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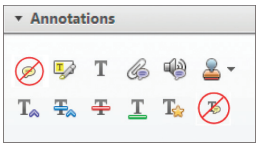
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Article

CONVERGENCE

Digital housekeepers and domestic expertise in the networked home

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Abstract

This article examines the distribution of expertise in the performance of 'digital housekeeping' required to maintain a networked home. It considers the labours required to maintain a networked home, the forms of digital expertise that are available and valued in digital housekeeping, and ways in which expertise is gendered in distribution amongst household members. As part of this discussion, we consider how digital housekeeping implicitly situates technology work within the home in the role of the 'housekeeper', a term that is complicated by gendered sensitivities. Digital housework, like other forms of domestic labour, contributes to identity and self-worth. The concept of housework also affords visibility of the digital housekeeper's enrolment in the project of maintaining the household. This article therefore asks, what is at stake in the gendered distribution of digital housekeeping?

Keywords

Digital housekeeping, domestication, domestic labour, expertise, gender, labour, networked home

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Introduction

This article considers the distribution of expertise in the performance of 'digital housekeeping' (Tolmie et al., 2007). That is, the labour required to maintain a networked home. The networked home encompasses a multitude of devices and services and their interrelations in an ecology of media. Digital housekeeping is a useful term for drawing attention to the kind of expertise required, and the labour performed within the home to create and maintain this media ecology and to integrate it into the domestic setting.

By expertise, we mean the shared social construct that incorporates specialized knowledge, skills and comprehension (Bassett, 2013). Expertise is a complex topic, diverse in definition, domains and impact. The literature on expertise identifies and defines expert knowledge through a range of strategies, activities and characteristics. These can be loosely summarized as: agency in decision-making, the ability to see meaning and implications of actions, the interiorization of cognitive capacity and a sense of responsibility (e.g. Cellier et al., 1997; Farrington-Darby and Wilson, 2006; Glaser and Chi, 1988; Shanteau, 1992). In relation to new media, debates locate expertise in discussions of terms such as 'literacy' and 'digital natives', the latter indicating expertise as an inherent characteristic that omits the labours of becoming expert. An expert, the person perceived to have the social and cultural capital of expertise, has contextual knowledge of specific items or terminology related to a particular area (Xiao et al., 1997); is able to do particular tasks in relation to the topic (Urena, 2004); and comprehends the significance of what they know and do (Farrington-Darby and Wilson, 2006). The emergence of the term expertise since the 1970s is attributable to the growth of knowledge-based professions (McNeil, 1998: 55–56) and co-emerged alongside the proliferation of information and communication technologies. There are, however, concerns over what constitutes expertise, especially from the perspective of gender (Fleck and Tierney, 1991). Works motivated by such concerns have 'exposed the social and political construction of expertise' (McNeil, 1998: 57; see also Cockburn, 1983, 1985; Phillips and Taylor, 1980; Wajcman, 1991). These works highlight the bias with which expertise is attributed by virtue of sex.

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The findings presented in this article, based on a study on the impact of high-speed broadband on Australian home life, indicate how transformations within household media configurations give rise to new opportunities for 'digital expertise' under conditions of persistent gender inequalities. We identify how expertise developed in the home is applied to other social fields and consider the cost of maintaining a networked home in terms of the labour required and its trade-off against other household activities. The work of situating and maintaining technology in the home emphasizes the social and material construction of technology in everyday life.

We draw from ethnographic and qualitative data collected in 2013 and 2014 on the impact of high-speed broadband in the home to consider how expertise and gender play out in the way household members interact with and manage domestic media technologies. The sample consists of 22 households from Victoria, Australia, connected to high-speed broadband through the Australian Government's National Broadband Network with media ecologies of varying complexities ranging from the simple (few devices with basic network set-ups) to the highly complex 'bleeding edge' (pushing the limits of the capabilities of technologies within their household). The sample also contains geographical and other technological variables, from urban and suburban homes with fibre to the premises (FttP), to regional homes on wireless connections, and remote homes connecting via satellite. The article is based on qualitative data from interviews with members of each of the 22 households and technology tours of the media ecologies within each of the homes. During

this field research, we observed different kinds of work and expertise that went into the adoption and domestication of this digital infrastructure, which extended to the management of digital content, devices and networks.

