

TechnoCapitalism Meets TechnoFeminism: Women and Technology in a Wireless World

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ABSTRACT

Mastery over technology has long been seen as a key source of power for men, reflected in hierarchies of sexual difference at work and at home. However, in the new digital age, many contemporary feminists surmise that the link between technology and male privilege is finally being severed. While early second-wave feminism stressed how embedded technology is with capitalist and patriarchal relations, cyberfeminism conceives of the virtuality of cyberspace and the Internet as spelling the end of the embodied basis for sex difference and thus liberating for women. This article presents both pessimistic and optimistic perspectives, drawing on the social studies of technology. The technofeminist approach advocated here recognises that the gender–technology relationship is rapidly changing, while emphasising that this is the result of feminist politics and not technology per se.

Introduction

The purpose of this article is to place the discussion of women's position in information technology (IT) employment in the wider context of feminist debates on gender and technology. Indeed, interest in gender, science and technology developed largely in response to the long-standing marginalisation of women from technically-oriented work and professions, such as engineering. So it is not surprising that early feminist analyses of technology tended to have a pessimist tone. Technology was seen as a defining feature of masculinity, producing and perpetuating occupational segregation by sex in the workplace. Since then, groundbreaking developments in digitalisation and biotechnologies have led many contemporary feminists to surmise that the traditional link between technology and male privilege is finally being severed. Yet, even as this possibility is contemplated,

there is a suspicion that some existing societal patterns of inequality are being reproduced in a new technological guise. While cyber gurus assert that everything in the digital future will be different, how true is this for the social relations of gender?

After all, feminist perspectives of the woman–machine relationship have long oscillated between pessimistic fatalism and utopian optimism, technophobia and technomania. The same technological innovations have been categorically rejected as oppressive to women and uncritically embraced as inherently liberating. While new information and communication technologies (ICTs) can be constitutive of new gender dynamics, they can also be derivative of and reflect older patterns of gender inequality. My argument here is that social science needs to continually engage with the process of technological change, as it is a key aspect of gender power relations.

The paper begins by examining how technology and technical expertise came to be so closely identified with masculinity. It then goes on to evaluate contemporary cyberfeminist theory, particularly the claim that digital technologies are inherently liberating for women. A critical weakness of this literature is its leaning towards technological determinism, addressed in the following section. By contrast, technofeminist approaches, building on the social studies of technology, conceive of the relationship between gender and technology as one of mutual shaping. I explore this in the final section.

Male Machines Rather than Female Fabrics

Let us begin by reflecting for a moment on the traditional conception of what we take technology to be. There has been a tendency to think about technology in terms of industrial machinery and cars, for example, overlooking other technologies that affect most aspects of everyday life. The very definition of technology, in other words, has had a male bias. This emphasis on machines dominated by men conspired in turn to diminish the significance of women's technologies, such as horticulture, cooking and childcare, and so reproduced the stereotype of women as technologically ignorant and incapable (Stanley 1993). The history of technology still represents the prototype inventor as male.

Extensive feminist research has traced the long and complex history of women's limited participation in science and technology (Harding 1986; Noble 1992). For example, in *Women Scientists in America*, Margaret Rossiter (1982: 88) recounted in great detail the 'defeminisation' of science in the wake of professionalism. When women finally gained access to higher education in the 1880s and 1890s, scientific organisations increasingly shunned women, as 'the very word professional was

in some contexts a synonym for an all-masculine and so high-status organisation'. Similarly, Ruth Oldenziel's *Making Technology Masculine* (1999) argues that it was only with the formation of engineering as a white, male, middle-class profession that 'male machines rather than female fabrics' became the modern markers of technology. During the late nineteenth century, mechanical and civil engineering increasingly came to define what technology is, diminishing the significance of both artefacts and forms of knowledge associated with women. This was the result of the rise of engineering as an elite profession with exclusive rights to technical expertise. Crucially, this involved the creation of a male professional identity, based on educational qualifications and the promise of managerial positions, sharply distinguished from shop-floor engineering and blue-collar workers. It also involved an ideal of manliness, characterised by the cultivation of bodily prowess and individual achievement. The discourse about manliness was mobilised to ensure that class, race and gender boundaries were drawn around the engineering bastion. It was through this process that the term 'technology' took on its modern meaning. Whereas the earlier concept of useful arts had included needlework and metalwork as well as spinning and mining, by the 1930s this had been supplanted with the idea of technology as applied science. At the same time, femininity was reinterpreted as incompatible with technological pursuits.

