# The Roles that Make the Domestic Work

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## ABSTRACT

This paper builds on earlier CSCW studies of domestic technologies, looking at the frequent maintenance required by new security technologies that households are adopting to provide safety and security. It explores how the roles and responsibilities are allocated within a household to support these domestic routines. This paper reports a qualitative study of usage practices surrounding safety and security. It classifies three primary approaches to computer security in the home, and discusses how technical skill, household structure and gender relate to the approach selected, and discuss the transitory nature of such arrangements.

## Author Keywords

Ethnography, Gender, Security

## ACM Classification Keywords

H5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous.

## General Terms

Human Factors, Security, Theory.

## INTRODUCTION

As new technologies arrive in the home they need to be incorporated into existing domestic routines. Within the field of CSCW, these routines are an established area of study [2, 5, 24]. Grinter and colleagues, for example, describe how domestic networking technologies impact on domestic routines and significant amounts of collaborative work is required for domestic networking. Homes are, after all, sites of collaboration. It is in creating and maintaining roles that we organize our collaborations surrounding digital houseworks. Further, technologies can have gender inscribed into them as part of the design process [13], and they continue to be gendered through use and how roles surrounding them are created.

Housework and the technologies that faciliate it are no different. Digital housekeeping [23], like mundane housekeeping, is a way of contributing to the shared responsibilities of the home. Housework has been examined

in light of gender before [17, 18], but this research precedes the inclusion of modern computing technologies into home-care rituals. Darrah and Lally's ethnographic studies [3, 9] do explore the inclusion of technology in modern family life but they do not discuss how roles are allocated or constructed. Of course, within the larger CSCW community work exists looking at gendered practices of mother's list making [22] or vacuuming [21], but not how the roles of digital housekeeping are constructed and how technologies are gendered through use. Understanding this process of gendering domestic work is critical to creating a holistic picture of domestic technical routines.

This paper presents the results from a study about the collaborative work of ensuring domestic safety and security using technology, a type of digital housework. I did not seek to write a gendered study of housework, but rather gender became an analytical category for my grounded theory [19] that emerged after my fieldwork. Perhaps this in part due to the realities of being a female ethnographer in homes with the type of access that entails seems to have necessitated its discussion. In teasing out the individual voices, I noticed in particular that men and women saw the digital housekeeping of security in different ways and were performing different sorts of activities. In this paper, I build on earlier work [15] which established that technical knowledge in the form of end user programming is a resource informally traded to contribute to the larger domestic economy.

## THE STUDY

In order to understand the domestic ecology of computer security, interviews were conducted with 20 households with individuals ranging in age from three to 85 (see [14 p83-5, 99, 116 & 130] for complete tables of households). Household membership was fluid including visiting parents, girlfriends, ex-husbands, but comprised aproximately 70 people, 49 of which were inerviewed–31 adults and 18 children[1]. This included 11 households with children under 18 (four two-parent households with children, four female headed single-parent households, and three male headed single-parent households, one of which had a new platonic roommate) and nine households without young children (including two multi-generational households with adult children, one couple with a foster child who just moved out, two couples without children, one household of single male

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[1] The children were interviewed as part of my position at Symantec and are discussed separately [13]. Here the discussion will be limited to the adult interviews as covered by my UC Irvine IRB.

roommates and three single individuals living alone). Within each of these types of household structure, I observed patterns in how they met their technology needs.

I conducted the majority of this research in Silicon Valley including San Francisco, Oakland, Berkeley, and San Jose (HH1-12) with a few households in Orange County (HH14&15) or the greater city of Los Angeles (HH16-HH21)[2]. These areas were not chosen as being necessarily representative of the United States or of computer users in general; rather, as high tech centers they enabled ready access to early adopters of domestic technologies. As anthropologist Laura Nader's research [12] suggests, by studying such cultural elites, insight is gained into technology practices for all technology users. Additionally, similar to Darrah et al's research [3], selection of Silicon Valley early adopters enabled me to see how boundaries of work and home are renegotiated in response to new technologies. Active negotiation within the spheres of home and work was especially valuable because of the complex relationships of gender and technology use across public and private spaces.

In order to learn about domestic technology, I employed an ethnographic approach. In-situ studies allowed me to explore the social, physical, fiscal, and temporal environment in which households were making privacy and security decisions and configuring and programming technologies. Participants were asked to complete pre- and post-study questionnaires. While in the home I engaged in interview and observation. I asked participants to give me a tour of the technology artifacts as related to computer safety and security in their home, photographed key objects, and brought dinner (shown to be effective by [8]) in the hopes of having some unstructured time with the family. This was successful, and as a result I became engaged in the domestic routines of setting the table, clearing the table, and washing dishes, which gave me a chance to chat informally.