Within media studies, there is a strong tradition of studying the adoption and 'domestication' of technologies, which this research builds on (e.g. Silverstone and Haddon, 1996; Silverstone and Hirsch, 1992; Spigel, 2001). Domestication research examines the contexts in which media technologies are experienced, what they mean to the people encountering them, and the role these technologies play in everyday life, typically within the home. Whilst domestication research has predominantly focused on particular technologies, such as the computer (Aune, 1996; Bakardjieva, 2005; Lally, 2002), the internet (Bergman and van Zoonen, 1999; Ward, 2005) and mobile phones (Haddon, 2003), more recent research highlights the importance of studying the interrelations of multiple technologies within the home.

Whilst early domestication research often focused on moments of acquisition, including the pre-acquisition period where the technologies' place with the existing ecology of the home was imagined, and the processes of accommodation, in which technologies are physically and symbolically located in the home, it is important to note that domestication remains an ongoing process (Haddon, 2004; Miller, 2010, 2012). As part of the ongoing process of domestication, the formation and negotiation of social 'rules' around how household members interact with particular technologies also play into the ways technologies are domesticated. Household members, for example, may exert control over others' access to or use of digital media in the home based upon issues such as location, ownership or the division of labour. As part of engaging with technologies, then, domestication research must take account of the economic, political and cultural contexts both within and beyond the walls of the home (e.g. Lally, 2002; Pierson, 2005; Ward, 2005).

Domestic labour practices, for example, have a significant bearing on domestication within the home through the efforts required to integrate new technologies into the household's media ecologies, efforts that may be 'resisted' by the technologies themselves, by existing rhythms within the household and by other household members. Far from serving to realize the putative end of labour in the home, new technologies often require significant work. This finding is supported by research by Tolmie et al., who use the term digital housekeeping to refer to 'the work involved in setting up and maintaining home networks' (2007: 332).

The term digital housekeeping also suggests discourses of housekeeping as women's work and AQ2 situates our study in relation to earlier accounts of gendered household labour (e.g. ~~Fox, 1980;~~ Hochschild and Machung, 1989; Malos, 1975; Vogel, 1995). The ways in which household labour is distributed and negotiated have gendered meanings. The introduction of labour saving technologies to the home – such as washing machines and microwaves – changed the way women performed housework and the amount of time others in the household (i.e. men and children) allocated to housework, yet did not significantly reduce the amount of time women spend performing domestic labour (Cowan, 1983).

We consider how digital housekeeping implicitly situates technology work within the home in the role of the 'housekeeper', a term which is complicated by gendered sensitivities to the distribution of domestic labour (Bell et al., 2005; Blythe and Monk, 2002). Already established in feminist approaches to domestication research is a consideration of the gendering processes of technology, such as how identities in relation to technology are gendered and how particular technologies are themselves gendered in their aesthetics, uses and perceived meanings (Berg, 1997; Bergman and van Zoonen, 1999). A feminist approach draws attention to such labours, shows how expertise is unevenly acquired and the ways in which particular values are inscribed in

constructions of expertise. Furthermore, it draws attention to the way in which expertise is motivated by particular gendered desires and interests.

Based on the arguments outlined above, in this article, we firstly set out the kinds of work that constitute digital housekeeping. This is followed by an examination of the forms of digital expertise that are available and valued within the home. Thirdly, we look at how expertise is performed and distributed amongst household members. Finally, we consider the conditions of labour under which such expertise is accessed or required, paying particular attention to the gendering of this labour. These aspects of work, expertise and gender are situated in relation to the demands made by the evolving dynamics of household media ecologies, newly impacted by the appropriation of high-speed broadband infrastructure.

Practices of digital housekeeping

General housekeeping activities serve to maintain the functioning and maintenance of the household and are associated with a wide range of tasks including meal planning and preparation; shopping; cleaning; laundry; maintenance and repairs; care of adults, children and pets; management of bills and expenses; and transportation (Arrighi and Maume, 2000; Cunningham, 2007; Lachance-Grzela and Bouchard, 2010). These forms of work are usually conceptualized as unpaid and may be conducted routinely or intermittently (Lachance-Grzela and Bouchard, 2010: 769). Census surveys documenting the distribution of these tasks within the home repeatedly identify gender division in the hours dedicated to performing these tasks (Australian Bureau of Statistics, 1997, 2006, 2009). Such surveys do not include tasks related to digital housekeeping, which this article positions as an additional form of labour, also conceptualized as unpaid, in the networked home. In this section of the article, we identify the types of labour involved in digital housekeeping, and how these labours contribute to shaping the rhythms of home life.

