a standard Spanish computer jargon does not exist, so it is difficult to get people accustomed to commands. Burch also pointed out that education systems in Latin American are in general oriented towards memorization, rather than logic. Most computer software is developed for users who learn new steps through a process of trial and error, rather than through memorization. She says that this is another factor that makes user-interfaces difficult for people in Latin America. What these points exemplify is that issues of useability will vary from region to region. In this case, for example, the Latin American APC may consider some different options in the development of their interface that will make it easier for people to remember steps. This is a clear example of why a woman's program must be developed around women's experiences in specific contexts, rather than around preconceived notions of what those may be. In the sections to follow, other methods the APC has used to accommodate women's needs will be described.

Structure of the network and communications options available

As was discussed earlier, Balka points out that the structure of a communications network will determine the type of communication possible on that network. For instance, some networks are more compatible for one-to-one and one-to-many communication, while others networks allow extended communication possibilities including databases and conferences. Moreover, she says that the structure of the network will have an impact on who will use it, and how. She says,

> Although it is often assumed by novice users of computer networks that the use of any computer networking facilities will accommodate a full range of electronic communication options, this is in fact not the case. Each physical network structure supports a different array of communication options, and within any given category of computer network structure, implicit and explicit social decisions appear to affect membership in speech communities that exist on-line, as well as the communicative norms that evolve and are maintained on-line. (Balka 1992: 93)

What Balka's research implies is that the type of communication possible on a computer network has implications for women's use of (or desire to use) a network.

The APC consists of a central node system that enables a wide variety of communications options: electronic-mail, electronic conferences (private and public), and on-line databases.[67]

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[67]Sallin (1994) describes these services of the APC: Electronic Mail: connectivity with every major computer network

Many of the APC nodes also now include full internet connectivity, increasing the range of navigational tools available (gopher, telnet, World Wide Web, FTP, WAIS). Clearly, there is a wide selection of communication options between groups or individuals through the APC. Conferences, for example, are used to distribute information on specific issues. They may be private, semi-private, or have unrestricted access. Information is structured to facilitate group decision-making processes and co-operative work. It should be noted, however, that there are ways of communicating that are not sustainable through most computer communications systems, including APC, but which may be technically feasible. Various advances in groupware, for example, may make cooperative decision making and work more convenient through computer networking systems. [68]

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service worldwide, including the Internet, Bitnet, CompuServe, Dialcom (including TCN and UNINET), MCIMail, Connect (including HandsNet) and more than 30 others.

Computer Conferencing: with multiple-site participation, and private, semi-private and unrestricted access options. Capability of interchange in USENET and other formats.

On-line Databases: full-text databases including Agenda 21, Environmental GrantMakers, Rocky Mountain Environmental Directory, Third World Resources, Greenpeace Press Releases, United Nations Information Service, Shortwave Radio Transcripts, and Pesticide Information Service (1994: Appendix 5).

[68]Yaron Goldberg, Marilyn Safran, and Ehud Shapiro, for example, discuss problems of using e-mail and conferencing for continuity of discussion, and maintaining document consistency (for example for group editing). In response to these problems, they suggest, "...exchanging documents by placing them in a shared file system accessible to all group members, and performing version

What the above discussion illustrates, is that there is still an element of choice involved in deciding what kind of communication is possible via a network. Further, there is a difference between simply deciding how users will communicate and offering that service to them, and consulting users about what their preferences are for communications options. In a similar argument, Balka suggests that,

> The adoption of computer networks by feminist organizations should address explicit social goals, rather than offer what merely is possible with off-the-shelf hardware and software. Extensive care should be taken to ensure that whatever computer networking system is selected will meet the communicative goals explicitly articulated by group members. (Balka 1992: 311)

While the APC does provide a wide selection of options, to date, it has not consulted with its new women members to note whether or not they would prefer forms of communication other than those offered. Doing so eventually would be one way to ensure that women's needs are integrated into the possibilities of the system.