While Grinter, Tolmie and colleagues' work [7, 23] focuses broadly on home networking, in this study I focused more specifically on managing computer security in the home. I interviewed household members about how they kept their computers safe and secure. I examined the structure of these households, the roles and responsibilities within the household, and the types of activities performed to assure safety and security. While HCI literature often distinguishes between security, a technical concern, and privacy, a largely social concern, it became apparent during my interviews that for my participants the boundary between "security" and "privacy" was indistinct [4].

Throughout the course of the interview, I asked open-ended questions about "privacy and security," and I found that participant responses revealed their characterizations of what these issues entailed. Some focused on traditional security

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concerns: the security of the computer itself; software to protect from viruses, spam, spyware, etc. Others I interviewed focused on what HCI literature typically calls privacy issues such as identity protection. Others still stressed the importance of keeping children safe online. My interviews suggest that while technologists may differentiate between privacy and security, my interviewees did not. Consequently, throughout this paper, I will use this set of tasks, which comprise the member's category of activities that keep them "safe and secure" and refer to this broadly as security.

## DIGITAL DOMESTIC HOUSEKEEPING FOR SECURITY
While there were many differences in how the work of digital security was allocated, broadly speaking the tasks themselves were similar in all of the households though there were varying degrees of caution, vigilance and technical ability. All of our adults participants were aware of spam, computer viruses, and the concept phishing (though often not the term) as things to be avoided and that protective measures needed to be taken, even if some were rather unclear as to the specifics. Inviduals used a combination of technical and social solutions to achieve privacy and security ranging from, for instance, using blocking software, to not opening emails from unknown parties. Amongst those with children they expressed a need to keep them safe from preceived dangers online in the form of predators or age inappropriate content. Each household and household member placed different emphases on the relative importance of these tasks. The interview protocol encouraged participants to comment on both technical and social means of keeping themselves safe and secure. Some areas were emphasized more than others, and the actual steps taken were highly idiosyncratic.

I classifed households into three major types based on how they organized themslves meet their security needs. Of the twenty households I interviewed I classified six into what I call Security Czar Households, four as Self-Support Households, six as Outside-Support Households, and four as blending these approachs or being in a transitional state. Next, I will describe and define each of these types in turn.

### Security Czar Households
Frank (HH1) described safety and security as, "…nothing happens on it [the computer] that I didn't authorize… nothing comes off of it, nothing goes on to it."

The first of the three approaches for households to meet their security needs were the Security Czar Households. The role of Security Czar was held by the most technically sophisticated member of the household; the Security Czars were highly technical in terms of professional background, rating of their own technical ability, and in the type of security tasks they performed. Security Czars took responsibility for traditional security tasks for the household's computers, computer-related childcare, and instruction in ways to protect household-member identity online. Security Czars were present in six of the 20 households I interviewed. The Security-Czar Households

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consisted of two nuclear families, two single fathers with full-time custody of their children, and one single father with partial custody of his child and a new platonic roommate. I have also included a professor who resides in a different state from his wife due her difficulties finding a job locally. These Security-Czar Households had a number of characteristics in common with regard to the Security Czars' levels of technical sophistication and tasks they performed.

The Security Czar in five of these six instances was male. The Security Czars' jobs included three engineers, a UI designer, a statistics professor who relied heavily on computer modeling software, and a "service specialist" who provided technical support over the phone. Each of these jobs typically required significant computer skills. Barbara (HH14), the single Security Czarina, was exceptional in her computer use, as we will see later. In instances where my research team and I interviewed multiple adults in the household, the Security Czars ranked themselves higher than their partners' self-rating. Additionally, there were similarities in the types of activities performed by the Security Czars. This high level of technical ability is of interest relative to the abilities of others in these household, or when compared to Outside-Support Households.

However, other adults and older children in the Security-Czar Households actively engaged in other security activities, which included safe banking and shopping practices along with identity-theft protection procedures. In some of these households, it became apparent through interviews with the household members and the Security Czars themselves that the Security Czar was instrumental in educating them. This opens the possibility that the holder of the Security Czar role, and more broadly how the household organizes itself to meet its technology needs, may change as parties in households increase their skill, and I saw evidence of this through my study.

Security Czars focused on controlling the computer environment for everyone. One way to understand this is to look at previous work on the importance of control of technology and identity. For example, Livingstone [10] proposes that for some men, technology gives them a chance to express control and expertise. We can see this manifest in the experiences of three of the security czars interviewed: Frank, Leshawn, and Barbara.

The importance of control over technology is demonstrated by Frank (HH1), who described safety and security as, "…nothing happens on it [the computer] that I didn't authorize… nothing comes off of it, nothing goes on to it." He later says regarding his children's computer usage that he tries "to appear omnipotent." Similarly, Lashawn (HH20) maintained a home network for his daughter and himself, a network which was also used by his new roommate and upstairs neighbor. He complains that others do not practice similar safe computing practices and says, "I hate that…. some people do not know enough." While he asserts that computing, like driving a car, requires personal responsibility

and training, he prefers to use "access controls" to keep his friends from "messing up" his computers. He has a primary personal machine, and he maintains a separate computer for use by his daughter and his friends. Frank and Lashawn were both successfully maintaining control of their households' technology. This technological mastery provided Frank and Lashawn a masculinity gendered means of interacting with technology, and perhaps a means of demonstrating power and authority in the home. Further, it helps create an identity for them of caretaker giving them the opportunity to digitally nuture.