Managing digital content

One of the most prevalent forms of digital housekeeping to emerge through our data is *the access and management of digital content*. Homes with high-speed broadband show a strong preference for accessing digital content on demand compared with broader national patterns of internet use (Ewing and Thomas, 2012). Identifying, accessing, storing and organizing digital content is a significant feature of digital housekeeping (Tolmie et al., 2007), which is performed in reaction to, or anticipation of, household needs. For instance, Doug lives with his young family in an area of Victoria that is approximately 4 h east of Melbourne. His family access high-speed broadband through a satellite connection. At the time of our first interview, Doug was downloading a recently released animated movie for his family to enjoy later that evening. Their Saturday night movie routine is reliant on Doug identifying a suitable 'family friendly' movie, locating it online and downloading it in time for them to watch. Downloading is problematic with their intermittent satellite connection. If the service is interrupted it can take several hours, so Doug has to schedule this task ahead of time. Digital housekeeping in relation to content is chiefly concerned with its acquisition, a problem associated with their limited broadband connection.

For other participants, digital housekeeping in relation to content is chiefly concerned with its storage and organization because faster connections mean acquiring content is a less laborious process. Visiting a home in the inner suburbs of north Melbourne shared by three young professionals highlights the variations in the degrees of labour required to access content. On a FttP

connection, Christine, Alexis and Shawn can download content very quickly, 'it doesn't require much forward planning' (Christine, in interview, 2013). What does require planning and attention in their house is the process of storing digital content. They have two hard drives, each with a capacity of one terabyte, connected directly to the TV. One hard drive is for TV series, the other for movies. Christine recently reorganized the content on each of the hard drives so that it is possible for others to find items stored on them. The volume of content, together with the habit of dumping content in an operative folder, that is, downloads, in anticipation of immediate viewing, meant that the collection of files had become unwieldy. Prior to Christine's reorganization of the hard drives, they were downloading duplicates of content because it wasn't immediately obvious that a file was already available.

Managing digital networks

In addition to managing the acquisition and organization of media content, an important aspect of digital housekeeping is concerned with managing the materiality and the interoperability of the devices that contain and present that content. The material form of the devices needs to be integrated into the domestic environment in aesthetically pleasing ways as well as in a way that is functional. Aesthetic housekeeping tasks identified through the data include stacking hard drives neatly, hiding wires, making devices look orderly and so on.

Furthermore, the work required to manage the aesthetics and the function of digital devices began prior to the point of acquisition, when researching particular technologies to purchase, and investigating how they might be integrated into the current aesthetic and functional ecology of the home. For example, Carl, running an online marketing business from his inner urban home, carefully researches interoperability between new and current devices prior to purchase – a non-trivial task that may occupy many hours.

Once devices have entered the home, digital housekeepers *position the device in the existing ecology of the home*, which often involves getting the new device to 'speak' to the network of existing ones. Depending on the expertise available within the home, and degree of interoperability required, selection of new devices may be made based on perceptions of ease of establishing interoperability. In Anne and Michael's home, recent technology purchases have all been Apple products because they perceive the interoperability of devices within the Apple ecosystem to be seamless. This is obviously not always the case, as they discovered when they realized that switching from a Mac to a Macbook meant their music no longer streamed to their TV without some reconfiguration, a job which Michael has yet to find time to attend to.

The labour required to get the devices to 'talk' to one another, and to re-establishing rhythms of family media use, is significant. Digital housekeeping is especially labourious and frustrating when the interoperability of devices in the networked ecology is opaque, and expertise falls short. For instance, Diane and Scott spent a considerable amount of time investigating why their wireless doorbell was ringing every time the living room lights were switched on using the light's wireless remote:

> When you turn the lights on the doorbell rings. The light is on remote control. . . . Sometimes the doorbell would ring at night. (Scott, in interview, 2013)

Such examples demonstrate that bringing new devices into the networked home brings about new complexities of interoperability. They also demonstrate that expertise and digital housekeeping are not mutually constitutive. The ability to maintain systems of interoperability is linked

to comprehension of how such systems function. With this in mind, below we consider what constitutes digital expertise within the home and what forms of digital expertise are available and valued within the home.

Expertise within the home

Expertise can be described as a techno-social construction that draws upon existing social and technological dynamics, such as the political economy of technological production and materiality of digital systems through which the user is 'configured' (Bassett et al., 2013). From the data, we identify three particular measures that households used to differentiate expertise, namely, comprehension, knowledge transfer and automation.