Organization of the Material

One of the major reasons to join the APC is that specific information is accessible in an organized format. In general,

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management with a source control system, ...or editing them using collaborative writing tools" (Goldberg, Safran and Shapiro 1992: 79). While the authors acknowledge that there are still problems with these tools, there is at least a base which could be worked from to further develop these communication capacities.

navigating the internet can be difficult for even the most experienced computer user. New systems, software, networks, and servers are being developed by the month and just keeping up with the new technology and possible sources of information available can be a full time task. For those users who are interested in the type of the information carried by the APC (i.e. environmental, women's and other progressive political news, raw information, and discussion) the standard conference format is very convenient. This has been an important component of getting women and women's organizations interested in computer communications.

Conferences shared by APC networks are organized by both topic and function. Using women's issues as an example, there are different conferences for discussion, news stories, and the posting of listings and other events. These conferences can be accessed by conducting a search by keyword the same way you would look up reference material in the library. When the user inputs the keyword, the network lists all the conferences that contain that word. The search also explains which group facilitates that conference, and describes its purpose. When searching under the keyword "women" a user would find such conferences as "women.only" (an informal, conversational conference for the exclusive use of women), "women. news" (a conference for complete and referenced international news stories about women), and "women.forum" (a conference where

groups can post information and events of particular interest to women and where a certain amount of discussion can take place about those events and issues). The APC can provide a hard-copy list of women's issue conferences available on the APC.

Many other more specific conferences exist that refer to women and women's issues. Any group which regularly uses the APC to conduct its business, or to facilitate the dissemination of information, may chose to create a conference for women (or any other group) to serve its' needs. In this way, the National Campus/Community Radio Association (NCRA) in Canada is considering facilitating a ncra.women conference on WEB where women working in community radio may discuss their issues. In addition, many topics that pertain to more than one issue are cross-posted to more than one conference so that the user can be sure to find the information. For example, a new story by the InterPress Service on women in the Nicaragua would be posted in the daily conference of the InterPress Service as well as in the Nicaraguan news conference (reg.nicaragua) and the women's news conference (women.news).

In the United States, a subsidiary network of the IGC called "WomensNet" was created in preparation for the United Nations World Conference on Women (UNWCW). WomensNet was established to provide networking and information resources to enhance

women's involvement before, during and after this conference. This network provides a clear and straightforward means of accessing this information which will be important for thousands of women. The networks' "resources" include over five electronic conferences related to UNWCW, information from non-governmental organizations (NGO's) which are involved, and information about general planning around UNWCW. WomensNet also developed a gopher site and world wide web (WWW) page[69] in order to highlight women's activities around UNWCW. The WWW page, called "Women of the World" enables people to find out information about the conference, the issues, and the women and groups involved. (WomensNet invited NGO's to send information for free publication on this site, whereas normally it costs to do this.) The Canadian WNSP is currently in the process of planning a similar WWW page. In countries where many women have full internet access, these types of tools can make information on women and women's issues easily accessible.

Content

Through the women's outreach program, the APC has made a particular effort to increase the current information that may be of interest to women's organizations on-line. The initiatives described above greatly enhance the amount of

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[69]The address for the WomensNet WWW page for Beijing is: Access URL: http://www.igc.apc.org/womensnet/beijing

accessible information there is about women. For example, a series of conferences were created pertaining to the next United Nations World Conference on Women (UNWCW) (including specific conferences for national and regional coordination and key documents on UN events), an on-line women's database indexing all UNWCW documents and on-line conferences is now available, and the APC can also provide directories of women's organizations that are members of the APC on-line.

Burch pointed out that the great majority of information on the networks is in English, and a lot of this does not even reach Latin America because of high transmission costs. A major thrust of the women's program in this area has been to encourage the increase of exchange in Spanish and Portuguese. Within the women's program, seven new conferences have been created. She said that once a few groups are on-line with a particular interest, then there is a "snowballing effect" in getting other groups on-line working in a similar area. In this way, it is expected that the amount of information will continue to grow.