Barbara was our one Security Czarina, and she, too, spoke of her computer maintenance activities in terms of control by stressing that she was "vigilant." However, she also discussed these activities in terms of their relationship to housework. I interviewed her together with her husband Ken, a general contractor. Barbara was responsible for the IT in the house. Reluctant to be interviewed alone because he didn't think he knew enough technically to be worthy of the interview time, Ken insisted on being interviewed with his wife. Ken's insecurity about his technical ability was unique among the men. He presented himself both as not technical and less technical than he should be—deviating from a norm. While several of my women interviewees unabashedly presented themselves as not technical, none implied they were less technical than they should be. Therefore, I suspected that Ken's true motivation was concern that I would judge him negatively in view of his limited technical skills.

Throughout the interview, both parties volunteered information as to why Barbara was in charge of the technology. Her husband emphasized that her superior technical ability resulted from his being "too impatient." Barbara stressed his technical ability in other realms, "he's the building guy, and he can build a house." Barbara's comment could be interpreted as justification for her household's division of labor, which simultaneously reinforced her femininity and her husband's masculinity. She used to hire a contractor (thus was an Outside-Support Household), but over time, she has become increasingly confident and now rarely seeks assistance. When Ken and Barbara moved to their new house, Barbara set up the network herself, which demonstrated how Barbara was at that point independent from needing the outside contractor's technical support expertise.

A private conversation with Barbara after the dinner interview served to illuminate the division of responsibilities in this home. Shortly after dinner her husband got up and excused himself leaving his wife with the cleaning up, and as it seemed socially appropriate I offered to help her clean up. This built rapport and prompted her to comment that it was unusual to get help with the housework, and her tone conveyed she was not entirely pleased about it. In cleaning up Barbara reinforces her own feminine role. This suggests that her husband's refusal to help with the housework could be viewed as a means of reinforcing the presentation of his

masculinity. While cleaning up, Barbara and I continued our discussion about her active role taking care of the computers:

> Barbara: "It became clear he was not going to do it" and then almost defensively—"he did not have the time."
>
> Interviewer: "Like taking care of the house?" (Said jokingly in reference to his not helping, as we were washing dishes and he was upstairs).
>
> Barbara: "Yeah, it is just another type of housework… "

For Barbara, cleaning the viruses from the computer was an extension of her role as a working mom who was accustomed to organizing her free-lance consulting work around her parental and household responsibilities. Strasser (1985) showed how historically technologies have entered the home and become integrated into woman's domestic role, and this is a present day example.

While Barbara and her husband felt the need to explain why it was Barbara who was in charge of the technology, neither Frank nor his wife Kristin made such comments. Here, Frank was the Security Czar, but despite our asking, neither member of this household volunteered any rationale for how roles were assigned beyond it being "Frank's job," nor commented on the differences in their technological abilities. This suggests that to them the role division was typical enough to not require comment, whereas for Barabara it had caused considerable work in the form of identity management.

Security-Czars had control over children and neighbors as well. Security-Czar Households were more likely to use, or had plans to use, at least some sort of monitoring technology at the Security Czar's instigation. Security Czars were often Outside-Support Provider for several other Outside-Support Households. This observation underscores the importance of moving beyond the core household membership to the entire Technology Household in order to understand how technology needs are met.

Security Czars then serve as the centers of technical knowledge in their homes and, I should emphasize, through these roles they are often engaging in nurturing acts of protecting. For some control over technology was seen as part of the role of a good parent or spouse. These roles are defined in response to both gender roles and technical skill, and to the extent the activity is gendered doing gendered work and adhering to gendered norms can contribute to a sense of domestic harmony. Further, these roles serve as a locus of power and authority as these are negotiated in response to–and because of– technology. Technologies change, and people respond to these changes by learning new skills. At the same time, household boundaries change, and as such, the role of Security Czar must be negotiated and maintained.

### Self-Support Households

> Kathy (HH7) described her strategy for sharing security work with her husband, saying that at work, she is "highly technical" [whereas] at home, "he does it faster." Makes a great comment about dangling a carrot, and he will just fix things, but you need to be careful when you dangle– "it's like a drug."

The second of the three ways in which households met their security needs involved computer owners in each household supporting their own computers. This category, which I refer to as Self-Support Households, consisted of individuals who supported themselves though part of larger households. In these homes, the distribution of power in terms of knowledge derived from technical training, hobbies, or careers, and the resulting authority was more balanced between the adult partners.