As already indicated in the previous section, *comprehension of systems* is an example of digital expertise. This is performed in a variety of ways. Christine set up the household's communal media system so that the computer connected to the TV can be controlled from an app on her iPad. She also set up the same app on her housemate Alexis's iPad. There is a distinction to be made between expertise in the use of preconfigured systems and expertise in constructing such systems. Christine is able to install complex media set-ups, but she is not interested in understanding how the system functions beyond the interface and her own use.

Acquisition of expertise is motivated by a desire for comprehension. Diane and Scott are learning to comprehend systems: 'it's hard', says Diane (in interview, 2013). Diane doesn't feel she understands a great deal about how digital devices work, she tries to 'fix things' in an effort to comprehend better. For instance, Diane just learnt how to configure her email accounts on her smart phone:

> I just learnt to set up email, and the difference between POP and IMAP addresses. I'm impressed because my brother couldn't work it out and he's in IT. Now I know the difference. POP address will only sync your inbox, IMAP will sync in and out. (Diane, in interview, 2013)

The process of becoming expert involves a period of learning, whereby skills are acquired and practiced in a deliberate manner. Deborah and Donald live just outside a regional town on a fixed wireless connection. Deborah and Donald's usage of their devices suggests limited digital expertise. When showing their shared laptop to us during our first interview, Deborah conflates the Wi-Fi signal strength with the internet connection strength. Deborah also tells us she turns the laptop off after use so that spam emails cannot 'get through' (in interview, 2013). However, since getting high-speed broadband, both Deborah and Donald have spent more time getting to understand the digital technologies already in their home. Specifically, Donald has become much more involved in the Web-design process and had learnt to manage his business's website himself. He now creates all content for the website, learning basic Web development and photo editing skills in the process. With this in mind, Deborah describes Donald's acquisition of digital knowledge, and his shift in their social circles from novice to expert:

> He has learnt so much in the past 7 months. Learnt so much! Now he's functioning on his own which is huge for him. He has never owned a computer in his life let alone had a website and done emails. And, some of his friends would laugh; he had no interest. Now it is what he does, and how he sources work and controls his business. (Deborah, in interview, 2013)

Deborah and Donald, and Diane and Scott, indicate their position on a steep learning curve towards becoming competent. At this stage of their knowing, they can identify gaps in knowledge,

and ask questions or take steps to addressing those gaps but they are not yet in the position to transfer knowledge.

Additionally, being expert involves *the ability to transfer knowledge*. As Diane shows, there is a considerable difference between acquiring knowledge and being able to transfer that knowledge to another, 'I need time for it to register. If Scott asks me a question, I can't explain it. I just know it works that way, and that's no good' (Diane, in interview, 2013). Diane is unable to transfer her knowledge and she is still in the process of becoming expert. She doesn't yet fully comprehend the significance of her actions, nor is she competent in all tasks, 'I can't do everything at once because I don't understand it enough. I'm just doing baby steps' (Diane, in interview, 2013).

Expertise is also demonstrated in *the automation of practice*. The repetition of actions to the point of flow is indicative of expertise. Emily, as the 'download queen' of her household, is more familiar with the processes of locating and downloading digital content than her siblings. Automation is akin to multitasking. Antonio's younger brother Rodrigo is often talking to his friends on Skype through his iPad, whilst playing a massive multiplayer online game on his computer. The majority of participants identified rhythms of multitasking as indicative of their competences; for example, Angela watches TV whilst searching for articles for her university essays on her iPad, whilst Riley and Ashley browse websites, check emails, read blogs and work on their laptops on the couch whilst also watching TV.

External expertise

Expertise inside and outside of the home is sought under particular conditions of access. Alexis typically asks her housemates, Christine and Shawn, to help her with technological issues, but she also contacts the information technology (IT) department of her workplace and the household's internet service provider (ISP). Diane and Scott rely on Diane's brother for technological advice because his expertise has been formalized through his status in the labour market, 'My brother in IT said we've got to get [high-speed broadband]' (Diane, in interview, 2013).

Participants access formal and informal channels of expertise outside of the home. Christine used Whirlpool, an Australian Community-run website hosting discussion forums on different topics, to learn about broadband Internet access and identify an appropriate ISP for their area. She chose their current ISP because forums on Whirlpool indicated that their customer support people were technically savvy (anecdotes from other participants suggest that expertise by ISP customer support people is sometimes lacking in substance). Christine's use of Whirlpool to compare providers and plans signifies her own expertise in knowing where and how to source appropriate information and make value judgments as to the expertise of others.