SUMMARY

This final section illustrates that through conscious effort, the APC has had some success in developing a computer network consistent with women's experiences. While there are a number of changes that could still be implemented, the APC is open to

discussion about the usability and structure of the network, and alters the general direction of its technical development according to women's suggestions. In essence, then, the APC is becoming a computer network "with women" rather than simply "for women". The difference and changes in the APC are far more than cosmetic. Since this program started, Burch sited a 100% increase in women members[70].

This example also illustrates the importance of taking a contextual approach to technological development for women. First, it is because of the APC's contextual approach that the nature of the technology is questioned at all. It was this perspective that led the APC to bridge the gap between technological development and user environments, which, as was seen, is crucial to get women, in particular, on-line. Secondly, their process of technological development is consistent with the view of women that has been described in previous chapters. Because the APC recognizes that women's experiences with technology are different in various regions, changes to the technology are made according to women's needs in particular areas. Minimal assumptions are made about what their needs may be. The result has been the development of a computer system that is much more user-friendly for women.

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[70]Sited during a talk at the "Reframing Frontiers" meeting, Austin, Texas. February 1995.

CONCLUSION

A "contextual approach" to the issue at hand promotes the notion that there is no single formula that can be applied to describe and alter women's relationship with computer communications technology. Instead, it calls for the acknowledgement of the various elements that lead to this particular social manifestation (or "articulation") and for the recognition of these elements in any attempt to alter that phenomena. When looking at "women", we need to recognize their experiences and current needs vis-a-vis technology. When describing "technology", we need to recognize the context of its development and use to understand how it may either alienate or facilitate women's interaction with it. As a fluid method, the contextual approach stands in opposition to rigid concepts of women and technology.

The consequences of applying rigid definitions to the issue of women and computer communications technology has been explained in this paper. Specifically, it is noted that the discourse of the "information revolution" implies that these technologies will, through their own agency, radically reform our lives. For the average person reading the newspaper or listening to government policy on these issues, the nature and shape of these technologies appears to be predetermined. Opponents of this ideology have shown that technological

development can take many different forms. Furthermore, the forms currently being promoted will probably result in the reproduction of relations of inequality to access that have existed with other communication technologies.

In their explanation of female underachievement in the sciences, numerous theorists have focused on characteristics that they perceive to be inherent in women, rather than on external circumstances that contribute to the shaping of their lives. Whether they attribute women's differences to biology, or to their "nature", the oversight of the context that has led to this "nature" can lead to inaccurate assumptions about female's needs and capabilities vis-a-vis technology. Further, even if perceptions of specific groups of women are accurate, this theory still leaves us ill-equipped to understand and address this problem globally. A more flexible means of understanding this problem is still needed.

It is seen that accepting current modes of technological development as "set in stone" means that women need to adjust their modes of working and thinking to suit the technology. This is not necessary for computers as programmers themselves have detailed ways in which software can be made to be more congruent with the needs of various types of users. In this claim is a confirmation of the contention that technology is first and foremost the product of historically specific social

constructions. Moreover, in the area of software design, those constructions have largely excluded women until now. As the programmers themselves show, changing this pattern is possible if the consciousness to do so exists.

THE WNSP

The question remains as to how to identify which issues should be addressed in the attempt to alter women's relationship with technology, and how they should be addressed. The contextual approach does not have as its goal the discovery of absolute connections between context and resulting social manifestations[71]. Rather, because it is accepted that the concept of "women" and of "technology" will vary according to the context, it is understood that these issues will change, as will the ways of dealing with them. Using this approach means that the WNSP accommodates the diversity of experience of the women in their project, making them receptive to the various dilemmas women have with technology around the globe.

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[71]It is true that some contextual issues will demonstrate a clear linkage to problems identified. However, others will not. For example, "technophobia" has been sited by several authors as being a reason for many women not to use computer communications. This can easily be related back to female's lack of exposure to technology. Alternatively, the social construction of software is not immediately evident as a determinant of why men and women have a different relationship with computers communications.