The Self-Support Households consisted of two single-user households who supported themselves and two mixed-sex households with children where each adult managed their own computer needs. Like Security Czar Households, the Self-Support Households had significant technical ability; however, mixed-sex Self-Support Households differed from Security-Czar Households in terms of evenly distributed technical ability among household members. For instance, Javed and Kate (HH2) both ranked their computing proficiency highly. Javed worked as a software engineer, and Kate, while she was not working in a technical profession, had obtained a master's degree in software engineering prior to deciding to train as an Emergency Medical Technician. Similarly, both Kathy and Tom (HH7) worked at software companies and rated their computing skills highly. The single individuals, while neither had technologically demanding careers, both came across as more confident with regard to technology during the interview and were older than the singles in Outside-Support Households.

While the allocation of security roles and responsibilities differed sharply between Security-Czar Households and Self-Support Households, the security activities performed were broadly similar with four exceptions. First, variation in security practices by platform was more readily observed in Self-Support Households, perhaps only because there were more Macintosh users in this category. Second, Self-Support Households, unlike Security-Czar Households, had coordination and negotiation difficulties among the adults performing security tasks. Third, whereas in Security-Czar Households women receiving help from a Security Czar did not comment on the domestic division of labor, those in the Self-Support Households spoke at length about these issues. (This is true of the Security Czarina, as well, which contributes to a larger point that women engaging in technical work had the additional burden of negotiating how they presented their gender and technical ability). Fourth, and perhaps as a consequence, I observed the women in Self-Support Households providing the computer security related childcare, whereas in Security Czar Households, the Security Czar, regardless of gender, provided such care.

Not only were there differences in how couples practiced and coordinated care, there were differences in how the women in these two households discussed their involvement in home computing security. Kate (HH2) did not volunteer comments about her technical abilities and only mentioned her

husband's technology skills in the context of coordinating software licensing and care for their foster daughter. She felt her technical abilities and the allocation of the couple's roles were unremarkable.

Kathy (HH7), who is a product researcher in a technology company, however, spent considerable time explaining her technical identity. She describes herself as,

> "textbook [in that] she can do it all at the office but does not know how to use the [stereo] speakers. [She stated,] "I don't want to have to do tech." She wants to turn her brain off when she gets home and just ask her husband, even though she could have figured it out at work. [She] jokes, "it's his job, I do the dishes.""

Though Kathy claims she "turns off her brain" with regard to technology at home, she competently described needing to remind her ISP to turn "SMTP authentication" back on when her email account gets hijacked. She describes her security practices as follows,

> She says she is "pretty vigilant" and has two main strategies to keep herself safe online: "no static IP and get virus software up [and running]… it's the only safeguard you've got so they won't target a specific machine." She uses "IP mirroring from DSL to house" – this is set up by some combination of her husband and her provider. She said to ask him [her husband] for more details, "He's the IT guy."

> At work she says she is "highly technical" [whereas] here "he does it faster." Makes a great comment about dangling a carrot, and he will just fix things, but you need to be careful when you dangle– "it's like a drug."

Kathy is independent, but by strategically "dangling a carrot" in front of her husband, she takes advantage of what she perceives to be his ability to do things faster and to perform tasks she does not wish to do. Kathy gives an example of a recent installation,

> [She] said when she installed something [unspecified] she handed it to Tom to poke at—he played with it for a day and figured it out.

Kathy is capable of maintaining her own machine and does a great deal of the maintenance; however, she is constructing her technical ability in response to her situation and occasionally appeals to traditional gender roles—"it's his job, I do the dishes." When Kathy mentioned, "dangling a carrot," she said it almost suggestively, giving me a knowing look that implied I knew exactly what she meant. Of course, from the rest of her comments, we know that the technical problem itself serves as a "carrot" in that her partner relishes the chance to master technology. What went unspoken and was conveyed only by Kathy's tone is that flirtation, flattery, and appeals to gender roles, all can be combined to encourage him to do the task. This suggests that security work is not simply done by the individual with the most skill, but rather it is subject to social relationships and the possiblity that individuals may minimize the appearance of technical skill to allow better management of their gender identity or to help ensure an equitable division of domestic work.

Even though both of these women were engaged in the security activities in the home, they were negotiating their activities with regard to their presentation of their feminine identity very differently. Kathy acknowledged that there were differences between her technical ability and that of her husband; additionally she knew her husband's fascination with technology was a strong motivator for him. She would take advantage of these ability differences and appeal to gender roles to ensure completion of tasks. In Kate's case, however, while gender roles existed in the form of her more extensive involvement in computer related childcare, these roles were not explicitly appealed to in determining how tasks were allocated. This suggests construction of technical and feminine identities can vary substantially even in households with similar technology role allocation.