While much literature has focused on women's role in the professions, early socialist feminist research concentrated on the sexual division of labour in manufacturing (Glucksmann 1990; Milkman 1987; Walby 1983). The craft system in particular was seen as key in consolidating the enduring connection between technical skill and masculinity. Cockburn's (1983) classic study of male craft workers in the printing industry, for example, demonstrated that clashes over technological innovation in the 1980s were still profoundly gendered. She found that despite radical technological change that both lessened the requirement for physical strength and constituted an objective deskilling of the work involved at the technical level, male workers were able to wield sufficient collective union power to establish that they were a distinct group with distinct qualities. They preserved their status as skilled artisans and continued a historical marginalisation of women, ensuring that the official definition of skilled work always shifted in line with the shifts in men's role within the workplace. Cockburn showed that men's traditional monopoly of technology resulted in machinery that was literally designed by men with men in mind.

The extent and intransigence of women's exclusion from scientific and technical skills and institutions thus led many early second-wave feminists to adopt a pessimistic stance. While liberal feminists tended to see the problem as one of increasing women's access to education and employment, Harding (1986)

and others pointed out that this analysis located the problem in women rather than questioning science itself. Western science was itself conceived of as a distinctively masculine project, inherently patriarchal (Hartsock 1983; Keller 1985; Merchant 1980). During this period, as I have discussed at length elsewhere, diverse and conflicting ideological perspectives were elaborated (Wajcman 1991a). While authors such as Firestone (1970) saw technology as liberating women — from unwanted pregnancy, from housework and from routine paid work — there was much more concern with the negative implications of new technologies, most clearly reflected in the highly charged feminist debates over the new reproductive technologies (Corea 1985; Hanmer 1985; Klein 1985). A tension throughout these debates was whether the problem lay in men's domination of technology, or whether the technology is in some sense inherently patriarchal.

The developing socialist feminist analysis saw masculinity as embedded in the technology itself, and worked to expose technology as a key source of male power (Cockburn 1985; Game and Pringle 1983; McNeil 1987; Wajcman 1991a, 1991b; Webster 1989). Instead of treating technology as neutral or value-free, it argued that social relations are materialised in tools and techniques. This constituted a compelling critique of popular and persistent sociological arguments that are characterised by technological determinism. Technology was seen as socially shaped, but shaped by men to the exclusion of women. An emphasis on the embedded character of patriarchal structures and norms in technology opened this literature to charges of adopting an essentialised view of gender. Advocates of a post-structuralist notion of fluid identity took issue with what they saw as a dualistic conception of gender difference (Jeanes 2005). In my view, this genre was more sophisticated than is now acknowledged, and generally showed an understanding of the historical variability and plurality of the categories of 'women' and 'technology'. But this did not prevent it from generally portraying technology as a negative force, reproducing rather than transforming the sexual division of labour at work and at home.

The socialist feminist literature made a strong link between capitalism and patriarchy, seeing class and gender as bound together in the social relations of capitalism. For most social theorists, capitalist industrial society was characterised by sharp divisions between manual and non-manual work, between valued employment and de-valued, privatised work in households, and gender-segregated employment patterns. However, this dominant view of capitalism and its future development was in the process of breaking down and the trends in computerisation and biotechnology that feminists identified were increasingly being associated with a fundamental change in capitalism itself. According to theories of the 'information society' or 'knowledge economy', the old hierarchies were disintegrating and being replaced by less rigid, more flexible networks. At the same time, with

rising standards of living, identities formed within consumption seemed to be becoming more important than those formed within the social relations of work and production. Globalisation gurus like Castells (1996) and Giddens (1990) gave prominence to the intensity, extensity and velocity of global flows, interactions and networks embracing all social domains. For these writers, such changes were heralding an exciting new post-traditional network society.