Because the WNSP questions the nature of technology, it recognizes that the ideology shaping the development of the information infrastructure is contributing to the alienation of women from new communication technologies. The neglect of a notion of human choice in the discourse surrounding the "information revolution" means that a diversity of needs cannot be accounted for in technological development. It is too often implicitly assumed that the market will take care of issues of access. In their literature, the APC strongly implies that conscious consideration of specific needs in technological development is necessary to ensure access by a wide range of people.

The WNSP's approach to developing training and outreach projects for women was described. Those working on the WNSP did not espouse to know what it was that all women needed in order for them to engage with this technology. Rather, they maintain an openness to learning about the nature of women's interaction with technology in each region. Through a process of consultation with the female users, they learn about women's technophobia, their misconceptions about the technology, their lack of access to it, their alienation from it, their desire to have the technology meet practical needs. Further, the WNSP thoroughly questions the social construction of technology and how this contributes to the types of problems mentioned above. Therefore, the way the WNSP presents

the technology is changed, unlike more traditional methods of training where women are expected to adjust to the technology.

Finally, the idea that technology is socially constructed, and the importance of this for the WNSP is revisited. Focusing in on the computer networking system itself, the WNSP discovered several reasons why there were fewer women users than men. They found that usability of the system was a particularly important issue for female users, and that the communications options available, organization of the material, and the content on the network all had particular significance to getting more women on-line. Again, these issues are all related to the context within which technology is constructed. The perception of technology that the WNSP adheres to was fundamental to recognizing and being inclined to address these issues.

When putting contextual analysis into practice, therefore, what is needed is an enhanced understanding of women in a particular environment, and of the meaning of technology in that same situation. The more the proponents of a project know about a particular group of women's needs, and about the meaning of technological development for those women, then the easier it will be to address difficulties they may have with a technology. The present obvious need to develop off-line editors for people using electronic mail in Latin America, was

not so clear to the first people exporting this technology to regions with poor communications infrastructures. There are countless other unacknowledged needs of diverse sectors within and between every society that are not taken into consideration in the current drive to build an information infrastructure.

The stakes in this debate are not small. If governments and information service providers are to do more than pay lip service to ensuring that women (and other groups historically alienated from and marginalized by technological development) have access to this new information technology, than a radically different approach needs to be taken to make this happen. A recent quote by the Australian writer, Dale Spender, is pertinent here:

> Estimates vary, but between 80 and 85 per cent of users on the information superhighway are male. At a time when the road rules are being worked out, there's not a woman on the virtual horizon.
>
> I am a writer. Putting words together is the most time-consuming activity of my existence. But whereas I used every skill I have with print to promote equality of the races and sexes, the same resources are not there when it comes to the new information infrastructure. I am not so skilled. And, as an author, I have no ways in.
>
> The medium is dominated by technologists--which is a bit like having the typesetter in charge of the book...

> As writers and educators, as policy makers, communicators and feminist agitators, we have been left out of cyberspace, which is why we have to start demanding our rights; we owe it to the next generation.
>
> I used to think that persuading men to vote to give up their exclusive power must have constituted the greatest political victory ever. Now I think that making men share the information infrastructure will be an even more significant triumph.[72]

The relationship between access to communication and power that is implied by this statement has been an underlying message throughout this paper. This issue is being articulated and dealt with with great clarity and vision by thousands of feminist media activists around the globe. However, there is still room for them to expand their vision to the inclusion of new communication technologies. If not, they will be marginalized from these technologies in much the same way as they were from radio, television, or the telephone when they were first introduced. Rather than being left to scramble to catch up after the backbone of these technologies has already been laid, it would be easier for women to gain ground in these initial developmental stages.

The theory described in this thesis applies to the vast numbers of other communication technologies that are being introduced into our realm of existence: virtual reality,

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[72]Spender, Dale (1995). Women must tackle high-tech roadblocks. *Australian* 9 (3). Access URL: http://insect.sd.monash.edu.au/infobahn.html#Spender

satellite technology, digital audio broadcasting, etc. These technologies will directly and indirectly influence women's ability to communicate around the globe. As has been pointed out, women need to be involved at all levels (users, policy makers, etc.) during the implementation stage of these technologies so that their needs and perspectives are taken into consideration. The examples of how this could be done exist in initiatives like the WNSP.

