Computer Users Do Gender: The Co-Production of Gender and Communications Technology

Lori Leach¹ and Steven Turner²

Abstract
The so-called “digital gender divide” has encouraged studies attempting to demonstrate the co-production of gender and information technology. Vivian Lagesen has criticized many of these attempts for failing to provide fully symmetrical accounts. Here we describe and analyze beliefs and practices concerning computers, gender, and technology evinced by managers in a network of public sites (Community Access Centers) created to provide community access to digital technology in the Canadian province of New Brunswick. From those results, we argue, among other conclusions, that distinguishing more carefully between the gendered uses of new technologies and the gendered forms of attraction associated with them produces a more fully realized and more perfectly symmetric understanding of how gender and communications technologies are co-produced. We show that the concepts of actor-network theory facilitate that analysis, and so interpret the study as supporting and extending Lagesen’s program.

Keywords
technology, computer, gender, actor-network theory, co-production, New Brunswick, Lagesen

Introduction: ICT, Gender Gaps, and Co-Construction
Studies of the relationships among technological change and adaptation on the one hand, and gender stereotyping and women’s experiences on the other, have multiplied rapidly in the diverse literatures on science and technology, media, and gender (Wajcman, 1995, 2010). Some of that growth has been fueled by worry over the so-called “ICT gender gap”: the concern that girls and women still lag behind their male counterparts in the adoption of and use of digital information and communications technology (ICT). The “gap” may refer to the use of ICT in daily living, or to the claim that women’s participation in ICT as university students and industry-professionals has decreased proportionally from highs in the 1980s. By the 1990s, earlier concerns over a socioeconomic and rural-urban “digital divide” had given way to concern over a digital divide across gender lines in many countries. That concern has prompted efforts of many kinds to make ICT more attractive to women, as well as debates over the success of such programs.

Whether a digital gender gap persists, or is disappearing with the maturation and diffusion of ICT, has prompted debate and uncertainty. Canadian data, for example, show that male adults use the Internet slightly more than women (81%-79% in 2009), that the ratio has changed little since 604693

¹Government of New Brunswick, Fredericton, Canada
²University of New Brunswick, Fredericton, Canada

Corresponding Author:
Lori Leach, Department of Post-Secondary Education, Training and Labour, Government of New Brunswick, Fredericton, Canada, E3B 5H1.
Email: lori.leach@gnb.ca

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2005, and that age and socioeconomic status are far more important determinants than gender of ICT access and use (Statistics Canada, 2014). Thomaz Drabowicz (2014) draws on the 2006 PISA data (Program for International Student Assessment) for a comparative study of self-reported computer and Internet use among adolescents in 39 countries. He finds higher rates of access and use among boys in every country, but, unexpectedly, also that the size of the digital gender gap is not correlated with other social and cultural measures of gender equality. In a major study, Knut H. Sørensen et al. acknowledge that ICT gender differences in daily life in Europe and the United States have narrowed on some fronts, such as Internet use and ownership of mobile phones, and that women’s use of social media outweighs that of men. But they conclude that “available statistical information does not support claims of a disappearing digital gender gap” (p. 24), whether in the proportion of women and men accessing and using the Internet, in time spent on the net, or in Internet and computer skills.

The under-representation of women in higher computing education and among professional ICT specialists remains “very substantial and apparently stable in most (Western) industrialized countries” (Sørensen, Faulkner, & Rommes, 2011, p. 24). For the United States, Thomas J. Misa (2010) has shown that the proportion of women studying computer science has fallen from 37% in the mid-1980s to 15% around 2007, and from 39% to 29% of the American white-collar computing workforce over roughly the same period (pp. 5-6). But Mellström (2009) has used the example of Malaysia (where women are highly represented among computer science students and computing professionals) to argue that “ethnic and class inequalities often are as important as gender differentials” in determining career access (p. 891).

Efforts to explain and diagnose the digital gender gap have varied widely. Sørensen et al. (2011) claim to detect three distinct but overlapping “narratives” in the existing literature which perform that function. The earliest narrative, linked to feminist technology-and-society theorists such as Judy Wajcman and Wendy Faulkner, focuses on the strong association of technology with masculine culture, and with the corresponding exclusion of women (Faulkner, 2007). That exclusionary association, reinforced by social and institutional pressures, leads to the voluntary abandonment by women of many technologies (including ICT) that are perceived as “gender inauthentic.” Sørensen et al. detect a more recent variant of this account in what they call “chilly climate” narratives. These focus less on the gender-exclusionary quality of technology in general, and more on the particular history and unique features of ICT. In particular, they portray computing-culture as originally gender neutral or even woman-friendly, but as increasingly subject to “hacker” or “geek” stereotypes since the 1980s. These have subsequently discouraged women’s participation in computing and led to “leaky pipeline” effects, as women enter, and subsequently leave, the field.

A third contemporary narrative, one allegedly more conducive to women’s participation in ICT than the first two, Sørensen et al. call “the woman communicator.” They identify this narrative with “cyberfeminist” approaches. Scholars writing in this tradition may be highly critical of ICT and its culture under current patriarchal structures, but they are typically optimistic about women’s engagement with the Internet and net-based communications. Sometimes they invoke women’s talent for communication and networking to predict a coming, utopian convergence of ICT, female participation in and transformation of ICT, and women’s culture. Although this approach has been criticized as essentialist, it more commonly seeks to transcend discriminatory gender differences in ICT use and access. Sonja Bernhardt (2014), for example, has argued that new forms of consciousness promoted by the digital social media and global communications will kick-start a new, radical individualism among the young, and make it possible for them (both men and women) to transcend the cultural pressures of the past that have blinded them to the potential of ICT to serve their life-interests.