Our informants thus identify and exhibit expertise in numerous forms of digital housekeeping – including accessing content, managing content, managing the aesthetics of devices, constructing functional networks of devices, deploying these networks, transferring knowledge about these devices and networks, automating the use of the devices and calling upon external expertise when required.

Housekeepers and the distribution of expertise in the home

A frequently intense argument in feminist literature has been on discrepancies in distribution of domestic labours. Women perform a greater proportion of domestic labour, regardless of their financial contribution to the household (Hahn and Wilkins, 2014). Forms of domestic labour are

part of one's enrolment in the project of maintaining the household by contributing in ways that are visible. Visibility is grounded in threshold levels, the subjective point at which a person is stimulated to perform a task. Variations in threshold levels contribute to allocation of domestic labours and perceptions of expertise within those labours:

> This pattern creates self-reinforcement, and the individual(s) with the lowest threshold will perform a given task even at low stimulus levels, until he/she becomes specialist for that task. Thus, when we apply this theory to human domestic labour, it suggests that my partner may begin doing the laundry because he has a lower threshold for piles of dirty laundry, but through repetition, he becomes 'expert' at laundry. Ultimately, he and I will come to see the task as 'his' and a self-organising system of domestic labor is created, reproduced, and maintained in everyday practice. (Alberts et al., 2011: 27)

Expertise is subjectively distributed in the home. Once it becomes distributed and habituated, it is difficult to renegotiate (Alberts et al., 2011: 32). In their initial situating of digital housekeeping, Tolmie et al. 'prefer to suspend the broad concerns with gender that occupy mainstream social scientists, and instead seek to inspect the particular demands of digital housekeeping from the perspective of *household members*' (2007: 333), though they do not dispute the role of gender per se. Yet, as our analysis below shows, it is problematic to situate digital housework outside of gender concerns when considering how housework is premised on particular forms of gender-inscribed expertise.

If we consider aspects of expertise, such as (1) comprehending systems, (2) the ability to transfer knowledge and (3) automation of practice, then it is possible to make some judgments on where, or rather, with whom expertise is associated within each of the participating homes. A significant proportion of participants categorized as expert are male. Counting only adults and teenagers participating in the study, 17 out of 29 males and 6 out of 28 females identified themselves or were described by other household members with these indicators of expertise. A significant proportion of female participants described being digitally literate and competent users of digital technologies, yet were 'disinterested' or yielding to a male household member's expertise when it came to digital technology-oriented decision-making. Often it seems, expertise is a proxy for identity. For example, Riley, an accountant, spends hours researching through internet forums, sale websites and consumer choice websites in order to make decisions on device purchases for his and Ashley's home:

> Riley: Ashley's not really interested.
>
> Ashley: I just want things to work. I'm not interested in doing a whole lot of research on them to be honest.
>
> Riley: The server was a big deal. A lot of hours in that one. I wanted to make sure I got the right one.
>
> Ashley: Other than my own phone I would say Riley chooses most of it. (~~Ashley and Riley,~~ in interview, 2013)

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Ashley and Riley have clear ideas about who will do the research into new technologies, as determined by their individual levels of interest. Whilst it is clear that Ashley has interest in what technologies can do, and is willing to research devices for her own use, she leaves researching home devices to Riley because she perceives it to be something he enjoys doing more than her. She describes his digital housekeeping as part of his social identity rather than a skill. This impacts on notions of gender, and through that, the allocation of expertise:

> This masculine affinity with technology is not inevitable. It is the product of the social constitution of male gender identity, which revolves around technical prowess. (Webster, 2014: 44)

As researchers, we were aware of participants' tendencies to default to 'the household expert' in discussions of technology operability and acquisition and actively sought input from other members of the household during discussions. The most pronounced example of this occurred during the interview with Jeremy's household, when researchers repeatedly attempted to engage his wife Amy in the discussions. Amy enthusiastically engaged with the researchers only on her own technology use, and the biography of herself and Jeremy as a couple in terms of how long they had lived in their home, leaving all other conversation topics to Jeremy to answer. Amy also remained in the family area rather than join us in the technology tour of the household, delegating the responsibility of demonstrating and describing the household's media ecology to Jeremy.