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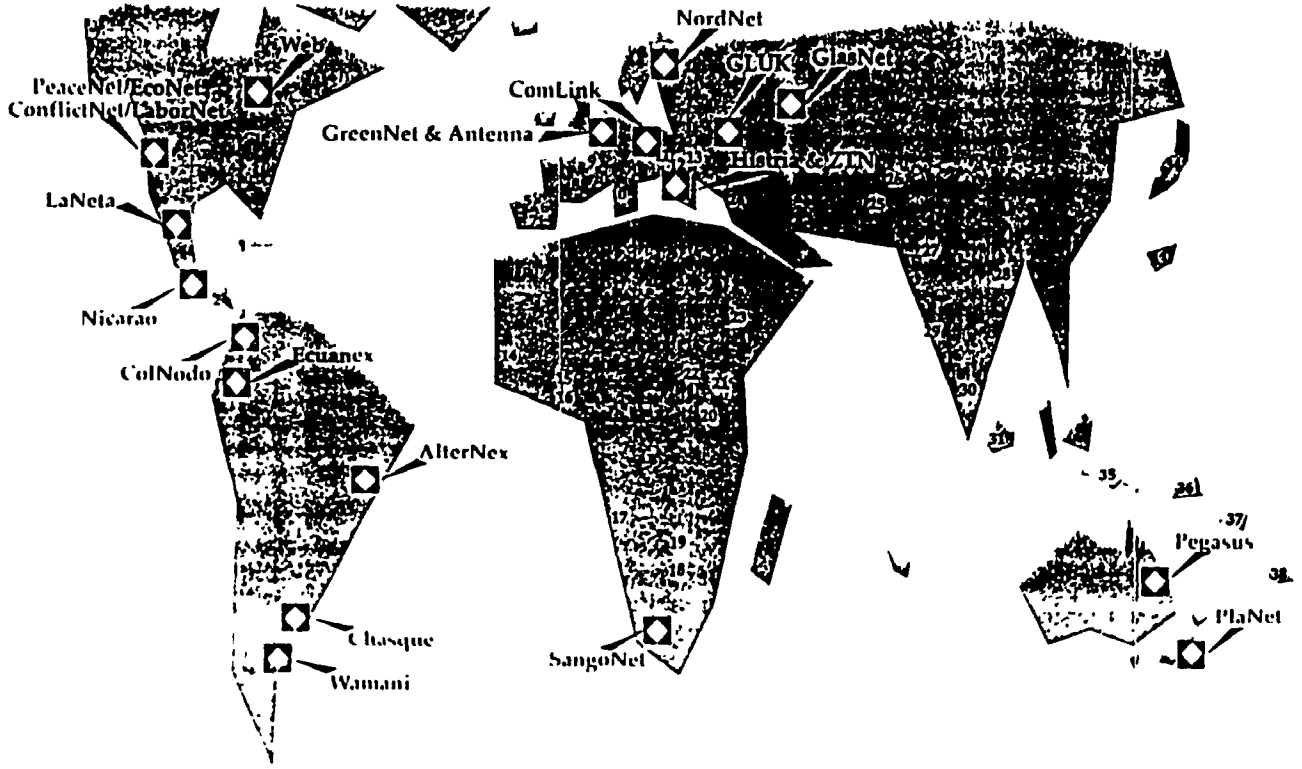
APC Networks

Association for Progressive Communications



APC Member Networks

These networks form the backbone of APC. They are interconnected via telephone networks and the Internet. Electronic mail, news and databases are exchanged regularly between all APC members.

1-38 Partner Networks

Partners are local host systems with whom APC exchanges information while also spanning gaps in our global networking. On demand connections are made via Fido, UUCP, and Zconnect transfer protocols.

See reverse for Member Network Addresses.

