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Chapter 2

Sorting Out the Question of Feminist Technology

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Introduction[1]

In the last two decades, scholarship on the relationship between gender and technology has grown significantly. Drawing on concepts and theories in Technology Studies, a major focus of the literature on gender and technology has been directed at understanding how a system of gender relations becomes inscribed in a technology and, vice versa, how technology reinforces, embodies, or disrupts gender ideas and relationships. Lurking in the background of much of the literature on gender and technology is an interest in social change, social change that will improve the circumstances of women and create more equitable gender relations. Indeed, one might say that lurking in the background is a question about whether technology is a friend or foe of feminism. This is not to say that those who study technology and gender are always suspicious of, or negative about, technology. There is often an implicit suggestion of just the opposite, that if we better understood the relationship between gender and technology, we might use that understanding to further the progress of feminist social change.

In this chapter, I want to bring these background ideas and possibilities to the fore, and confront the connection (not just between gender and technology, but) between feminism and technology. I will do this by pursuing the question of this volume, the question whether there are or could be feminist technologies. The question is, to be sure, somewhat odd – what could it mean to say that a technology is feminist? Would it mean, for example, that the technology can only be used for feminist goals? Would a feminist technology only lead to positive consequences for women? Or what? The question may also be somewhat dangerous since it seems to call for an essentialist answer. An answer could fall into the trap of essentialism both about women and about feminism. Would a feminist technology be one that is good for all women? Would it be one that realized the goals and interpretations of all feminisms? To be sure, these dangers should be avoided. The analysis provided here will try to continually question the meaning of the question while at the same trying to answer it. The point of asking the question is to see where it takes us. The analysis is exploratory: it is a first attempt by this philosopher to sort out a concept and frame it in interdisciplinary, theoretical territory. Exploring the question will, hopefully, shed new light on the feminism-technology connection.

Starting Places

Associations of Gender and Technology

As much of the scholarship on gender and technology indicates, the starting place for thinking about the intertwining is with the cultural associations between gender and technology. These provide an important backdrop for approaching the feminist technology question. The association relationship is far from simple. But in Euro-American culture there are several

important and conflicting associations worth mentioning. First, technology is often associated with masculinity. Technology is thought to be masculine – the domain of the male, while women are often thought to be inept with technology, ignorant and unskilled with regard to how artifacts work, and simply less interested in it. Woman – the feminine – is associated with nature, and technology is just the opposite; it is the realm of the human-made, the artificial. Despite social programs and policies aimed at increasing the number of women who enter the field of engineering – the domain of expertise with regard to technology – engineering is still associated with men. The gender composition of the field continues to support this association in that there are still relatively small numbers of women pursuing careers in engineering.

Part of the association between technology and masculinity is, of course, constructed through selective use of the term 'technology' (Stanley 1998). Human-made, material objects used by men are called technology; human-made, material objects used by women are referred to as tools or utensils or appliances. Domains of knowledge and skill mastered by men are called technical or technological while those mastered by women are considered crafts. In this respect, while the cultural association of technology with masculinity is undeniable, it is important to remember that associations are cultural constructions with complex histories.

Current notions of what technology is can be traced back to the late nineteenth century when engineers, as part of the process of professionalization, were claiming special expertise. As engineers defined technology, the significance of both artifacts and forms of knowledge associated with women were left out (Wajcman 2004). Thus, the feminist technology question must take into account that while associations are real (e.g., people actually do associate technology with masculinity), the things associated can be understood and constructed in other ways.

The other type of association has to do with the way certain technologies are associated with women and others with men. This probably derives from the historical separation of spheres, setting up an association of certain domains of life with a particular sex. While these associations can and do change as gender systems change, certain tools or devices, skills, and domains of expertise are associated with men and others are associated with women. Men are expected to know, and are more likely to know, about how automobiles and electronic devices work and know how to fix 'things'; women are expected to know more about childrearing equipment and techniques, cooking techniques and tools, how to use cleaning appliances, and so on. These associations are well-known from everyday life.

Of course, gender systems change, and so do these associations. Thus, the strength of the association of particular technologies with men or with women may be weaker today, at least in the U.S., than twenty years ago. At the same time, the stereotypes seem to have an uncanny persistence. We continue to think of doctors as male while women doctors outnumber men in certain fields of medicine. We continue to think of the kitchen as women's domain while the number of men who cook and are quite interested in cooking is on the rise, not to mention that the so-called great chefs of the world are predominately male.