Reflecting these more general trends in social theory, feminists became increasingly uneasy with the negative cast of the debates about technology and society. They warmed to information, communication and biotechnologies as being fundamentally transformative, unlike previous technologies. Theories of the global, networked, knowledge society see these technologies as revolutionary in their impact, providing the basis for a new information age. Cyberfeminists have been particularly influenced by these ideas and, more generally, the 'cultural turn' in social theory. The virtuality of cyberspace and the Internet is seen as ending the embodied basis for sex difference and facilitating a multiplicity of innovative subjectivities. In the wired world, traditional hierarchies are replaced by horizontal, diffuse, flexible networks that have more affinity with women's values and ways of being than men's.

The optimistic register of such feminisms resonates with a new generation of women who live in a world of greater sex equality. That a strong current of 1970s feminism sought to reject technology as malevolent is now seen as fanciful. Indeed, early concerns about women being left out of the communications revolution, victims of the digital divide, now seem misplaced. A proliferation of mobile phones, the Internet, and cyber cafes are providing new opportunities and outlets for women, particularly those in highly industrialised countries who are better placed to take advantage of these technologies. While the early adopters of the Internet were overwhelmingly men, recent data from the United States show no gender difference in Internet use (NTIA 2002). China, a country where Internet take-up is relatively recent, shows how rapidly change can occur. Over an eight-year period from 1997, the proportion of Internet users who were female rose from twelve percent to 39 percent (CNNIC 2005). Certainly in the Western world, already there seems to be no gender gap whatsoever in relation to ownership or access to the mobile phone. Especially among younger people, this artefact is not culturally coded as either masculine or feminine. Whereas intensive computer and Internet usage is still more common among men, teenage girls are particularly heavy users of SMS text as well as audio messages (Agar 2004; Lally 2002; van Zoonen 2002). Indeed, as with the early landline, the major use of the mobile phone for texting and maintaining social ties was unanticipated by the designers (Fischer 1992). Innovative female users, rather than male designers, established what was to become the typical pattern of use.

Cyberfeminism

During the 1990s, then, feminist postmodern theories of technoscience, such as cyberfeminism and cyborg-feminism, became the predominant perspective. A common argument in this literature was that the virtuality of cyberspace and the Internet spelt the end of the embodied basis for sex difference. According to Plant (1998), for example, digital technologies facilitate the blurring of boundaries between humans and machines, and male and female, enabling their users 'to choose their disguises and assume alternative identities'. Industrial technology may have had a patriarchal character, but digital technologies, based on brain rather than brawn, on networks rather than hierarchy, herald a new relationship between women and machines. Cyberfeminists claimed that the Internet provided the technological basis for a new form of society that is potentially liberating for women.

For Plant, technological innovations had been pivotal in the fundamental shift in power from men to women that occurred in Western cultures in the 1990s, the 'genderquake'. Old expectations, stereotypes, senses of identity and securities were challenged as women gained unprecedented economic opportunities, technical skills, and cultural powers. Automation reduced the importance of muscular strength and hormonal energies and replaced them with demands for speed, intelligence, and transferable, interpersonal and communication skills (Plant 1998: 37–8). This was accompanied by the feminisation of the workforce that favours independence, flexibility and adaptability. While men were ill-prepared for a postmodern future, some women became ideally suited to the new technoculture.