APC Partner Networks

17 Angola (AngoNet)
12 Austria (Alpin, DLMUI, LINK-ATU, SIGNALI)
28 Bangladesh (DAK)
5 Basque Country (Euskalnet)
9 Belgium (Knooppunt)
3 Chile (Reuna)
2 Costa Rica (Huracan)
1 Cuba (Cubarred, RedDavid)
11 Czech/Slovak Republics (Econnect)
23 Ethiopia (PADIS)
38 Fiji (Pactok)
8 France (GlobeNet)
15 Ghana (FOI Ghana)
16 Ghana (GhastiNet)
13 Hungary (GreenSpider)
29 India, Bombay (IndiaLink Bombay)
27 India, Delhi (IndiaLink Delhi)
30 India, Madras (TODD)
4 Ireland (Connect Ireland)
10 Italy (ItalyNet)
34 Japan (JWICS)
21 Kenya (ELCI, Thornfree)
32 Malaysia (Pactok)
24 Palestine (Baraka)
35 Papua New Guinea (Pactok)
33 Philippines (Email Centre)
14 Senegal (ENDA)
36 Solomon Islands (Pactok)
7 Spain (Pradesa)
6 Spain, Catalonia (Pangea)
31 Sri Lanka (SL Net)
20 Tanzania (UNETTAN)
25 Tajikistan (TAJnet)
22 Uganda (MUKLA)
26 Uzbekistan (SilkNet)
37 Vanuatu (Pactok)
19 Zambia (ZamNet)
18 Zimbabwe (Mango)

(This is a partial list)

APPENDIX 2

"APC GENDER AND INFO TECH PROPOSAL"

GENDER AND INFORMATION TECHNOLOGY: THE RIGHT OF WOMEN TO HAVE EQUAL ACCESS TO COMPUTER COMMUNICATIONS TECHNOLOGY AND NETWORKS

Proposal of the WOMEN'S NETWORKING SUPPORT PROGRAM of the ASSOCIATION FOR PROGRESSIVE COMMUNICATIONS TO THE FOURTH WORLD CONFERENCE ON WOMEN

Information and communications are playing an increasingly important role in economic and social development. Meanwhile, the recent developments in communications technology have progressively reduced the barriers to communicating over distances.

At the same time, computers have enormously increased the capacity to accumulate and access information sources and data. Combined with communications technology, the possibilities for information access are almost infinite. In today's "information society", the rapid access to relevant information is indispensable for timely intervention in most realms of human activity; access to this technology is therefore a key to successful action.

It is widely recognized that in order for the world to be able to advance in the quest for sustainable development, peace, social justice and racial, ethnic and gender equality, it is fundamental for citizens' groups and organizations throughout the world to have greater participation in the decisions that concern them and to develop their capacity to propose viable alternatives and priorities for economic and social development.

This possibility depends to an ever greater extent on the access of these groups to the benefits offered by new and emerging communications and information technology. In particular, new decentralized technologies such as computer networks and fax, when democratically employed, constitute powerful instruments for socializing information, which could contribute to securing the advances made by humanity, such as fuller participation of women in all spheres of activity.

Nonetheless, access to these technologies is highly unequal in different geographic regions and social groups. This inequality contributes to increasing the gap between those who have access to abundant information resources and those who are deprived of this access, thus reinforcing the marginalization that already exists in terms of development and technical resources.

Women in particular, tend to be under-represented in terms of access to these technologies, and especially women from less developed regions and from marginalized groups. Paradoxically, women from these social groups are precisely those who make up the work force that produces computer components, in working conditions that are often damaging to their health; similarly, women in low-grade technical and service jobs also make up the largest group of computer users, while many others have lost their jobs to increasing automatization. In contrast, women are less present in fields such as computer systems administration and in technical development. They are also proportionally under-represented as users of computer networks.

As a result, women have less access than men to the information and networking resources that these networks offer; and they have fewer possibilities of orienting development of this technology to answer their specific needs.

Many women's organizations have come to appreciate the importance for their work of creating and participating in regional and world-wide information exchange fora that enable them to share ideas, proposals, documents and information. Computer networks are one form of appropriate technology that makes this exchange possible. Combined with other media forms such as fax, printed material, radio, etc., such exchange can more easily be extended to regions and groups that cannot access computer networks.