Nothing that has been mentioned so far is new or startling; it simply provides the background for approaching the question of feminist technology. While it might seem a small step to move from certain technologies being considered feminine to certain technologies being considered feminist, the step is fraught with complexity.

Co-construction of Gender and Technology

The last two decades of scholarship in the field of science and technology studies have provided the concepts and tools to move well beyond the associations of gender and technology. The field seems to have converged around a thesis that provides a framework for the feminist technology question. While there are many contentious fine points, STS theory is centered on the idea that technology and society co-constitute one another (Bijker 1995; Mackenzie and Wajcman 1999). STS scholarship has been directed at theorizing, modeling, explaining or exploring how a wide variety of social factors, social conditions, cultural notions, ideologies, and policies shape the development and endurance of technology. And vice versa, STS theory explores how artifacts, techniques, and systems of knowledge and expertise shape and constitute society; artifacts are intertwined in social practices, social institutions, and cultural notions. Technology and society are inseparable; we can't really disentangle them.

An important corollary of the STS co-construction thesis is a revision to the concept of technology. Technology is not merely material objects or artifacts. Material objects do not and cannot exist or have meaning or use independent of social endeavors, social processes, social practices, and social meaning. Thus, when it comes to studying technology, the focus of attention and the unit of analysis should not be on artifacts alone, but rather *sociotechnical systems*. Technology *is* the combination of artifacts together with social practices, social relationships and arrangements, social institutions, and systems of knowledge. The combination is variously referred to as *sociotechnical ensembles* (Bijker 1994) or *sociotechnical systems* (Hughes 1994) or *networks* (Law 1987). In actor-network theory (ANT), artifacts are treated as actants, equal to human actors in their potential influence on the system (Callon 1986). While technology is *not* just artifacts, neither is the social just social. Many social practices, relationships, institutions, and arrangements are partly constituted by artifacts. Whether the social endeavor is work, education, childrearing, or medical care, artifacts are involved. Artifacts shape these social practices; social activities or practices could not exist as they do without the artifacts. Even something as profoundly social as childrearing, is constituted in part by artifacts. Childrearing – at least as we know it today – consists of a wide array of social practices of engagement between parents and children, and these are mediated and constituted by such things as baby bottles, playpens, car seats, inoculations, teething rings, childrearing manuals, diapers, toys, etc.[2] The artifacts have shaped and been shaped by the social ideologies and practices of childrearing. Hence, childrearing is a sociotechnical system.

Bringing this notion of technology as sociotechnical systems to the question of feminist technology both helps and complicates the task. It brings us closer to an answer because social arrangements, social practices and relationships are the 'stuff' of feminism and the 'stuff' of sociotechnical systems. Indeed, Cockburn and Dilic describe this connection as a key premise of their 1994 volume, Bringing Technology Home:

> The social constructivist approach shifts attention away from the artefact as hardware to the knowledge and processes that together give a thing meaning. All of us inevitably consolidated around this approach because of the demands made by the concept of 'gender.' Gender was clearly social relations. To be able to see gender and technology shaping one another, technology had to be seen as social relations too. (Cockburn and Dilic 1994:7-8).

If we identify technology as social relations, a seemingly quick and easy answer to the feminist technology question appears: *feminist technologies are technologies that constitute and are constituted by feminist social relations*.

If only it were so simple! Unfortunately, this simple answer thrusts us into the middle of the most daunting questions of feminism and feminist theory. It also has the danger of pushing the materiality of technology completely out of sight.

Materiality

Remember that sociotechnical systems consist of social relations together with artifacts. One of the most intriguing aspects of the feminist technology question is precisely that it calls upon us to consider the role of artifacts and the human-made material world in gender relations. This in turn raises the question whether the world has been physically constructed in ways that constrain feminist goals and it points to the possibility of design – feminist design – as a new strategy for feminist goals. Thus, while a focus on social relations allows us to consider technology and feminism together, we should not lose sight of artifacts and the built environment.

The role of artifacts is somewhat controversial within STS. Many STS theorists agree that artifacts are seen as artifacts or entities only through a lens of social and cultural meaning (Collins and Yearly 1992); they are delineated as 'things' in social contexts that, in effect, make them things. Others hold on to the notion that the materiality of artifacts has some influence independent of how they are individuated and socially constructed (Callon and Latour 1992). Artifacts have particular (hard, non-malleable) design features and whatever their cultural meaning, the design of the artifact can itself have an influence on social behavior.