A commonly used theoretical framework for analyzing the digital gender gap today, and one applicable to all the so-called narratives, is rooted in the “social-shaping” tradition within feminist studies of technology. Social shaping sought to demonstrate how new technologies often owe their evolving form and acquired social meaning much more to their users than to their ostensible producers, who are typically unable to dictate or foresee the meaning of their creations. Those users are very often women, especially for communications and household technologies. The analysis, therefore, blurred the line between “making” and “using” a technology in ways that commonly emphasize women’s agency (Berg, 1994; Cockburn & Ormrod, 1993; Lie, 1995; Lohan, 2001; Martin, 1991; Oudshoorn, Rommes, & Stienstra, 2004; van Zoonen, 1992; Wajcman, 1991, 2002).

Social shaping was directly extended to the analysis of technology and gender, often under the label, “co-construction.” It was further popularized within science and technology studies by Sheila Jasanoff in 2004, as “co-production.” In this framework, analysts seek to show, first, how the social meaning of an emerging technology is shaped by prevailing gender conceptions, and, second, how that evolving technology in turn shapes and reshapes cultural understandings of gender and individual forms of gender consciousness. Especially in its co-production form, this approach invokes a performative understanding of gender as “something done” and continuously re-created by social action. It seeks a symmetrical analysis by imposing the same understanding on new technologies, treating them as sociotechnical assemblages, the meaning of which is shaped extensively by use.

Demonstrating co-production via empirical studies, however, has proved a challenge. In 2012, Norwegian scholar Vivian Lagesen charged that feminist studies have typically offered asymmetrical treatments of gender and technology,
including information technology. Often, she claims, established gender roles are taken as the social “given,” and the analysis proceeds by showing how technology is interpreted to comply, or how it “becomes gendered.” Only rarely, she says, does the analysis proceed in the other direction, to show how technology helps to re-shape or co-construct gender itself. As an example, she cites a famous analysis of the microwave oven, which was originally marketed as a “brown” technology (like televisions and stereo sets) mainly for men, and then “re-invented” (this time successfully) as a “white good” (like refrigerators and kitchen ranges) to be sold to women. The analysis cleverly demonstrates how gender-based user-roles shape the technology and its meaning, but it declines to discuss how the technology might have impacted gender roles themselves. Similar criticisms have been offered by Catharina Landström (2007) and, in a different context, by Julia Nentwich and Kelan (2014). Nentwich and Kelan note that the concept of “doing gender” is common in their field (labor studies), but that in almost three quarters of the empirical studies, the concept is appropriated only “as a way of grounding, legitimating or validating [authors’] research findings,” and plays no substantive role in the analysis. Performative notions of gender underlie co-production analysis, and according to Lagesen’s critique, are equally difficult to demonstrate persuasively in gender and technology studies.

Lagesen offered two recommendations for escaping this practical impasse. The first is that feminist technology studies should embrace so-called actor-network theory (ANT). Following the action-theoretical schema pioneered by Bruno Latour (1999, 2005), analysts must first observe how new elements (in this case, new technologies) introduce uncertainties, tensions, or controversies (often about gender roles and capabilities), and then follow closely “how involved actors work to overcome the uncertainties, to stabilize the controversies,” usually by recourse to new standards and discourses, or the building of new networks of interest and compatibility (Lagesen, 2012, p. 446; Quinlan, 2012). Her second recommendation is that these efforts should be embodied in empirical case studies of encounters with new technologies which would provide symmetrical analyses of how technology and gender is co-produced. Lagesen concludes her analysis by inviting readers to join the effort and produce empirical results on the “reassembling” and “stabilizing” of gender as part of the technology and gender co-production. We concur with Lagesen that analysis in terms of co-production, as well as the ANT perspective itself, has much to offer studies of technology and gender, especially issues of ICT, the digital divide, and the contemporary encounter of women with computers and information technology. We also share Lagesen’s perspective that attempts to distinguish between technology and the social meaning of that technology is generally unproductive for gender analysis and insight into the process of co-production. In what follows we respond to Lagesen’s call and offer an empirical, gender-focused examination of an encounter between human actors and a new technology (the personal computer) in one specific context and ask how traditional gender understandings were de-stabilized and re-formulated for those actors as a result of the encounter.

The Setting and the Study: New Brunswick’s CAP and Its Actors

In the early 1990s, the federal government of Canada began laying the groundwork for what was popularly called the “information highway.” That highway, it was ideally hoped, was to carry the nation toward a knowledge- and information-based economy that would in turn create a new society that would address the needs of all individuals economically, socially, and culturally (Information Highway Advisory Council, 1997). Geographic obstacles would be eliminated, enabling the most remote community to mobilize and reorganize itself to benefit from the economic and social opportunities of computer technologies. The federal government’s “Community Access Program” was intended to democratize access to the information highway by bridging the socioeconomic gap between the digital “haves” and the “have-nots,” that is, the gap between those who had the means to access computer technologies and those for whom computer technology was not accessible—the disenfranchised, low-income minorities (Dickinson & Sciadas, 1996, 1997, 1999).

Most of Canada’s provinces and their governments readily bought into the federal initiative and none more enthusiastically than the province of New Brunswick in eastern Canada, under then-premier Frank McKenna. New Brunswick was economically depressed, mostly rural, and isolated from large urban markets. The information highway promised a way to promote the province’s human capital, foster digital modernization, and encourage economic opportunity. But ensuring equality of access was seen as essential. Computer technology was the “new toy” and up to this point in time, tinkering with it was reserved for those with vast computer technical knowledge and special expertise. Under the CAP, access to computers was to become available to the public and affordable to all.

New Brunswick CAP sites, funded jointly with federal and provincial money, were established first in rural communities where need was perceived as the greatest, and housed primarily in free spaces such as schools, libraries, and community centers. A CAP Center offered anywhere between 3 and 20 computer terminals for public use. Moll and Fritz (2007) report that at its peak, CAP had opened 8,800 sites across Canada, while in New Brunswick, the number of active sites peaked at 250 in 2001 (Connect NB Branché database, 1992-2012).