In both of these households, care for the children's safety online was a topic the women spoke to at much greater length, even though both men were asked the same questions which is indicative of these women's greater involvement in childcare related to computer use. Whereas Security Czars, the five male and one female alike, were primarily responsible for monitoring children's activities online, women in the Self-Support Households were fully responsible for the day-to-day, computer-related childcare tasks. While the adults were each responsible for themselves, the women were, in essence, acting as Security Czars for the children by assuming primary responsibility for child-care related computing.

The Security-Czar Households and Self-Support Households had many similarities in terms of security activities, yet there were some key gender differences from the primarily male Security Czars. Women in this category had greater technical ability than the female recipients of Security-Czar care. I saw examples of both men and women supporting themselves in Self-Support Households, and within the two-adult Self-Support Households, women were technologically independent. However, unlike the women in Security-Czar Households, women in Self-Support Households had the additional burdens of communication difficulties and meeting their own and their children's technology needs. When asked about their roles in using the various security technologies and the history of each security technology in the home, these women used a range of approaches in discussing their technical and gender identities. For some women it became clear that their technical and gender identities were subject to much explicit negotiation whereas others answered without mentioning their technical and gender identities. Yet their involvement and decision to participate or not participate in these security tasks means that all of these women were co-constructing their gender and technological identities. Whereas, women receiving care from a Security Czar avoided identity management work, these women had to incorporate their technical skills into their feminine identity. This suggests that how one defines ones identity is critical to the creation of roles for digital housework.

## Outside-Support Households

> Um, I don't know what there is so, I rely on my IT person at the office to recommend what we need, and he has just put the Trend (Anti Virus) on it. But uh, one of my solutions…. but nobody one will listen to me…" (Christina HH3).

The third and final way in which households met their security needs was to seek help from a source outside the household boundaries. This Outside-Support Provider became part of the households' larger Technology Household, and the individuals providing the support may well have been Security Czars or self-sufficient individuals in their own homes. These six Outside-Support Households sought external assistance from corporate IT, friends and family, or some combination of the two. Outside-Support Households differed from Security-Czar Households and Self-Support Households both in terms of demographic characteristics and the activities performed.

All of the Outside-Support Households were less technical than those in the other two categories. This relative technical disparity was likely a key contributor to their need to seek outside sources of current and more advanced technical knowledge. However, there were additional demographic differences. In particular, there was a distinct demographic difference based on the source for their Outside-Support Provider. The mixed-sex households (HH3&5) both relied on their company's IT department whereas the single women primarily sought help from significant others.

In HH6, HH10 & HH19 at least one of their Outside-Support Providers was a significant other. These households all consisted of women living without other adults. Lisa (HH11) was dating a man in her company's IT department due to her romantic relationship, she received individualized technical services beyond what she could expect him to provide in his official capacity in support.

Unlike the other Outside-Support Households that used IT as the Outside-Support Provider and worked at companies with significant IT support, these women worked in careers (marketing, film production, biotech management) that were less computer-focused and thereby characterized by less access to professional IT support. These individuals owned single computers and did not have a home network.

Finally, Outside-Support Households negotiated assistance through existing social relationships. Professional relationships allowed some households to obtain both computers and support out of professional obligation, whereas social relationships allowed gifts of technological expertise and equipment. The source of the Outside-Support Provider and resulting obligation affected how household members went about getting help, which I will discuss in the next section.

All of these households relied on help outside the home for their most technically demanding security tasks. However, there were also activities for which they relied on other members of the household or took care of by themselves. One area in which all of these households relied on their Outside-Support Provider was computer selection and setup of initial security software.

For individuals who used their social networks to obtain their Outside-Support Provider, this assistance represented a gift and a form of nurturing. As Sara (HH19) explains, "part of the gift was that someone set it all up for me." Lisa stressed that because it was a gift she was not able to influence decisions. Her boyfriend installed AVG, a popular Anti-Virus program, because it was free and would not require an annual payment to update. Yet once she started using it, she found she preferred the interface of Norton Anti-Virus, which she had on her old computer. She wanted to switch back, but did not know how. Since it was a gift she had to wait for an appropriate time to ask him for additional help and socially negotiate the situation so as not to appear ungrateful.

In addition to computer selection and the initial security setup, individuals who used their social networks to obtain their Outside-Support Provider sought help with major issues. For instance, Christina (HH3) went to her IT department to remove a virus whereas Sara, (HH19), sought help from her brother and then from her now ex-boyfriend to recover data following a hard-drive failure. Lori (HH10) and Yan (HH6) both went to their outside resources to have their home networks installed. In some instances, the an Outside-Support Provider set up the computer to automatically update itself with current virus definitions and other security updates (HH3, HH5, HH6, HH11).