Since answering the feminist technology question is an exploratory endeavor, I do not want to rule out either approach. It seems better to keep the status of artifacts alive and see what the feminist technology question reveals about it. This means, however, that we have to break the feminist technology question into two questions. One question has to do with artifacts – the materiality of technology and the design of artifacts. A second question has to do with sociotechnical systems, networks of social arrangements, practices, and relationships *together with* artifacts. While pure constructivists may dismiss the first question outright, as I have already indicated, I find it intriguing precisely because the materiality of the human-made world is something that has not been fully addressed by feminism and seems a potentially important new site for feminist social action and social change. The second question, while important in its own right, is ultimately essential to understanding the first question since artifacts are always components in sociotechnical systems. Whatever influence the materiality of the artifact has will operate in the context of the system of which it is a part. We have, then, two questions: 1) Are there (or could there ever be) artifacts that could be considered feminist? and 2) Are there (or could there ever be) sociotechnical systems that could be considered feminist?

The Daunting Questions of Feminism

When we claim that feminist technologies are those that constitute or are constituted by feminist social relations, we are thrust into the middle of the most daunting questions of feminism. What is feminism? Yes, feminism is for the empowerment of women but does this mean equality or does it mean more power for women than for men? Is feminism merely (or primarily) a critical perspective, identifying what is wrong (e.g., inequities) but not able to give content to the idea of alternative, non-gendered social relations? Can we, who are situated here and now, even

imagine a world in which feminist goals are achieved? What might that world look like? It might be equitable but what would happen to sex and gender?

Compounding this problem is the enormous variation of women's circumstances. Feminists and feminist theory acknowledge that because of the varying circumstances of women as well as varying ideas about gender and strategies for improving the conditions of women, there may not be a single feminism but rather different forms of feminism (Frye 2000). This is to say that we must eschew essentialism with regard to feminism.

Yet the feminist technology question requires some sort of account of feminism, some characterization of the kind of social relations that could be considered feminist. If we cut to the core and try to characterize feminism in a way that spans different forms of feminism, several candidates seem ready at hand. First, we might say that feminism is about improving the conditions of women. Here feminist social relations would be those that are good for women. While there seems something right about this account, it doesn't seem to get at the gender component. That is, there are many social conditions and social relations that are good for women but have nothing to do with gender or may involve differential treatment between men and women.

A second candidate is gender equity. Feminism can be understood to be a view of the world that focuses on the inequities in women's circumstances as compared to men's and has as its goal creating a world in which no disadvantage correlates with being a woman. On this account feminist social relations might prevail in a world in which social relations are generally cruel, selfish, and inhumane. But if women and men were alike treated in this way, feminism will have been realized. The point of focusing on equity is to emphasize that feminism is concerned with women's circumstances relative to men's or, perhaps more accurately, in relation to and with men. This is quite a contrast to feminism as concerned with what is good for women.

A third candidate arises when we imagine those who might challenge gender equity as much too weak an account of feminism. Perhaps our focus should be on technologies that *favor* women, rather than merely equalize. At the end of her piece on appropriate technology and women in the Third World, Oblepias-Ramos (1998) suggests:

> it may be said that technologies become appropriate when they carry a deliberate bias for a specific underprivileged sector of a community, as well as an overall appreciation of that sector's overall physical and cultural environment (Oblepias-Ramos 1998).

If we think of feminist technology as a kind of appropriate technology, we could think of it as technology that favors women. (Note here that it is not enough to say that feminist technology is technology that *addresses* women or women's needs since that is what is meant by 'feminine' technology.) Technology that favors women could be understood, for example, to be technology that counters pre-existing imbalances in gender relations, imbalances that favor men. Another reason for thinking of feminist technology this way is that many current technologies – artifacts, at least – seem to be gender neutral and, therefore, arguably, gender-equitable, but calling them feminist doesn't seem right. Roads, clocks, furnaces, telephones, for example, don't seem to address women and men differently, yet these artifacts do not seem good candidates for feminist technology. So, there is a point to thinking about feminist technologies as those that favor women in some way.