In Canada as elsewhere, political enthusiasm for the digital revolution proved short-lived, and challenges mounted for the provincial CAP networks. The speed with which
computer technologies were growing and changing during this time (and still today) became problematic. The digital gap was not eliminated, as was initially anticipated, and the continual decrease in federal funding forced provinces and local communities to assume the burden of maintaining the CAP network. By 2005, only 3,786 sites remained open in Canada and only 109 in the province of New Brunswick. Well beyond its original 4-year mandate, CAP survived until 2012 when the federal government officially disbanded the program. Today in New Brunswick, remnants of the former CAP centers exist in small numbers as “Community Adult Learning Centers” and focus primarily on adult literacy, including “digital literacy.”

Gender equality and women’s access was not an explicit motivation for the federal government in the development of the CAP. In New Brunswick, when CAP sites became operational in the mid 1990s, they were initially operated by employee-managers who were primarily men. Managers’ main function was to provide technical expertise in local communities to those interested in learning how to operate new technology. As the network evolved, however, the position of Center manager shifted from one of pure technical expertise to one focused on social networking, promotion, and teaching basic computer skills. Gradually, women began to assume these positions, until CAC managers came to constitute a mostly female and decidedly low-wage workforce. The evolving role of the network to constitute a mostly female and decidedly low-wage workforce.4 The evolving role of the network to constitute a mostly female and decidedly low-wage began to assume these positions, until CAC managers came to constitute a mostly female and decidedly low-wage.
Managers on the Gendered Nature of Technology

The CAC managers were uniquely positioned, first as observers of gendered behavior and attitudes toward technology among their Center clients, and second as user/agents/shapers of computer technology in the social context of the CAP Center. Unlike the subjects of most previous studies of computer users, most female managers in the study were older (41-55 years), and came mostly from the more rural areas of a rural Canadian province. Few had formal computer training of any kind before taking the CAC positions, and while most reported 10 to 15 years of experience with computers (counting their CAC service), nearly 20 reported significantly less experience; not all had computers at home, and not all of those had Internet service. In this, the female managers differed significantly from the male managers. These men, while a minority among managers, were younger, with longer experience with computers than the women. The female managers in the study, bringing little expertise or training to their positions, mostly learned on the job, in the process of teaching computers skills, and helping others on the wrong side of the digital divide to use the new communications devices. In this regard, the CAC managers may more closely resemble the general population, who self-learn computer skills via trial and error to cope with the plethora of new applications on desktop, laptop, and handheld devices. They certainly resemble the classical Latourian actor, challenged by new social demands and expectations, all mediated by a technology whose meaning and possibilities are still undefined and in flux.

Of course, incorporating gender stereotypes into the analytical categories of the study ran the risk of acting as a self-fulfilling prophecy and mitigating against more nuanced understandings. Nevertheless, it was imperative to examine how the managers, as key informants, shared common stereotypes about women and technology, and how they observed them to be shared by others. Starting with such gender dualisms, we believed, was essential to our aim to later problematize them. Questions both on the survey and interviews prompted them to classify common technologies as “used mostly by men” or “used mostly by women.” Predictably, diesel motors and air pumps scored heavily as “used by men” and domestic technologies such as irons, vacuum cleaners, and baby monitors, and that classical feminized business machine, the typewriter, were seen overwhelmingly as “used by women.” Interestingly, electronic and communications technologies (telephones, fax machines, computers, scanners, DVD players) were scored predominantly as “used by both.” But only 9 out of 59 respondents to the survey were prepared to associate the computer more with one gender than another. We take this as a sign that the “social meaning” of the personal computer is still in flux and in formation, and has not yet undergone the assimilation to gender stereotypes that most or all technologies of the past seem to inevitably experience.

That is not a characteristic of all digital technologies, however; the survey showed that the X Box, the classic gaming device, is viewed overwhelmingly as used by men. The survey also showed that male managers were somewhat less willing to classify technologies and devices as strongly gendered by use as were female managers. This may, of course, reflect only reluctance among the male participants to give voice to derogatory gender stereotypes. However, we speculate that growing ubiquity of computers and digital communications devices in the modern workplace (both still relatively “gender neutral” and both used extensively by men and women in that context) may be carrying over into gradual reshaping of attitudes about gendered technology.

Managers were also asked how they and their CAC clients used computer technologies for personal ends, and how those uses differed by gender. The survey and interviews confirmed the now-ubiquitous research finding that for men, gaming is the predominant non-work-related use of the technology; 61% of the managers listed it among the uses they observed among their male clients, but only two of them confessed personally to gaming. One young male manager commented as follows:

In my experience at the CAC the war type gaming there’s a lot of guys of all ages in there . . . I guess you’d call them hard-core online gamers . . . [T]here isn’t any women that get involved . . . They don’t want to waste their time doing it. They typically don’t need the whole male ego shoot them up, kill them type [of activity]. (Leach, 2011, p. 209)

The female managers in the study reported rather different patterns of personal use from the men, and those patterns applied both to their clients and themselves. Email communication and online chatting replaced gaming by men among the most frequently reported uses (50% of all the uses reported for women, only 11% of those reported for men), and general information searching on the web was reported twice as frequently as applying to women than to men (46% vs. 21%). The informants were fully aware that these use patterns reflected gender-stereotypical behavior. One younger female manager wrote,

[W]omen use [computers] for things like support groups, things like connecting with other people, information, connecting with programs, things they may not have had access to fifteen years ago . . . A stay at home mother today has access to everything that women did not have access to then. (Leach, 2011, p. 209)

Two other managers confirmed:

Men don’t communicate as much as women. You know, with grandkids far away and things. Here, men don’t seem to be the main users; it is women for genealogy or patterns online or email. (Leach, 2011, p. 210)
I guess women tend to do more Internet searching. Theirs is more communication-based Mail and Internet. (Leach, 2011, p. 211)

Not all computer uses showed different gender patterns, of course. Both men and women were reported as using computers for hobbies and other personal interests (29% and 36%), and for online services like banking (7% and 11%). Men were reported as using the computer to search for employment more than women. Perhaps the most interesting difference between managers’ personal use of computers and those uses they reported observing in clients was their higher use of online services, an outcome perhaps reflecting their greater confidence in the technology. In general, we conclude that the female managers in the study showed markedly greater use of computers for emotionally connected activities, including means of coping with isolation, means of coping with routines of daily life, and online support. The women in the study demonstrated a flexibility to be connected to both stereotypically masculine practices and stereotypically female practices of connecting with others and expressing emotional needs (Leach, 2011).