The idea that the Internet can transform conventional gender roles, altering the relationship between the body and the self via a machine, is still a popular theme in postmodernism. The message is that young women in particular are colonising cyberspace where, like gravity, gender inequality is suspended. In cyberspace, all physical, bodily cues are removed from communication. As a result, our interactions are fundamentally different because they are not subject to judgements based on sex, age, race, voice, accent or appearance. In *Life on the Screen*, Turkle (1995) enthuses about the potential for people to 'express multiple and often unexplored aspects of the self, to play with their identity and to try out new ones ... the obese can be slender, the beautiful plain, the "nerdy" sophisticated'. It is the increasingly interactive and creative nature of computing technology that now enables millions of people to live a significant segment of their lives in virtual reality. Moreover, it is in this computer-mediated world that people can experience a new sense of self that is decentred, multiple and fluid. In this respect, Turkle argues, the Internet is the material expression of the philosophy of postmodernism.

The most influential feminist commentator writing in this vein is Haraway (1985; 1997). She too argues that we should embrace the positive potential of technoscience, and is sharply critical of those who reject technology. Famously, she prefers to be a 'cyborg' — a hybrid of organism and machine parts — rather than an ecofeminist 'goddess'. She notes the great power of science and technology to create new meanings and new entities, to make new worlds. She positively revels in the very difficulty of predicting what technology's effects will be and warns against any purist rejection of the 'unnatural', hybrid, entities produced by biotechnology. Genetic engineering, reproductive technology, and the advent of virtual reality are all seen as fundamentally challenging traditional notions of gender identity.

For postmodern feminists then, the collapse of these oppressive binaries — nature/culture, animal/man, human/machine, subject/object — is liberating. The cyborg creature, a human-machine amalgam, fundamentally redefines what it is to be human and thus can potentially exist in a world without gender categories. Cyberfeminism sees these technologies as dissolving the sex/gender nexus in the hybridisation of the lived body and machines. As such, they mark a new relationship between women and technology.

Such developments in feminist scholarship have stimulated important insights into the gender relations of technology. While the initial enthusiasm for everything digital has now been tempered by the increasing recognition of global online pornography and the use of the Internet to traffic women, for example, these theoretical currents did provide a refreshing antidote to the technophobia characteristic of earlier feminist thought. Importantly, they stressed women's agency and capacity for empowerment, treating ICTs as flexible and open to new meanings and uses. However, there is a lingering tendency in this postmodern writing on gender and technology to fetishise the new. For example, Haraway's piercing analysis of the interconnections between capitalism, patriarchy and technoscience sits uneasily with her belief in the emancipatory potential of advanced technologies. At times, her enthusiasm for the cyborg figure appears dangerously close to endorsing cyberfeminism's embrace of all technological innovations per se. A sharp divide is made between cutting-edge technologies and existing technologies. Such a discourse of radical discontinuity has echoes of technological determinism — albeit of a celebratory rather than pessimistic kind.

Technocapitalism

As I noted earlier, such claims about the transformative effects of digital technologies are not confined to postmodern feminist scholarship. They abound

in mainstream millennial reflections, whether it be theories of globalisation, risk, or the 'network society'. In many ways, cyberfeminism closely resembles the more popular cybergurus, but with a feminist inflection.

Take, for example, Castells (1996), who argues that the revolution in information technology is dramatically changing the character of capitalism. In the 'informational mode of development', labour and capital, the central variables of the industrial society, are replaced by information and knowledge. In the resulting 'Network Society', the compression of space and time made possible by the new communication technology alters the speed and scope of decisions. Organisations can decentralise and disperse, with high-level decision-making remaining in 'world cities' while lower level operations, linked to the centre by communication networks, can take place virtually anywhere. Information is the key ingredient of social organisation, and flows of messages and images between networks constitute the basic thread of social structure (1996: 477). For Castells, the information age, organised around 'the space of flows and timeless time', marks a whole new epoch in the human experience.