Another complexity comes into sight when we consider *new* technologies. Here we have to keep in mind that the new artifact or system will function in contexts in which a gender system existed before or, if the new artifact creates a new context, we have to remember that it functions in the context of a broader society in which a gender system operates. Because of this, that is, because gender systems prevail in the context in which technologies are newly introduced or in the broader society, the feminist technology question could be embraced simply as a relativistic notion. That is, a technology might be considered feminist when it improves upon prior conditions or creates social relations that are better for women than those in the broader culture. Whether or not the technology is feminist would, then, be a matter of whether or not the technology in question constituted *more gender-equitable* social relations than those constituted by a prior technology or more gender-equitable social relations than in the broader culture.

This relativistic account of feminist technology is very tempting; however, it seems to settle for too little. I said earlier that the point of probing the feminist technology question was to garner insights into the gender and technology connection in the hope of discovering more effective ways of intervening to improve the circumstances of women. In this respect, figuring out what could constitute feminist social relations is not something we should avoid.

We have then four candidates for feminist technology: 1) technologies that are good for women; 2) technologies that constitute gender-equitable social relations; 3) technologies that favor women; and 4) technologies that constitute social relations that are more equitable than those that were constituted by a prior technology or than those that prevail in the wider society. While I plan to use gender equity as my primary focus, I do not want to rule out any of the other candidates. Each gives us a way of thinking about the notion of feminist technology and allows us to note something important about the gender-technology connection.

STS Themes and the Feminist Technology Question

In the introduction to *Sex/Machine*, Hopkins (1998) lays out what he takes to be the four key themes expressed in the gender and technology literature. Adapting these themes to the feminist- rather than gender-technology connection yields the following four relationships: 1) Technology is associated with feminism; 2) Technology reinforces sexist (masculinist) social sytems, 3) Technology subverts sexist (masculinist) social systems, and 4) Technology alters the very nature of gender and sex.

To address the fourth theme, Hopkins includes a section entitled "Body Building, The (Re)Construction of Sex and Sexuality" containing pieces on cosmetic surgery, surgery on intersexed infants, and adult sex change operations (transsexism). Sex and gender alterations raise the deepest questions at the core of feminism. If the goal of feminism is gender equity, then should equity be sought by de-emphasizing gender differentiation and disconnecting social expectations with sex and gender? Or, should we hold on to the idea that there are significant differences between men and women and insist that there should be equality of a kind that recognizes difference? On the face of it at least, it would seem that cosmetic surgery and sex change operations accept gender differentiation; they accept sex as binary – one is either male or female. The technology, then, provides individuals with a means to fitting or better fitting into one of these categories. If anything, this seems to promote gender differentiation. Thus, if the goal of feminism is to eliminate or at least diminish gender differentiation, sex and gender alteration may be non-feminist or anti-feminist. On the other hand, feminists might argue that sex alteration creates a more complicated array of sex and gender categories and in this way challenges the idea of sex as binary. The point is still that different accounts of feminist goals

lead to quite different perspectives on sex and gender altering technologies. Thus, while sex and gender altering technologies are important sites for study, they are not easily brought into our pursuit of the feminist technology question.

I have already discussed the association between technology and masculinity and the association of certain technologies with men and others with women. Technologies also can, and have been, associated with feminism. For example, feminists have fought for a variety of forms of birth control and, thus, many associate birth control with "women's liberation" and, hence, with feminism. Of course, whether the particular forms of birth control we have now are good for women, bring about equitable social relations, or favor women are different matters (See Chapters 3 and 6). In other words, just because certain technologies may be associated with feminism does not make them feminist.

The problem is that *association* is much too weak a relationship to ground a notion of feminist technology. Associations can be wholly inaccurate and can be deliberately shaped by advertisers, policymakers, and others who have non-feminist or even anti-feminist interests. Take, for example, the construction of Virginia Slims as feminist cigarettes (Craig and Moellinger 2001). Advertisers of Virginia Slims sought to convince women that smoking this particular brand of cigarette was a sign of their freedom and liberation. However, while these cigarettes, deliberately packaged and advertised for women, made it more socially acceptable for women to smoke, they marked women as different from men, and played on the troubled association between femininity and slimness. Moreover, they promoted something that was detrimental to women's health, undermining women's better longevity. So, while we can understand how the association between feminism and Virginia Slims could be constructed, Virginia Slims hardly seems a good candidate for a feminist technology.

This is not to deny the importance of associations but rather to set them aside as the foundation for a notion of feminist technology. The question of feminist technology should be concerned with something more; it should ask not just about cultural associations but about how technologies actually and potentially might affect the gender system and the circumstances of women.