Despite this reliance on external resources, there were three key areas where these individuals relied on themselves. First, these households were self-reliant when they were unable to obtain additional assistance and were forced to fill in the gaps to make the technology usable. For instance, given that home networks are not something corporate IT at larger firms will typically set up for employees, the HH5 home network was set-up by Sameer. While in some instances the Outside-Support Providers set up computers to automatically update in some households (Rati in HH5, HH10, HH19), the core members themselves were responsible for routine security maintenance such as installing Windows updates or updating virus definition files for their own computers. Second, these individuals were very concerned about identity theft, spam, and safe shopping practices, and engaged in a number of protective practices. These included not giving out contact information; using different email addresses or fake email addresses for potentially risky situations; avoiding online shopping; regularly monitoring credit-card statements; looking for security icons; and avoiding unknown sites. Finally, the third area of independence focused on keeping children safe online. Having outside security support still left these individuals with tasks they needed to perform themselves.

Yet, despite this independence from outside support for some security activities, some of the women in this category attempted to minimize their technical abilities by either

downplaying the abilities themselves or their abilities relative to their Outside-Support Provider.

Two of these women downplayed their technical knowledge directly. Rati, a usability professional (HH5) at a major software company, downplayed her understanding of home networks, an area for which her husband was responsible. During the course of the interview, she was asked how she would describe a firewall to a friend. She explained, "kind of like your wireless encryption… you set it up to protect your Internet connection and keep people from hacking in." This is a largely technically correct definition, yet she preceded the remark by saying, "that's his department…" (laughing and pointing at her husband being interviewed in the next room). She clarified that she would not know how to configure it, again implying that it was his domain. Similarly, Yan (HH6), who holds a Ph.D. and a professional position in a biotech firm, easily and accurately explained that some viruses "delete (files) or severely damage your computer" adding that they "can spread out—automatically affect others—[via a] mailing list." Despite being correct, she prefaced her answer with the caveat that she was "not savvy" when it came to technology. By downplaying their technical abilities or playing up the abilities of others Rati and Yan are both minimizing their expertise—presenting themselves as a non-expert.

Another strategy employed by two women in Outside-Support Households was to explain technological behavior in metaphorical terms by drawing on non-computing domains. Whereas previous research posits that men discuss technology in terms of specific technical functionalities or a set of acceptable technical metaphors that allow them to express mastery and control [10], these women did not. Sara (HH19), for example, described anti-spyware software as something that "protects her from evil things." A more involved series of vignettes from Christina (HH3) speaks to the same point.

Christina willingly gave control of her laptop to the IT person she hired to help with her home-based business, and trusted his judgment as to when to update software saying she would "rely on IT people to tell" her what she needed. For instance, when discussing how the IT person repaired her computer after a virus caused it to start running slowly, she mentioned he did his "magic." Further, she expressed hesitation about shopping on Amazon.com, joking that when she did find herself needing to shop there, she would "pray" that everything would work out well. She returned to this later when I asked her how she determined which sites were safe, saying that she relied on "just prayer"; beyond prayer, she said she "did not know how to decide." Christina's needs were served by explaining these technologies in metaphorical terms that pull from other domains. While the activity of prayer itself might be viewed as a means of expressing control, Christina's comment, "I did not know how to decide," conveys uncertainty. Unfortunately, this gendered difference in terminology—terms of technological mastery compared to use of non-accepted metaphors—has the

potential of being misinterpreted. Christina's uncertainty has the potential of coloring her metaphorical usage making it appear unsophisticated, as opposed to employing a different paradigm.

For instance, Christina demonstrated significant technological knowledge in her understanding of viruses, yet her husband disregarded her technological solution to the virus problem. During the interview she was asked to define a virus, which she described as "a worm eating away at the computer brains." She reported using Trend Microsystem Anti-Virus on the pre-screen questionnaire to protect her against viruses. Our discussion follows:

> I: "And are there, umm, any other sorts of programs that you feel like you need to keep your computer safe from these 'worms eating away at the computer's brains?'"
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> S: "Um, I don't know what there is so, I rely on my IT person at the office to recommend what we need, and he has just put the Trend (Microsystems Anti Virus) on it. But uh, one of my solutions, but nobody one will listen to me…"
>
> I: "mmhh? Well I will!"
>
> S: "Well, I said to my husband, I said why don't they just get a Macintosh! 'Cause I understand Macintoshes don't get viruses, wouldn't it be way easier if it [sic] just got a Macintosh? If it were up to me, and it were just me, I would buy a Macintosh. But because we do work between our home and with the office *he* says they won't be compatible, or he's afraid they won't be compatible, or it will be a hassle to make them compatible. So for that reason I am locked into a PC. But if it weren't for the business I would just buy a Mac."