Having established gender differences among the predominant uses that the managers (and their clients) made of personal computers, the study went on to ask whether the managers saw gender differences in the approaches to computer use among their clients: whether men and women differed in how they went about learning to use computers, solving problems, and dealing with frustrations. Managers mostly agreed that their female clients initially lacked confidence and were hesitant about their learning tasks in comparison with male clients, but several reported that with experience, their female clients usually attained a confidence and competence equal or superior to men. They reported their female clients as more willing to ask questions, more flexible, more patient with the technology and its outcomes, less concerned than men with deep control and knowledge about the hardware. One manager reported that the women I teach in general seem to be less worried about how it happens if they know what the result or outcome was, even if they don’t understand double-clicking could get to there or get to there . . . If they can do that [one way] that’s good enough . . . [T]he majority of men will [want me to] really break [the double-click action] down. They want to know how they might have gotten [to the same result in another way] and want to try it again. (Leach, 2011, pp. 233-234)

Another claimed that women seem to maybe, be able to adapt easier to a non-linear style of experimentation. . . . Women are a bit more open to exploring things as they go than a man. (Leach, 2011, p. 237)

A male manager contrasted his own operating style with those of his female clients: Myself, when I attack computer problems, or program, or anything, I want to know the “nuts and bolts” of how it works, first. Then I’ll use the darn thing as best I can. I know quite a few women that that’s not the approach they would take to that problem. They would learn how to use the program, and not really care about what was going on behind the screen. (Leach, 2011, p. 239)

Co-production analysis demonstrates the insufficiency of treating technological innovation exclusively as a supply-driven phenomenon dependent upon scientific knowledge, market forces, or engineering rationality. New technologies are rather shaped by social interpretations and user needs and interests, which only gradually stabilize new technologies and fix their social meaning. So far-reaching is this shaping that distinctions between a technology and the social matrix of its mobilization lose analytic interest. The contribution of feminist studies of gender and technology has been to show that prevailing gender concepts, reified through the active participation of women users, is one key factor in the mutual shaping of a new technology. This is particularly true for the computer, the most protean of modern technological innovations.

The study of CAC managers confirms the many others that document the distinct use-patterns of the computer by men and women, and the gender-specific styles of use, learning, and operation. In the spirit of co-production analysis, it indicates how profoundly gender shapes the technology itself. The fact that the personal computer despite its long history is still today viewed as a “flexible technology” associated with neither men nor women is, we contend, due to the fact that men and women respectively have carved out overlapping but still separate realms of use and operating style that the CAP managers, hard at work in the trenches of the digital revolution, observe each day.

**CAC Managers as Latourian Actors**

Literature on the digital gender divide has focused on two, somewhat different problems of inclusion. One is the comparative extent to which women have adopted ICT for personal and job-related use. The other is women’s inclusion in advanced computing study and professional roles in ICT. The CAP managers occupy a fascinating middle-ground. As a group, they lacked technical training and professional status, and so encountered the computer as a tool for personal use, much as their clients did. But as self-taught local-experts and trainers, they cultivated a job-related identity defined around ICT expertise and skills, much as ICT professionals do. The study probed questions of gender authenticity and self-concept that managers would evince in light of that expertise and their role as advisors and trainers. Those questions were central to analysis in terms of co-production. As Lagesen insists, new technologies produce uncertainties and ambiguity for actors, and it is in the resolution of those
tensions, the stabilization of the resulting sociotechnical assemblages—if it occurs—that the co-production of technology and gender can be demonstrated symmetrically.

The empirical results richly demonstrated the uncertainties and ambivalence among the female CAP managers resulting from their expertise and interests. Not surprisingly, these jobs attracted women who had already evinced a standing interest in technology, especially electronic technologies, often from an early age. Nearly half (47%) had played with toy cars and electronic gadgets when they were children, a proportion transgressional of the traditional stereotypes of “girl’s toys” and “boy’s toys.” “It’s my nature to take things apart and find out how it works,” one rural female manager noted (Leach, 2011, p. 221). Another commented on patterns of male socialization, noting that boys “like to take things apart . . . because it is a mechanical thing in the male. It comes back to . . . playing with cars with Dad, and looking under the hoods of vehicles.” Asked whether she too had played with cars with her father, she replied with a laugh, “No, I used to take radios apart,” adding “My mother was not impressed” (Leach, 2011, pp. 220-221).

The “chilly climate” narrative on women’s recruitment into ICT, cited above, has focused heavily on the rapid emergence of the “geek” stereotype in the 1980s, as rendering professional and intellectual engagement with computers as gender inauthentic for women. The effect of the geek stereotype was sufficiently powerful to slow or drastically reverse recruitment patterns into computer science and ICT careers (Dunbar-Hester, 2008; Lagesen, 2007; Peddle, Powell, & Shade, 2008; Wajcman, 2004; Webster, 2010). Adopting computers for personal use and job-related use alone might not create gender ambiguities, but constructing a job-related identity around ICT skills might cross that dangerous boundary. The study sought to discover whether the managers feared that their unexpected new roles as community computer experts threatened their femininity, or social “normality” in the eyes of others. It asked the managers whether they thought others might consider them a “geek” in light of their employment and their skills. A substantial majority (77%) of the female CAC managers answered “no,” while a smaller proportion of male managers (50%) did so. The result suggests that the geek stereotype may be a greater threat to men in the field than to women, or it may suggest that women managers more willingly embrace elements of the stereotype (skill, commitment), at least within the protected setting of the CAP Centre. Many of the managers coupled their responses with an attempt to redefine the geek stereotype in ways that avoided or minimized its common, derogatory connotations. More than half the managers defined the “computer geek” for us mainly as someone possessing mastery, either technical or general in nature, over the technology; slightly less than half invoked the derogatory image of the geek as “obsessed” with the technology, as someone for whom “all they can talk about is computers” and “attached to a computer morning, noon, and night” (Leach, 2011, p. 153).