Reinforcement, Subversion, Constitution of a Gender System

I have adapted Hopkins' second and third themes (that technology reinforces gender systems and that technology subverts gender systems) for the feminist-technology connection as themes of technology reinforcing sexist (masculinist) social systems and technology subverting sexist (masculinist) social systems. These provide better starting places for addressing the feminist technology question – though they only serve as a starting place. Both themes focus on social relations (a gender system) and then identify a particular way in which technology affects social relations, i.e., reinforcing or subverting.

Notice, however, that neither of these themes provides a picture of how better, more equitable, or feminist social relations would be constituted. On the contrary, if we assume that most societies have gender-*in*equitable social relations, then technologies that reinforce a gender system will reinforce gender inequitable systems. Of course, technologies that subvert will subvert a gender inequitable system, but subversion doesn't guarantee that a more equitable system emerges. Rather, the reinforcement-subversion themes point to a relativistic notion of feminist technology. Both themes presume a prevailing gender arrangement, one that is strengthened (reinforced) or weakened (subverted) by technology.[3] By pointing backward to existing social arrangements, these themes suggest that in looking for a feminist technology, we should ask whether a technology is keeping things the same, or undermining the prevailing order.

Hopkins has, it should be noted, only identified two possibilities here when there are probably more. A new technology could not just reinforce gendered social relations but it might strengthen gendered social relations in such a way that men have more power than they had in the past and women have less. Likewise, a technology might subvert gendered social relations by making inequities worse rather than better. Two quite different points need to be made in terms of the reinforcement and subversion themes. The first is that reinforcement and subversion don't cover the entire landscape, and the second is that neither reinforcement nor subversion provide us with an understanding what constitutes improved (or any other form of feminist) social relations.

Two classic cases in the gender and technology literature are worth discussing here. Cockburn and Omrod (1993) provide an analysis of the development of a microwave oven in which prevailing notions of gender become reinforced and re-inscribed in the design of a new oven. Here reinforcement leads to the antithesis of a feminist technology. The design process is gendered; that is, it has gendered social arrangements and a gendered institutional culture. These gender relations are, then, re-inscribed in what is produced, a new oven. The new microwave oven reinforced prevailing ideas about men and women and their roles in the kitchen. Cockburn and Omrod's study suggests that from the perspective of design and production of technology, we have a chicken-egg problem. We may have to have feminist social relations at all stages of the design and development process in order to produce feminist technologies. Interestingly, this chicken-egg problem is roughly the same one that Butler struggled with in *Gender Trouble* (1990); how can we conceptualize non-gendered social relations when we think with concepts and language that are deeply gendered? Cockburn and Omrod take this a step further by drawing our attention to technology as a component of both the chicken and the egg.

The second classic case that is helpful here is Weber's analysis (1997) of the redesign of an airplane cockpit. This case involves reinforcement, subversion, *and* re-constitution of gender relations. The redesign of the airplane cockpit took place against the backdrop of an initial specification that reinforced the longstanding practice of not allowing women to be pilots. The initial specifications for the airplane cockpit were based on tables that provided the range of bodily measurements of men. The cockpit was designed to accommodate 90% of men, leaving out the tallest and shortest five percent. This meant that 70% of women were too small to safely function in the cockpit. Weber gives an account of what happened when the Secretary of Defense ordered that women be allowed to compete for all aviation assignments, including combat. Military policy analysts were horrified that the existing design for a new training aircraft, one that all pilots would have to master before moving on, would exclude the majority of female candidates. A working group was formed and came up with a new specification that would accommodate 82% of the female population. Using the language of reinforcement-subversion-constitution, the old cockpit reinforced inequitable gender relations; the new cockpit subverted the old system; and, the new cockpit helped to constitute a more equitable gender system of piloting. While the old cockpit was an obstacle for women to become pilots, the new one helped make it possible.

Thus, the new cockpit seems a good candidate for a feminist technology. More importantly, however, the account helps us to better understand the tension about the materiality of artifacts and their role in sociotechnical systems. The materiality of the prior cockpit – its dimensions and design features – did not allow equitable gender relations. While some women might have been able to fit into the cockpit, many fewer women could safely fit (as compared to the number and percentage of men who could fit). On the other hand, the new cockpit had

material features that were compatible with more equitable gender relations. Thus, we see that the materiality of the artifact made a difference in gender equity.