This idea that we are entering a new form of market capitalism rooted in technological invention and innovation, sometimes referred to as 'Technocapitalism', is widespread. Whatever the term used, such theories share an emphasis on intangibles, such as creativity and knowledge, being the core of capitalism, replacing raw materials and factory labour. In the words of Nicholas Negroponte, former head of the iconic MIT Media Laboratory, 'being digital is different ... in the digital world, previously impossible solutions become viable' (1995: 231). All these writers play the card of discontinuity and shower us with promises of freedom, empowerment and wealth. Such claims about the revolutionary impact of new technologies on society are hardly novel, yet they are still seductive, rendering pointless our knowledge of the present and past (Robins and Webster 2002). For example, the egalitarian image of creative knowledge work in the new economy is belied by employment trends marked by an increasing polarisation of jobs (Edwards and Wajcman 2005). Moreover, as other articles in this special issue describe, the labour market is still clearly characterised by a hierarchal sexual division of IT skills and expertise.

This is not to imply that we simply have new information technologies, but the same old social relations, values and goals. The issue of gender and IT is not the same as it was in the late 1970s. Computers are very different from what they used to be when feminists first began to study gender and computing. Likewise, men and women are changing their practices and entering new relationships with each other and their environment, and masculinity and femininity are now understood to be unstable constructions, dynamic rather than static. So, for example, while the Internet is necessarily producing new forms of connectivity and sociality, it

is important to stress that the social arrangements in which they are embedded are also changing. We can only understand the widespread discussion about the possibilities in cyberspace of experiencing multiple, fluid, innovative, gender-bending subjectivities, in the context of the transformation in women's lives, and in gender relations, over the twentieth century. For example, as the burgeoning literature on health movements and patient groups attests, women's advocates and organisations have successfully intervened in the paths of technological developments such as contraceptive technologies and abortifacients, altering their trajectories while asserting the priorities of bodily integrity and social justice (Clarke 2000). It is important to recognise that social movements such as feminism have wrought many of the social and political transformations that are usually attributed to technological progress *per se*.

Feminist Social Studies of Science and Technology

The social studies of science and technology (STS) have been challenging 'technological determinism' since at least the 1970s (see, for example, Jasanoff et al 1994; MacKenzie and Wajcman 1999). Social scientists increasingly recognise that technological innovation is itself shaped by the social circumstances within which it takes place. The idea that technological artefacts are socially shaped, not just in their usage, but also with respect to their design and technical content is no longer controversial. Indeed, STS no longer thinks of technology and society as separate spheres influencing each other: rather technology and society are mutually constitutive. Such an approach contributes to an understanding of social and political change by exploring how technologies and new forms of life are co-produced. Society itself is built and bound together with objects and artefacts.

My own perspective, technofeminism, fuses the insights of new streams of gender theory with a thoroughgoing materialist approach to the social studies of technology (Wajcman 2004). In common with recent Dutch and Norwegian feminist research, this approach treats technology as a socio-technical product, enabling us to conceive of a mutual shaping relationship between gender and technology (see for example Oudshoorn, Rommes and Stienstra 2004). Technology is then understood as both a source and a consequence of gender relations. In the cultural process of defining what IT is, how it should be used, what IT skills are, or in other words what 'counts' as valuable knowledge and expertise, gender functions as a cultural category in 'sorting things out' (Lie 2003). In this process of negotiating boundaries, gender is a marker that still functions to sort out high-tech from low-tech or no-tech. In other words, gender is constitutive for what is recognised as technology, and gendered identities and discourses are produced simultaneously

with technologies. The fact that technology, culture and gender relations are so interwoven helps to explain why this link has proved so durable.

Sharon Traweek's (1988) research into the high-energy physics communities in the US and Japan provides a striking example of how, whatever their demonstrable technical skills and capabilities, women have the wrong 'disposition' for technoscientific work. She found that while female workers in Japan possess a range of dispositional characteristics that are deemed necessary for work in the field of high-energy physics in the US, these self-same characteristics are cited as reasons for their relatively poor performance in their own country. Conversely, female workers in the US possess the right dispositional characteristics for work in the field in Japan, but are not deemed to have the 'correct' attributes to participate in their home country's intellectual community.