Interestingly, female managers were more prone to think of the “geek” as someone “obsessed” than were men. We conclude that some elements of the geek stereotype trouble the managers. For women, those elements did not suffice to render their roles as managers “gender inauthentic,” but they did reflect an underlying tension between technical expertise and traditional notions of gender appropriateness.

For the female managers, therefore, their personal encounter with the computer as a technology offered career opportunity, fulfillment, and pleasure, combined with the threat of de-stabilizing traditional gender expectations and social conformity. Whatever ambivalence or tension that encounter may have entailed, it did not prevent the CAP managers from experiencing their work in the CACs as overwhelmingly positive. Women reported working in a technology environment had increased their self-confidence (83%), self-esteem (72%), ability to work with technology (94%), logical thinking (55%), and capacity to understand ICT (91%). Male managers also reported overall positive benefits, but to a much lesser degree than did women managers (10-15 percentage points lower on most key measures). The significantly greater impact of CAP jobs on women than on men reflects, we think, lack of other comparable opportunities for technology involvement for the women attracted to CAP positions, and their own success in creating a feminized environment uniquely nourishing to themselves and their clients—the subject of a later discussion.

The theme of acquiring computer technology as liberating and empowering was echoed in many of the interviews with female managers, some of whom spoke directly to their satisfaction in transgressing traditional gender expectations:

I learned about computers and I [became] the go-to person. I’d do all the wiring for speakers like for surround sound . . . DVD player programming . . . You know the cable guy, the TV repair guy . . . Anything to do with electronics or to do with televisions or, uh, equipment hooking up speakers or anything like that . . . Now I do all that! . . . It’s more of an ego boost because it’s nice to have someone, especially in the male department, ask me [for help] . . . A man wants me to hook up his speakers! . . . And I have to say there are times when I do smirk. ’Cause it is such a, like a contrast. Because I was raised . . . like mother in the kitchen and father is the breadwinner. (Leach, 2011, p. 222)

Another sounded the same theme:

Well, yes, I guess I think so. I do get people who approach [me] and they ask, “Can you come to my house and look at the mess I made [of my computer].” And, you know, you feel better when you are able to fix it for them. (Leach, 2011, p. 225)

It is important to the analysis that the position of CAP manager is not only one of technical expert and resource person but also one that involves teaching, helping, and social networking with the diverse, largely unskilled, and generally non-affluent clients who visit the Center. Many of the female
CAP managers sought a resolution of the tension between their status as technical experts and traditional gender expectations by emphasizing how the skills required in their positions proved to be inseparable from the “soft” attraction of helping others. One wrote that her most memorable experience of working at the CAC was “watching the face of a 78-year-old woman seeking a copy of her mother’s picture scanned and come up so clear on the computer; an amazing gift” (Leach, 2011, p. 226). Another female manager, one who prided herself on her technical skills, expressed surprise at the unexpected satisfaction she derived from the softer side of her CAC job: “I have surprised myself at some point when it really became obvious to me that I love teaching. And, it’s like, where did that come from?” (Leach, 2011, p. 226). For this manager, as for others, the CAP Centre proved to be a network site at which tensions arising from involvement with a new technology could be negotiated and resolved. Managers’ personal envisioning of their relationship with digital technology both confirmed and simultaneously problematized the gender dualisms at work in the relationship.

**The CAC Network as a Feminized Space**

The categories of actor-network analysis serve well to explain the role of New Brunswick’s CACs. They functioned as a support network—the site for a web of associations and interrelationships that redefined and reconciled interests around the disruptive effects of a new technology. Clients from the community, older citizens, and people disadvantaged by lack of access to computers and frequently intimidated by the challenge computer use posed, found in the CAC personal assistance and local support for their first ventures with the new technology. CAC managers found outlets for technical interests and proclivities that previously, especially for the women managers, had had no satisfying and non-threatening ways of expression. The job-expectations of the manager’s role integrated the “hard” requirement of technical skills with the “soft” requirements of caring, teaching, and nurturing, and in so doing reconciled self-image and social expectations for women managers in ways that few other work-spaces would have done. None of this was intended. The interests of the governments that initiated the program lay in rural modernization, workforce enhancement, and the development of social capital. The evolution of the CAP toward a network populated by women site-managers and women clients was an unplanned and unintended consequence. But like most classic Latourian networks, it nevertheless evolved to accommodate actors and interests very different from those involved in the original negotiation.

To this role, gender was essential. The success of the CACs lay in their realization of a “feminized space,” where clients’ encounter with the technology was explicitly and instinctively tailored by manager-instructors to recognize and respond to gender-based needs. In that sense, the encounter with a new technology offered by a CAC was very different from that offered by any formal training course in a job-training center, community college, or university. One female manager, explaining why in her opinion women made the best CAC trainers, offered the following:

Women are just a little more tolerant, patient, and understanding than men seem to be . . . And women are only now finding out about [technology] . . . so I think that women . . . when it comes to dealing with other people, you know, you can attract more bees . . . you know more flies with honey . . . Women are not as intimidating as men are. So it would be easier for women to come back because they would feel comfortable with another woman. And men would come back because men would feel that they weren’t competing . . . It’s bad enough that [men] have to swallow [their] pride and come in and have someone explain things. But to have to come in and have you know Mr. Sharpe . . . sit down beside you. (Leach, 2011, p. 245)

One young male manager agreed:

[Women] provide more of a welcoming open environment. Maybe it’s less threatening because women are not perceived in those technology savvy roles. (Leach, 2011, p. 244)

Most of the female managers interviewed admitted to using very different approaches to introducing male and female clients to the personal computer, and to doing so on ways that capitalized upon gender stereotypes in regard to technology attraction:

When I [teach a] computer basics [course], first I’ll have a computer that is torn apart so that they can actually see inside. Because people are under such misconceptions about what’s inside the computer, and how it works. . . . The men that take the course, I can always catch their attention at that time. (Leach, 2011, p. 246)