Nevertheless, the new cockpit did not and could not automatically bring about gender equitable relations. (Artifacts don't *determine* social relations.) The dimensions of the new cockpit didn't necessitate that women be the pilots; men could and did fit in the new cockpit. Other aspects of the sociotechnical system had to come into play before the number of women pilots would increase. The rules had to be changed, women had to want to be pilots, and, more generally, the network of social relations had to reconfigure to make for women pilots.

We might think of the material features of an artifact as necessary but not sufficient conditions for gender equitable relations. The materiality of the cockpit seems to affect the situation in this way. We can imagine situations in which the materiality of an artifact allows gender equity, but because of the social meaning of the situation and ideas about gender, what the artifact allows in the way of gender equity is not perceived or used. The new design of the cockpit accommodated nearly as many women's bodies as men's and eliminated a major rationalization for prohibiting women from being pilots, but there was no guarantee that the possibility of equity would be taken up. Other things had to happen to bring about a shift in who could and would be a pilot.

This is not the whole story, but thinking of the material features of an artifact as necessary but not sufficient conditions for gender equitable relations gives us some leverage on thinking about our two feminist technology questions. We can now return to those two questions: 1) Are there (or could there ever be) artifacts that could be considered feminist? and 2) Are there (or could there ever be) sociotechnical systems that could be considered feminist?

The Two Feminist Technology Questions Confronted

Feminist Artifacts

The airplane cockpit case suggested that particular kinds of artifacts, and by extension the constructed, material world in general, might be necessary though not sufficient conditions for gender equitable social relations. Artifacts and the constructed world create possibilities and constrain other possibilities. Nevertheless, the materiality of artifacts does not alone determine social relations or sociotechnical systems. Once the cockpit was built so that a large percentage of women as well as men could function in it, the number of women who became pilots did not automatically become equal to the number of men pilots. Other components of the sociotechnical system had to fall in line. And, going in the other direction, before the cockpit came to be redesigned certain gender relations had to have changed to bring about the pressure (wish, imperative) to redesign the cockpit more equitably.

This, of course, is not news to STS scholars. The field takes as its starting place a critique of technological determinism. When an artifact is created or introduced or used, its material features do not *determine* the social relations around it. Once we recognize this, any hope that we might have had of finding an artifact that would, through its materiality, compel equitable gender relations is gone; we have to let go of the possibility of that sort of account of feminist technology.

Nevertheless, the materiality of artifacts is extremely important because it can facilitate or constrain equitable gender relations. How the artifact constitutes gender relations (and others) is contingent in complex ways. Certain patterns of social relations may be maintained despite the fact that the artifacts make equity possible and, in the other direction, pressures for more

equitable gender relations may push against the materiality or design features of artifacts (as in the cockpit design). For an illustration of the former we need only think of baby bottles and breast pumps that make it possible for men and women to share equally (though differently) the responsibilities of infant care. Yet despite the availability of these artifacts and the more equitable gender relations they make possible, patterns of unequal responsibility for infant care persist. For the latter, consider the first women to occupy traditionally male professional roles; the material environments in which they worked were often ill-designed for them, with no convenient bathrooms, chairs, tables and equipment that didn't fit women's bodies, and so on. The built environment was not conducive to women having such jobs.[4] Yet women often persevered – despite the built environment, despite the unequal infrastructure. They pushed against the material infrastructure and have had some success in transforming it; it was not determinative.

The non-determinative role of artifacts is often identified with artifacts being malleable or having interpretive flexibility (Pinch and Bijker 1987). Of course, some artifacts are more malleable than others in their materiality and design features (Winner 1986). For example, computers are extremely malleable in what they can be made to do and how they can be used. On the other hand, airplanes and lamps may be less malleable. Whatever the degree, however, all artifacts are malleable in the sense that they are compatible with different sociotechnical systems. What an artifact 'is' (what it is understood to be) is a function of its place in a sociotechnical system. It is precisely because of this interpretative flexibility that artifacts are not determinative.