It would appear that there is nothing consistent cross-culturally in the content of the virtues associated with success. We do see that the virtues of success, whatever their content, are associated with men. (Traweek 1988:104)

The co-production of gender and technical knowledge and artefacts does not end with the design and development process. STS studies stress that technologies are not fixed at the innovation stage but continue to evolve in their implementation and use. Different groups of people involved with a technology can have different understandings of that technology, and consumers or users can radically alter the meanings and deployment of technologies. So the same artefact means, and therefore largely is, different things to different women. For example, a young woman in the West experiences her silver cell phone as a liberating extension of her body. For her mother, it may primarily be a tool to keep track of her children. For women working as traders in Bangladesh, the mobile phone provides the means to run businesses selling communication services to other women.

The point I want to emphasise here is that the social relations of production that underpin the mobile phone's existence are opaque in all these cases. As material objects, mobile phones have to be mass-produced in factories. Furthermore, along with other electronic devices, such as laptops, they require the scarce mineral Coltan, usually mined in Central Africa under semi-feudal and colonial labour relations. The sharp rise in the price of Coltan on global markets has local effects, accentuating conflict among competing militias, with the very specific consequences for women that military conflict bring. The value of the STS approach is that it ties together the relations of production and consumption. This is particularly important because current academic writing on technoscience is primarily concerned with consumption, culture and lifestyle. Indeed, much techno-triumphalism rests on the assumption that we are living in a post-industrial, consumer-based society.

The salience of consumer culture is not a new phenomenon, but it has certainly intensified since the days when, fifty years ago, Eric Fromm (1955: 122) perceptively wrote:

In our culture ... we are surrounded by things of whose nature and origin we know nothing. The telephone, radio, phonograph, and all other complicated machines are almost as mysterious to us as they would be to a man from a primitive culture; we know how to use them, that is, we know which button to turn, but we do not know on what principle they function ... we live in a world of things, and our only connection with them is that we know how to manipulate or to consume them.

Cultural and media studies scholars, following Bourdieu (1984), argue that in late modernity, human relations and identities are increasingly defined in relation to consumption rather than production. Recent feminist studies emphasize the ways in which women are empowered by access to consumer goods, and that consumption is a site for the performance of gender subjectivities (Lury 1996). Within this framework, gender equality in the usage of ICTs may seem more important than addressing the gender gap in IT professions. However, the central thesis of STS is that people and artefacts co-evolve: the materiality of technology affords or inhibits the doing of particular gender power relations. Crucially, such a perspective redefines the problem of the exclusion of groups of people from technological domains and activities. Whereas policy makers and researchers explain the problem in terms of the deficiencies of users, such as women, technofeminism reveals how the concrete practices of design and innovation lead to the absence of specific users.

Conclusion

In order to fully understand the position of women in the IT industry, we need to look beyond the workplace and examine the wider context of women's relationship to technology, including women's interactions with ICTs in everyday life. Feminist theories of gender and technology now represent a broad and diverse field, and have informed both STS and the sociology of work and employment. We now have a more nuanced view of the relationship between production and consumption and how gender relations affect every stage in the life of a technology. Technologies embody and advance political interests and agendas, the product of social structure, culture, values, and politics as much as they are the result of objective scientific discovery. They can indeed be constitutive of new gender dynamics, but they can also be derivative and reproduce older conditions. The electronic

revolution has coincided with massive social transformations associated with increasing emancipation of women worldwide, economically, culturally, politically. The old discourse of sex difference has been made increasingly untenable by the dramatic changes in technology, by the challenge of feminism and by awareness of the mutating character of the natural world. For all the diversity of feminist voices, there is a shared concern with the hierarchical divisions between men and women that order the world we inhabit. The process of technical change is integral to the renegotiation of gender power relations. A vital aspect of this is drawing more women into IT because it is not only an equal employment opportunity issue; also at stake is how the world we live in is designed, and for whom.

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