Another said,

I know when teaching the Internet to male and female clients that going to sites that would interest them is a boost. For example, for women I take them to the Sears outlet site and men I will ask what their interests are and often end up on hunting sites or car dealer sites. I notice in the body language that the client becomes more excited and engaged in what they are learning and will often then forget about their nervousness when preoccupied in exploring something that interests them. I also find with men if you use the words “if you want” or “if you would like to do this next” before getting them on to the next step, they listen better. Where with the women, there is no need to do that extra coaxing. Praise works well on both sexes. (Leach, 2011, pp. 248-249)

Not all female managers admitted to gender-based manipulation in the interests of better technology training. The results showed, in fact, that the more highly a manager self-rated her technical skills, the less likely she was to admit to...
gender-tailored teaching styles. “My teaching style changes with each student and depends solely on their need and expectations,” wrote one such manager. “Is there a difference in style regarding gender of the student? I would not say there is a marked difference” (Leach, 2011, p. 250). But the insistence on training styles tailored to individual needs, gendered or not, was enough to confirm the status of the CAC as a feminized space.

Sørensen et al. (2011) have discussed the creation of “women-centered ICT spaces” as “inclusions strategies” (pp. 191-214). They conclude that initiatives such as women-only training programs, online networks for women ICT professionals, and online interactions for websites and magazines that specifically target women have been very successful. They are cautious, however, in their assessment of whether women-centered spaces can effectively influence the gender-coding of ICT. They associate women-centered spaces with essentialist narratives that presuppose women’s essential skills and predilections for networking and communication. The CAP study, however, suggests that discussing “feminized spaces” may start from a gender-dualist perspective, but need not result in a dichotomous categorization. Feminized spaces (not to be confused with “women-only” spaces) are capable of promoting women’s adoption of computers and influence the perceived gendering of ICT without confirming essentialist presuppositions. The results do not suggest that women in CACs made good technology teachers because they, somehow more than men, tailored their teaching to gendered needs and expectations (though they may have done so). Rather, in the space of the CAC, clients experienced computer technology predominantly as mastered and mobilized by women. They encountered it as fully integrated into the interests, pleasures, abilities, and lives of women. As a consequence, they were able to see the technology itself, if not as “gendered feminine,” or “gendered neutral,” at least as a technology relevant and accessible to men and women alike, both as a source of personal fulfillment and career potential. CAP centers offered a site for gender mainstreaming with the potential to reduce if not eliminate the gender-loading of the technology.

Vivian Lagesen reached similar conclusions in 2007, in her critical analysis of strategies intended to enhance recruitment of women into university faculties of computer science and to ensure their self-identification with the field. Lagesen’s analysis did not support the assumption that the computer science discipline had to change in a fundamental way to recruit female students. The key to success lay in increasing the number of female students already in the field and in increasing the number of female teachers, as well as efforts to make female students feel welcomed. When the number of women involved in the program increased, the symbolic image of the field changed from masculine to more neutral or gender diverse (Lagesen, 2007). Women entering the field did not report doing so to be “masculine,” suggesting that the gender symbolism of computer science is dynamic. Lagesen concludes optimistically that “gender symbolism in this field is much more dynamic and fluid than held in the literature on computers and masculinity” (pp. 87-88). The Canadian case study presented here confirms that optimism, and suggests that altering the gender symbolism surrounding computer technology may be easier in the “low-tech” and informal community context of the CAP network than in the formal, quasi-professional structures of a university faculty.

The Construction of Gender in a CAP Center

Lagesen claims that the greatest challenge of a case analysis of the co-construction of technology and gender lies not in demonstrating how existing gender expectations shape the reception, use, and social meaning of the technology, but in demonstrating how the technology shapes and re-shapes gender itself. The CAP study responds to that challenge by demonstrating that the encounter with the personal computer, as experienced by female clients and managers within the feminized space of the local CAP Center, enhanced empowerment, self-fulfillment, and the capacity to integrate technology with a personal, gendered life. We conclude by arguing for the technological shaping of gender in a stronger sense, by drawing on an unexpected result that emerged from surveys and interviews.

Human beings are attracted to technologies partly for their utilitarian benefit, that is, the many uses to which technologies can be put to further our particular life goals and interests. But most technologies, including ICT, also provide affective rewards to users in their own right—pleasure, fun, satisfaction, stimulation, compensation—beyond all considerations of utilitarian application. And in ICT, the capacity for pleasure has long been considered one of the most important markers of how men and women’s engagement with the computer differ. Men, so the argument goes, find affective reward in the possession of “technical knowledge” and “technical mastery,” while women’s attraction to the technology is more exclusively mediated by “use-knowledge” and skill at practical application. This gendered difference is thought to be expressed most clearly in the enthusiasm men and boys demonstrate for computer gaming. Gaming is often claimed to combine enthusiasm and technical skills, and so to instill in boys what Gansmo (2011) has called “boys room competence.” This competence carries over into personal adoption of ICT, comfort with ICT in the workplace, and choices about ICT careers. As such, it provides a partial explanation for the digital gender divide. Girls and women, on the other hand, treat computers as tools rather than toys; they value ICT for its ability to enhance other life goals rather than as a direct source of pleasure and reward. And while this more pragmatic and utilitarian embrace of the technology has often been considered “healthier,” it is thought to be one of the exclusionary factors underlying the digital gender divide, in accordance with Sørensen et al.’s
first explanatory narrative, which emphasizes the intrinsic link between technology and masculinity.

Helen Gansmo (2011) provides a trenchant review of the literature regarding these claims and its development. It is, she noted, founded on the venerable contrast between “hard and soft mastery” in programming and computer use (associated respectively with boys and girls) which Sherry Turkle (1984) developed in her classic work The Second Self: Computers and the Human Spirit. This contrast was deepened in the 1980s by Turkle and others, who claimed to analyze the affective roots of hacker culture and personality, which was regarded as largely alien to women (Gansmo, 2011). More recently, Gansmo argues, this alleged gender dichotomy has been challenged by more nuanced studies, showing that women may be motivated by fun and pleasure as much as men, although what women find pleasurable in ICT may be different. But newer studies have not displaced, in her judgment, the “gender dualised toy/tool dichotomy.” And that dichotomy, and its alleged significance for the digital divide, has stimulated inclusionary initiatives to persuade girls that “having fun with computers” is not gender inauthentic. Those initiatives have included computer parties, participatory sites aimed at girls, commercial development of computer games designed to cater to the imagined interests and desires of girls, and a large literature on girls and gaming.