Once it became clear I was taking Christina's technical knowledge seriously her tone shifted. She switched from metaphorical descriptions to more concrete ones. It is unclear from this discussion whether she actually believes Macintoshes have no viruses or was just exaggerating as part of her enthusiastic appreciation of having someone to listen to her opinion. Regardless, here she is demonstrating technological knowledge that Macintoshes are less susceptible to viruses and require less active security vigilance than Windows, and she feels her husband is not taking her proposed solution seriously. Her solution is a pragmatic one in that buying a Macintosh accomplishes the goal of secure computing environment without the need for additional software. Despite it being a much less time intensive solution to the same problem such a simple, self-contained solution, however, it does not provide her with the opportunity to demonstrate as much technical mastery as her husband's PC use. Consequently, this likely affects her husband's perception of her solution. This is aggravated by her tendency to use metaphorical descriptions such as "eating away at the computer's brains" rather than technical terms that demonstrate mastery and control. This suggests that the alternate metaphorical paradigm has the potential for being misunderstood.

At the same time, perhaps partially in response to not being taken seriously by their partners when doing technology work themselves, I suggest that women may be aware of this potential and use these metaphors, perhaps unconsciously, to

minimize the perception of their agency to encouraging outside support. In line with Turkle's [25] notion of women as intentionally defining themselves as a-technological to preserve their femininity, if women secure outside computing support in this fashion, their technology needs are met in a fashion that does not require gender inauthenticity, giving the largely male computer Outside-Support provider a chance to reaffirm his masculinity by asserting control. For instance, Christina's abrupt change in tone once it became clear that I, unlike her partner, was taking her technical knowledge seriously, suggests she may have been doing that whether consciously or unconsciously.

Those seeking support from an Outside-Support Provider did so for only some activities, whereas for other functions, they relied on themselves. The individuals in Outside-Support Households demonstrate that an Outside-Support Provider is a resource that could not be relied upon, but rather the support is often a gift from a lover or a friend or even a perk from working at a company. Consequently, computing assistance may come with social obligations. Like the women in the Self-Support Households, they were performing computer-security-related childcare on their own. While I saw examples of women from all three categories manage their presentation of their gender and technical ability, women in Outside-Support Households were most likely to do so in a fashion that downplayed their technical abilities even for security tasks they performed themselves. As a consequence of needing to seek assistance from the outside resulted in these women risk becoming dependent on an Outside-Support Provider to take care of their security and prevented them from developing the skills needed to manage these tasks on their own.

### Blended Households and Households in Transition

Four households used a mixture of the above three approaches to achieve a safe and secure computing environment. This included a household of single men, a woman undergoing a divorce, and two elderly couples with adult sons living at home. Looking at these homes best illustrates how computing support changes as household structures themselves change.

The first two of these were actively undergoing or had recently undergone structural change. HH21 consisted of five single men, three of whom were interviewed. In some respects, the owner of the home functioned as the Security Czar by setting up the network. One housemate was self reliant in all other respects, and the third still relied on the Security Czar of his previous residence, a close friend.

Aileen (HH8), who was going through a transitional period due to a divorce. It had been decided that the children would remain in the family home, with each parent spending part of the week with them. She had previously relied on her husband as a Security Czar. Because of the unique post-divorce housing arrangement, she planned to continue relying on him in the main house. In her own home, she was learning to support herself. This suggests that as households are

reconfigured in response to life events, access to those on whom one is dependent for technology guidance may become limited or the person one looks to for support may change altogether.

HH4 and HH14 both consisted of elderly couples living with their adult sons. In both cases, the adult sons to some extent act as Security Czars. In one household, Louis (HH4) resents having to provide his parents with support and attempts to avoid having to do so, an attitude that is consistent with Grinter's findings [6]. In the other household, Richard communicates technical knowledge well to his father, but he finds that his mother often "throws up her hands" in frustration. Consequently, in both cases the parents seek outside assistance. Unlike Outside-Support Households, however, neither household had a central Outside-Support Provider, which requires the coordination of potentially disparate technical knowledge.

The women in these elderly couples primarily sought help from men outside the home. Ila (HH4), a widow, used to rely on her husband but now relies on her three sons, her grandnephew, her late husband's stepson, and her new partner's son. During the course of the interview, she specified what kinds of assistance she received from each of these men. June and Manny (HH15) received additional assistance from their two grandsons. However, both of these women relied on their daughters for assistance with online shopping. Regardless of the gender of their helpers, these individuals received technology support from a variety of places and subsequently had to coordinate care.

These transitional households illustrate how computing support patterns are transitory and adjust to life events. Death, divorce, new jobs, moving, going off to college, and interpersonal relationships all can change how a household obtains its computing resources. Roles and responsibilities related to online safety and security are renegotiated accordingly in response to these events.

### DISCUSSION

This paper presents an account of the nature of digital housekeeping in regards to computer security and privacy, and suggests gender is an important element of understanding collaborative work in the home. While Tolmie and colleagues [22] differentiate themselves from "traditional social science accounts of housekeeping, which emphasize the roles of gender divisions to the accomplishment of housework in general," I have shown here how gender and gender roles are attributes around which digital housekeeping is organized. I have demonstrated that there are observable patterns in men's and women's behavior and how participants engaged with performing gender [1,6] in the context of social expectations of what men and women do. Further, as role boundaries around new technologies are socially defined, this intersection is critical for understanding identity with regard to gender and technology.