Designing artifacts for gender equity cannot, then, determine equitable gender relations. Nevertheless, it is important not to jump to the conclusion that artifacts are irrelevant to feminism or feminist goals. Artifacts and the built environment are an important factor in shaping gender relations; they can facilitate equitable gender relations and they can make such relationships difficult to achieve. Artifacts and the built world make a difference in what sorts of social relations are possible, what sorts of relations are easy or difficult, and what sorts of social relations are formed.[5]

Before turning to sociotechnical systems, the discussion of artifacts helps to explain two issues that were raised earlier about feminist technology – whether we should consider feminist technology a relativistic notion and whether we should consider it to be about favoring women rather than just about equity. Many of the artifacts that are part of our world and much of our built environment have been constructed with and around unequal gender relations and, consequently, seem to favor men. Think here of medicines designed with men's bodies in mind, the size of chairs, the heights of tables, the size of tool handles, the placement of bathrooms, and so on. Given this backdrop – a historical condition – artifacts and the built environment will have to be changed to create a gender-equal material infrastructure. Thus, it makes good sense in this historical period to think of feminist technologies as those that move in the right direction even if not achieving full gender equity. It also makes good sense to change the artifactual infrastructure in ways that favor women since this could bring about balance overall; it could equalize what is otherwise an unequal infrastructure. A plausible account of feminist technology could, then, refer to new artifacts and changes to the built environment that create the possibility for more equitable gender relations including artifacts that favor women.

Feminist Sociotechnical Systems

The analysis of feminist artifacts points to the importance of the sociotechnical systems framework. Feminist technologies will be those in which artifacts and social relations will work together to achieve gender equitable arrangements. This is consistent with our starting place in recognizing that technology and feminism come together around social relations, only now we see that social relations are constituted in sociotechnical systems in which artifacts and social relations are intertwined. Whether we focus on gender equity, what is good for women, what improves upon prevailing gender relations, or that which favors women, we have to look at a system in which all the parts contribute to the functioning of the system. This, of course, only describes feminist technology; it doesn't provide criteria for identifying what is equitable or what is good or better for women or what favors women. This combined with the chicken-egg problem make it unlikely that we will be able to identify a technology (sociotechnical system) that is unambiguously feminist. Most existing sociotechnical systems are likely, to some extent at least, to reflect the gender relations of the past as well as those that prevail in the broader world of which the system is a part. Thus, they are *not* likely to constitute or be constituted by gender equitable relations.

There are other problems with the concept of sociotechnical system. While obviously complex, it is an especially fluid concept. What counts as a particular sociotechnical system – what is inside and what is outside a particular system – seems to be entirely a matter of how a researcher or viewer chooses to draw the lines. Thus, the gender relations of a sociotechnical system can be delimited in any number of ways. This is important because we are likely to find mixtures of gender relations of various kinds in complex systems; there will be the gender relations in the design and development, manufacturing and distribution, marketing, meaning and use of a technology. How a sociotechnical system is delimited may, thus, skew what can be said about its gender relations and whether the system is feminist. A sociotechnical system may be gender equitable in some ways and not in others. It may have a mixture of feminist and non-feminist or anti-feminist features.

These points are illustrated by considering a large sociotechnical system such as the Internet. The Internet can be thought of as a single sociotechnical system or as a cluster of sub-sociotechnical systems. There are search engines, chat rooms, news services, websites of a wide variety of kinds, e-business activities, hackers, the open source movement; there are programs, quasi-regulatory organizations, computers, telecommunications line, and satellites. While no one seems to have claimed that the totality is feminist, there has been a good deal of discussion about whether and how the Internet helps, or even empowers, women (Frederick 1999). In the very early literature on the Internet, social theorists claimed that the Internet was beneficial to gender equity because the gender of the person with whom one communicates online is not obvious – or at least not obvious in the ways that gender comes into play in face-to-face interactions. The Internet environment was thought to be blind to physical characteristics as expressed in the cartoon that depicted a dog saying "On the internet, nobody knows you're a dog" (Steiner 1993). More recently scholars have argued that the Internet helps women who are confined to the domestic domain; it opens up opportunities for exchange, for having a voice, for forming political alliances, etc. (Balka 1993). Of course, certain subsystems are far from gender blind. Facebook and MySpace are filled with pictures that delineate gender, as do webcams.

My point is that whether and how the Internet affects gender social relations depends on which aspect of the Internet – which subsystem – one considers. Gender comes into play in how the Internet is used – think of the huge proportion of websites devoted to pornography. Gender comes into play in who is using the Internet and how. Gender is a factor in the culture and

composition of the institutions that control and maintain the Internet and the institutions that supply software, hardware, and internet service, and so on. Thus, the relationships between the Internet and gender as well as the Internet and feminisms are all over the place. Just about any social phenomena that can be found offline can be found online. The Internet, as a single sociotechnical system, is much too big and complex to be thought of as feminist or non-feminist.