It was to be expected that CAC managers’ attitudes toward the computer would have demonstrated those dualistic, stereotypical preferences: toy/tool, pleasure/use, technical-mastery/use-mastery. To some extent, they did. The survey and interviews inquired after the uses which managers and their clients made of personal computers. As explained above, managers reported a range of uses sharply delineated by gender and largely conforming to stereotypical expectations of the different uses to which men and women put personal computers in their daily lives. Then, to tap the affective dimension of computer use, the study also asked the managers cooperating with the survey to rate the level of enjoyment that they obtained from working with computer technologies. They were presented with the opportunity to explain what gave them enjoyment and why. In general, male managers reported higher levels of enjoyment: Three-fourths reported the highest level of enjoyment (5 on our 5-point scale), while only half of the female managers reported enjoyment at that level. Moreover, the male managers with few or no exceptions described the sources of the pleasure that they drew from computer use in terms readily associated with technical knowledge or hard mastery: technological problem solving, learning new things about computers and their operation, creation of new computer applications, fascination with technology in general, and discovering increasingly easy technical applications.

The female managers in the survey all reported high levels of enjoyment from working with computers (although not, as noted, levels as high as those reported by male managers). But their reports of the kinds of things that gave them pleasure differed from those of the male managers, and also differed from expectations, in several respects. First, almost half of the write-in responses offered by women managers were readily codeable into the areas stressing the pleasures of technical knowledge and hard mastery, including a general fascination with technology that had dominated the responses of male managers. “I like challenges and finding answers to problems,” wrote one, “there’s great satisfaction in solving problems on your own.” "I think it is mostly the type of person I am," wrote another. “I love working with electronics and the like” (Leach, 2011, p. 174). The results of the survey problematized the dualistic and stereotyped expectation that technical knowledge and hard mastery would have no affective appeal to women. Of course, the work of a CAC manager may have produced a self-selection for the capacity to take pleasure in technical knowledge, but that self-selection would have acted upon managers of both genders.

Second, the female managers in the survey reported enjoyment that was associated with the skills they possessed in using the computer for particular applications and purposes. And they did so in significant numbers—about half of all the responses—whereas male managers almost never produced responses so codeable. Ease and speed of access to information, the pleasure of skill acquisition, skill in teaching others, and skill in communicating widely and quickly—these were among the codeable responses that female managers produced which the men of the sample did not. For the female managers, pleasure-in-use and pleasure from skill and knowledge in use blended together in ways that seemed to find no direct counterpart among the male managers in our study, even though both genders were prompted with the same questions and the same opportunities to respond. This outcome roughly confirms the stereotypical expectation that women are attracted to use-knowledge, with the added finding that pleasure is associated with the possession and exercise of use-knowledge.

Both these findings together, however, indicate that what we call the “spectrum of attraction” to computers (from hard to soft knowledge and from hard to soft mastery) is gendered, but it is gendered in ways that differ from, and that deeply problematize, the stereotypical expectations of widely accepted gender dualisms. Asked why and how they took pleasure in working with computers, the women of the study produced many more reasons than men, and they produced responses that ranged over the whole spectrum of attraction, whereas male responses were focused and limited at the hard-mastery end of that spectrum. On the basis of that evidence, we suggest that women’s responses to computer technologies are more flexible, more multifaceted, and (at least at the level of affective response) more open than that of men are likely to be. This is novel. Traditionally biased expectation that gendered response to technology should be polarized around male and female norms leaves us unprepared for patterns of gendered response which do not reflect a simple
polarization by gender, but which do not also suggest that gender is secondary or irrelevant. They invite deep re-thinking of what gender means in relation to technology.

Interviews with CAC managers of both genders confirmed that tentative survey finding. Male managers proved much more inclined to boast about their technical understanding of the machines they used daily than did female managers. Prompted to explain the pleasures they took in working with computers, they readily resorted to the language of hard mastery, including (on occasion) that of “conquering” the machine and being driven by the need to master it. “I’ve always been a tinkerer, you know,” wrote one male manager.

“I’ll rip things apart to see how they work. . . . Learning about [computers] has definitely freed me up to not fear anything—any problem, it’s a matter of time before it can be figured out. (Leach, 2011, p. 219)

“My wife banned me from the Future Shop, the whole nine yards. It’s just I have always been someone who has followed technology and wants all the latest toys. . . . My first computer hooked up to the television set in the eighties, and my brother and I sat there taking it apart and writing programs so we could play games. . . . I have always looked at mechanical stuff like a clock you know, you’ve got the gears and the grinding and there’s an actual physical aspect to it. (Leach, 2011, p. 219)

As expected, significant numbers of female managers also reported pleasure and satisfaction in the technical knowledge and hard mastery they possessed, but they did not do so as readily as the men. Drawn out by conversation, one manager admitted, “Yep, you give me the parts and I can build ‘er!” Asked how she discovered her satisfaction in technology knowledge, she went on,

The first programming courses I took were probably in the ’70s . . . . and I loved that! But I have kind of a mind that likes that kind of thing. And then, really getting into it and I can remember [writing] a software program . . . based on a mathematical game. (Leach, 2011, p. 221)

Another commented on the pleasure she took from acquiring technical understanding: “I’m not intimidated at all [with electronics] now . . . . I understand now more of two things work together . . . whereas before the stuff [in] there . . . made no sense to me” (Leach, 2011, p. 222).