Computerized exchange networks have thus arisen on diverse issues of concern to women. There is increasing recognition that the development of such networks will contribute to advancing the cause of gender equality and to promoting greater participation of the South and of marginalized groups and regions in world-wide fora and decision-making processes.

Many women and women's organizations are therefore eager to access and appropriate this technology. Nonetheless, they often face obstacles that make this endeavor more difficult for them. Such obstacles include: less access to resources (financia and technological), reduced access to training and technical assistance or non-gender sensitive methodologies, social and cultural barriers for women and girls to access

technology, educational short-comings, misconceptions about technology and its use, language barriers, etc. etc. Special efforts are required to overcome these problems.

Meanwhile, the governments of the industrial powers and transnational communications corporations are involved in negotiations relating to the future of the communications industry and among other aspects, to the international distribution of cyberspace (that is, the infrastructure and legislation that will determine the operation of computer networks). Women's and citizens' groups do not have a voice in the negotiations which will influence national and international legislation and therefore their access to technological and information resources. It is therefore imperative to create mechanisms for them to formulate and defend their needs and interests.

The following recommendations relate to strategy and lines of action that will enable women to overcome the obstacles outlined above and help to guarantee them more equitable access to new and emerging communications technologies and electronic information sources.

WITH RELATION TO THE ABOVE, WE SUGGEST THAT THE UNITED NATIONS:

1. Promote the access of women, girls and women's organizations to new and emerging communications technologies and computerized information resources

Suggested actions:

* That UN agencies and NGOs support campaigns designed to raise awareness among women about the advantages of these technologies. That budgets be assigned to facilitate access especially in areas with less technological infrastructure.

* That governments support initiatives of NGOs that facilitate women's access to these technologies, give legislative and infrastructural support and reduce cost barriers.

* That women's organizations adopt these technologies and seek ways of adapting them to their needs. And that those organizations that have access support those that do not in benefitting from the information resources available.

2. Promote the development of computerized information resources on issues related to the advancement of women

Suggested actions:

* That UN, its agencies and governments make official information accessible to existing citizen's networks; offer infrastructural facilities to initiatives that develop data banks, on-line information services, Internet resources, etc. on these issues; and assign budgets for collecting and processing information in different languages.

* That women's organizations and NGOs participate in collective endeavors to pool information and make it available electronically in different languages.

3. Support the development of initiatives of women's and citizens' groups in the field of computer networks that promote the advancement of women and gender equality.

Suggested actions:

* That the UN, its agencies and aid organizations assign budgets to assist with such initiatives, in particular those that focus on women from the South, economically depressed regions and marginalized groups, and which promote South/South and North/South dialogue between women's organizations and women communicators who promote gender equality throughout the world.

* That women's organizations further develop networking initiatives in order to strengthen their capacity to coordinate actions internationally for the advancement of women.

4. Support women's and girls' access to training in using computer networks and promote a gender perspective in training and methodology in the field of new technologies

Suggested actions:

* That the UN, its agencies and aid organizations assign budgets to promoting and developing training courses and gender-sensitive training materials.

* That women's organizations develop proposals related to the specific needs of women in the field of technical training in computer communications and appropriate methodology

5. Promote equal access of women to advanced technical training and careers in computer communications

Suggested actions:

* That the UN and its agencies promote campaigns designed to overcome barriers to women and girls entering technical careers and assign budgets for infrastructure to training centres.

* That governments actively promote equal access of women to higher education and careers in computer communications technology and organize campaigns to encourage women and girls to enter these careers.

6. Promote and support the equal participation of women in international and national decision-making relating to use of communications infrastructure and access to compute networks

Suggested actions:

* That the UN takes a more active role in defining the international distribution of cyberspace, with particular attention to the needs and rights of less technologically developed areas and of women.

* That governments ensure that national legislation relating to computer networks incorporates the right to democratic access of women and citizens' groups to electronic networks.

* That women's organizations and NGOs: actively lobby governments and the UN to ensure that their rights to access and use computer networks are guaranteed by national and international legislation and public services.