Thus, to say that a sociotechnical system is or is not feminist requires particular attention to how the sociotechnical system is circumscribed. Even so, the analysis of any sociotechnical system is likely to reveal a mixed picture.[6] To be sure, sociotechnical systems are a key site for understanding the co-construction of technology and gender, but the important thing here is not so much deciding whether the system is feminist or not but understanding *how* the sociotechnical system constitutes gender relations. Given the chicken-egg problem referred to earlier, technologies that are good, better, or favor women and those that constitute gender equitable social relations are most likely to be those that have been designed, developed, or evolved (through users) with women's involvement or at least with women's rights and interests in mind. Otherwise, it is too easy to slip into re-constituting the world the way it is.

Conclusion: Feminist Technology

At the beginning of this chapter, I broke the feminist technology question into two connected questions, one about artifacts and the other about sociotechnical systems. I included the first question to ensure that we not lose sight of the materiality of technology. My analysis has indicated that we will not find artifacts that *alone* determine feminist social relations, but we will find artifacts that help to constitute (or get in the way of constituting) feminist sociotechnical systems. In other words, artifacts can constitute feminist social relations in combination with the other components of a sociotechnical system. Most importantly, my analysis shows the importance of artifacts and the built world in constituting gender equitable relations. Thus, artifacts and the built environment must be part of the feminist agenda since they make feminist goals harder or easier to achieve.

If artifacts can be feminist only as part of sociotechnical systems that constitute feminist social relations, can there be feminist sociotechnical systems? My analysis suggested two problems with giving an account of this notion. First is the problem of describing feminist social relations. We seem to be better at identifying inequities and non-feminist arrangements than at figuring out the alternative, i.e., how feminist social relations would be constituted. The second problem is that of delineating the sociotechnical system. Here my analysis suggested that sociotechnical systems may be circumscribed in ways that make it difficult to give a simple 'yes-no' answer to the question whether the system is feminist. We are much more likely to find a mixed picture. This is, of course, not an obstacle but rather an alert to the complexity involved in pursuing the feminist technology question.

Finally, in trying to answer the feminist technology question, I put forward four different ways that we might think about feminist technologies. If we acknowledge the chicken-egg problem, this multiplicity of criteria may be the best we can do for now, that is, we may have to make do without a sharply delineated notion or set of criteria. The important thing is that technology stays in the sights of the feminist social movement and that feminists call for sociotechnical systems that are good for women, gender equitable, sometimes favor women, and are always an improvement over prior gender-inequitable social relations.

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Endnotes

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[2] In "Technologies of Autonomy", G.M. Vestby (1996) treats parenting as a sociotechnical system and shows how the telephone has become part of parental care and control, allowing for "remote parenting." See M. Lie and K. Sorensen (eds), *Making Technology our Own? Domesticating Technology into Everyday Life* (Oslo: Scandinavian University Press, 1996).

[3] A slight distraction here is that, in theory at least, a prevailing gender system could involve feminist social relations and if this were the case, a new technology that reinforced the prevailing pattern would be feminist. Likewise a subverting or disrupting technology introduced into a feminist system could be anti-feminist insofar as it subverted gender equable social relations.

[4] Issues of this kind persist in the workplace. For example, at my own university, it has recently come to the fore that women who work late into the night in their labs – doing so is essential to their professional progress – are fearful of their environment. The buildings have little security and women must walk to their cars through very poorly lit spaces. While safety has no doubt been a concern in the design of and improvements to the campus, the safety of women faculty has not, evidently, been taken into account.

[5] Smeds, et. al. (1994) give an account of the adoption of the central vacuum cleaning system in Finland. While purchasing the system did not make a huge difference, they report that purchase was "followed by a more equal sharing of the task of vacuum cleaning between men and women in the home"(p. 39). See Cynthia Cockburn and Ruza Furst Dilic (eds) (1994) *Bringing technology home Gender and technology in changing Europe*. Buckingham, Open University Press.

[6] See, for example, Martin's account of women's use of the telephone in the late nineteenth century. She concludes that the telephone had contradictory effects on women: "it had some emancipatory influence, yet it often contributed to reproduction, and even reinforcement, of sexist attitudes" (p. 70) (Martin, "The Culture of the Telephone" (1991) in Hopkins.)