As in the survey data, the female managers interviewed expressed a broader spectrum of attraction to computer use when queried them about what gave them satisfaction and pleasure. These included not only technical knowledge and hard mastery, but “soft” skills, such as facility in communicating and searching for knowledge over the Internet and their understanding of how to assist other users and learners.

The helping theme came up frequently during interviews with female managers. “Computers have made me who I am,” commented one manager, “and I just love to help to show this to others, you know.” Helping adults navigate the ‘new frontier’ and gain confidence with knowledge” (Leach, 2011, p. 225). Female managers described the pleasures they took from their interaction with the computer as lying along a broader spectrum of attraction than did male managers, a spectrum that ranged from the extremes of hard mastery to the “soft” pleasures of social uses and effective teaching.

Some of the interviewees seemed quite aware of the greater openness to computers suggested by this spectrum of responses and the attitudes behind it. One woman commented with asperity,

In my world, it is the women who have all the technology skills and it is the men who know very little, you know, about technology. They might know how to put [a computer system] together, but to actually use one for a purpose other than porn or games . . . You know, they just don’t have a clue. So we [women] are more productive, we use it in more productive ways. (Leach, 2011, p. 229)

Many speculated that the emergence of information technology was undermining traditional stereotypes about men, women, and technology, opening up technology-related opportunities for women, and creating opportunities for women to apply their particular styles of learning and use. “Women seem to maybe be able to adapt easier to a non-linear style of experimentation [with computers],” wrote one male manager. “Women are a bit more open to exploring things as they go than a man” (Leach, 2011, p. 237). Observations of that kind reflect a tacit recognition of the differing spectrum of attraction evinced by men and women, a spectrum on which women may see the benefits of use-knowledge differently than men, and so report a distinctly different pattern of affective response. They also represent a subtle but very important shift in the subjectivity of gender itself, here a product of technological change, and another episode in the ongoing co-construction of gender and technology that Vivian Lagesen has challenged observers to document.

Conclusion

The empirical study discussed in this article has focused on the managers of CACs created in the Canadian province of New Brunswick in response to the problem of the so-called “digital divide”—initially understood as a socioeconomic and rural/urban divide. We have addressed the “other” digital divide—the gender divide—and tried to demonstrate the co-production of technology and gender from the experiences and beliefs of the CAC managers, as well as the efficacy of actor-network perspectives in understanding their encounter with personal computers within the CAC network. Particularly
for the female managers, the encounter was seen to be an ambivalent one, experienced simultaneously as rewarding and empowering on the one hand and threatening to traditional gender expectations on the other. That ambiguity was resolved through the active creation of a feminized space within the CAP network, which in turn facilitated actors’ reconceptualizing the way in which computers, as a technology, are thought of as gendered objects and systems. The context in which CAC clients encounter the computer is one in which the technology and its human agents that use, teach, and communicate its social meaning, blur together into a state of mutual interdependence.

The case study also addresses the co-construction of technology and gender. For managers, the social meaning of the computer is actively shaped by gender-based attitudes and use-preferences, and we have documented these dualisms at work in the attitudes and performances of the participants. But the other side of the equation has also been addressed. By teasing apart the experiences of use and the experiences of pleasure in a new technology, the study has moved toward a less dichotomous characterization of the findings and opened interpretive space beyond the dualisms. The results have suggested that women’s gendered relationship to technology is different from what has been taken for granted, and is being reshaped by the encounter with ICT. The analysis therefore satisfies Lagesen’s call for symmetrical accounts of the co-production process, and may provide useful perspectives on inclusionary projects for women in ICT.

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Notes
1. This theoretical perspective is compatible with the feminist post-humanism advocated by Karen Barad, although her “agential realism” carries skepticism about the technology–society dualism further than do traditional formulations of co-production (Barad, 2003).
2. The Connecting Canadians program included other programs such as SchoolNet, VolNet, LibraryNet, and Smart Communities programs. “Altogether, several hundred million dollars were spent through these programs in support of roughly 10,000 community-based ICT initiatives ranging from community web portals, public Internet access sites, and community technology centers to computing hardware for schools and network infra-structure for rural and remote communities” (Clement et al., 2004, p. 10).
3. That said, according to Shade (2006), Canada was one of the few countries to consider gender equity in public policy deliberations including concern specifically for gender and information technology. Early Canadian policy formulations on the promotion of universal access to computer technology and the Internet recommended that initiatives consider gender as an important category to include in universal access definitions (Shade, 2006). Unfortunately, gender mainstreaming of Canadian access-to-internet programs never did materialize (Shade, 2006). The Federal government shifted the focus to technical broadband issues and an e-commerce strategy to address the growing trend for a “knowledge-based” economy, and gender considerations became subsumed by Industry Canada’s Connecting Canadians agenda and other international projects (Rideout, 2003).
4. In this respect, as in others, the New Brunswick Community Access Centers (CACs) program resembled Scotland’s Ardmore Network, studied by Tine Kleif and Faulkner (2003), as one of 48 European case studies constituting the recent SIGIS project.
5. Given the pay of $11/hr, it would be unrealistic to attempt to attain advanced technically trained employees.
6. We sometimes refer to managers and clients as “male” or “female” to distinguish “gender.” For an excellent review of the non-consensus use of the terms gender and sex in academic literature, see Muehlenhard and Peterson (2011). They conclude that distinguishing between sex and gender was a valuable contribution at one time. For feminists especially, it provided a way to reject biological determinism that linked biology with rigid sex roles and expectations and, more recently, provided a way to understand trans-sexualism where the biological sex of an individual did not match their gender identity. However, they predict that “as researchers learn more, the distinction between sex and gender may become less important or meaningful” (Muehlenhard & Peterson, 2011, p. 801).
7. We recognize that male managers can be actors in the “feminized space” as well, and that men can have varying arrays of “feminine” attributes. This thinking takes “gender” beyond “sex” and “feminine” qualities into the realm of technology work.

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**Author Biographies**

**Lori Leach** is a researcher with the Provincial Government in the province of New Brunswick, Canada, and, an instructor at the University of New Brunswick.

**Steven Turner** is retired from the University of New Brunswick as professor in the history and social studies of science.