Each of these three approaches to allocating security roles and responsibilities construct and adhere to gender roles differently. Our male Security Czars sought control and were responsible for all of the households' technology, including monitoring technology for children's activity. Doing so removed all, or nearly all, computing tasks from the female head of household. While the female partners of Czars were reliant on their partners for security support, they were the only people for whom these technologies did not introduce additional work. They were also the only women for whom the introduction of computing into the home did not add an additional childcare task. Our female Security Czarina accomplished these duties by herself, but she was careful to present them in terms of traditional duties of the housewife, while at the same time emphasizing her husband's technical ability. Other women sought help from outside the household, and while performing some duties on their own, downplayed their technical abilities. How these women presented their technical abilities with regard to agency was negotiated along with the types of computer-related work they performed.

Technical identity and gender identity are key subjects of this renegotiation as they affect gendered divisions of labor. I have shown here that women were thinking about how to present their technology knowledge to their partner. Further, I have shown that lack of technical knowledge may be desirable in some circumstances. Women who relied on a Security Czar or Outside Support Provider avoided significant amounts of digital housekeeping, and consequently such roles may be one way women limit their overall housekeeping responsibilities. Gender and technical identity are being co-constructed, as for both men and women this influences the allocation of roles and responsibilities within the home.

Power, authority, responsibility, and independence all emerge in response to whether households seek knowledge from without or within. Security-Czar Households tend to have a central point of knowledge, and for the men I interviewed, mastery of technology allows for an expression of control. Households with multiple adults with balanced technical knowledge, or technically competent single individuals tend to provide their own support. Finally, households with less technical knowledge seek an Outside-Support Provider. However, as new requirements for technical knowledge emerge, which results in new opportunities to learn, the roles of Security-Czar and Outside-Support Provider are constantly renegotiated. These renegotiations occur in response to changes in the home, which include changes in membership, structural or situational, as well as evolving technical abilities among household members. As such, to understand and design for the collaborative work of the home, we must understand the nature of these transitions and design technology that accommodates renegotiation of roles.

The renegotiation is tied to existing relationships with relatives, friends, neighbors, and colleagues. Renegotiations occur in response to these relationships and the roles with which they are imbued; consequently they are just as much about reinforcing the social relationship as they are about accomplishing the technical work. Repeatedly we saw instances of parents caring for their children, and spouses caring for one another as a form of digital nurturing. Similarly, Lisa (HH11), in waiting for a polite time to ask for new anti-virus software, places more value on ensuring domestic harmony than resolving her technical challenges. The technical and the social are tightly coupled with technology roles that not only result in the acts of digital housekeeping, but reinforce social bonds.

## CONCLUSIONS

Households meet their technical needs in a variety of ways through the constructions of digital housekeeping roles. Each of the three primary approaches discussed here—Security Czar Households, Self-Support Households, or Outside-Support Households has associated costs and benefits. This work suggests that we can no longer assume digital housekeeping tasks are assigned in response solely to technical skills. As technical skills, as well as, household structure, and memberships change, these approaches are reinterpreted. I have shown how centers of technical knowledge in the home affect how computing needs are met, but also how these roles are also organized in response to domestic priorities, as well as, themes such as power and authority, responsibility and independence, providing and nurturing, construction of identity, and preservation of domestic harmony, and maintenance of gender roles.

Further, I have shown that the technical work from security tasks is only one part of work that results from new technologies. As new technologies are integrated into the home, we must adapt domestic roles, including gender roles to accommodate them. Individuals are co-constructing both their gender and their technical identity. Not only is technical work being done, but identity work is being done as well. Gender is as we learn from Gofmann and Butler performative, and as such an act of ongoing identity construction [1, 6]. This suggests that technology must be designed not only to accommodate varying skill levels in the home and support the technical demands placed upon it, but it must be designed responsively to the type of identity work that is going on as well. (And it is further complicated by gendered used of technology metaphors as I have shown). As technical skill runs counter to traditional Western definitions of femininity [25], integrating technologies into domestic routines will continue to present a challenge for women's identity construction in particular, and I have shown examples of both how some women negotiate technical femininity and others actively adopt strategies to share technical work with other member of their household. For men, I have shown how technological expertise can provide a means of nurturing and demonstrating *digital chivalry*. Identity is being constructed in relation to technology and normative gender.

While normative gender practices are subject to redefinition and re-inscription as technologists we have the opportunity to actively support this identity work in our designs, and potentially help ensure greater equity in domestic work (which is still shown to be problematic [11,20]). As we engage in design, we must not only design for the task of digital housekeeping, we must be mindful of the social construction of these roles and the social values our technologies reinforce in response to digital housekeeping.

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