For many of our expert participants, digital housekeeping is a component of their identity in and outside of the home. Digital housework, like other forms of domestic labour (Johnson and Lloyd, 2004), contributes to identity and self-worth. It also affords visibility of the digital housekeeper's enrolment in the project of maintaining the household. Jeremy, as a university lecturer in network design and security in an engineering faculty, creates complicated set-ups in his home in order to demonstrate them to his students:

> Internet access is important for me because that's my job. I teach students how to build internet devices, and build the internet and how to design it. I've got a server there. There's a lot of things I run on that box which I don't need to run. If I wasn't teaching . . . I probably wouldn't have the full level of complexity that I have here. I often use the server here as a demonstrator in class, I log in to my home system to show people how things are set up in a working environment . . . I run a web server here, which hosts half a dozen websites but the only people that access those sites are me. (Jeremy, in interview, 2013)

Participants adopt a discourse of 'choice' in describing digital housekeeping that imitates arguments of women's domestic labours being a choice. Such arguments assert problematic power differentials:

> When involvement in housework is constructed as a choice, any disproportionate contributions can be defined as voluntary, the labour of others may not be demanded and attempts to change the behaviours of others cannot be legitimate. Even complaining is inappropriate because it misrepresents one's actions as somehow forced by others. (Natalier, 2003: 266)

There are two competing issues here. The first issue is that by labelling digital housekeeping as a choice undermines the centrality of the labours to household rhythms. The second issue is that often the extreme degrees of complexity requiring additional labour *is* by choice. A proportion of the 'work' of the digital expert in the home is interest based, rather than efficiency or need based. Often these interests create the need for more work within the household. Rather than contributing to the running of the household, this labour actually holds the power to disrupt it, as this quote form Jeremy illustrates:

> It's a complicated setup, so it is like a business. I have to spend a night a week to maintain it. To update it. Sometimes I will announce there will not be internet or television recordings for an hour. It depends, I don't do it at a convenient time. The worst is when I claim it will only be off for half an hour. It is usually only one of the internet or the media that is broken, so they can use the other while it's out. (Jeremy, in interview, 2013)

In hosting his complicated set-up, Jeremy occasionally has to reset the system to fix a bug. One of the few interjections by Amy into our discussion was to tell us that she had no expectations of

Jeremy, except that he keeps things working. A similar scenario plays out in Malcolm and Nysha's home. Though Nysha is herself an expert by our categorization, Malcolm is the driving force behind setting up the systems in their home. He 'enjoys mucking around with it as much as anything' (Malcolm, in interview, 2013).

Being able to 'muck around' extends beyond processes of knowing, or being expert. Several participants indicate that playing around with technologies in their home is a means of championing innovation, acquiring technologies that are not widely adopted in perceived support of technological advancement at the cost of efficiency or ease. It is also apparent through the data that those with expertise have the most agency in making decisions related to technology (though there are of course exceptions) and that such decisions are not always to the advantage of the household. For instance, Nicholas was very excited to show us a Mesh Potato, a low-cost telephone and internet device, produced within an open-source philosophy, which enables them to make VoIP (Voice over Internet Protocol) calls with an old analogue handset. Marwa has no choice in the set-up of the home phone system. She uses the Mesh Potato to call her parents who live in Northern Victoria, a full day's drive away. The Mesh Potato has a tendency to crash so that Marwa cannot ring out nor her parents ring in. Marwa therefore often uses her mobile or Skype to call her parents. Whether or not technology works is valued differently by experts and non-experts.

The participants framing digital housekeeping as elective draw attention to household practices through which technologies take on and acquire meaning. Furthermore, technologies within the home are a means by which people do identity work (Giddens, 1991) to achieve personal and social objectives. Echoing earlier studies of media labour (e.g. Morley, 1986), the way experts engage with technologies within the home illustrates structures of power. For example, studies of remote control use in households show that technology-oriented activities provide opportunities to do gender (Gray, 1992; Morley, 1986; Walker and Bellamy, 1993). Gauntlett and Hill (1999) found that men are more likely to find pleasure in using the television remote control, and channel 'hopping', which makes explicit their control of the device and position within the household.

Labour and conditions of expertise

Practices of digital housekeeping necessitate forms of immaterial labour. Many participants identified tasks required in their homes which they were hoping to 'get round to doing'. Craig likes to hack or tinker with systems. He has 'a list' of things to do such as connect the TV in the kitchen to the Wi-Fi router, reconfigure hard drives after getting a virus on them some months back and reinstall software that will allow him and his wife Janet to curtail their teenage son Dylan's late night Internet use. Similarly, Jeremy describes the amount of work it takes to keep his home system running amidst the pressures of everyday life:

> In here we have a computer connected to the TV, which is essentially the media centre for this room. It can stream videos from the central server, that's also the TV recording box, so it's essentially a TiVo box, home built, that stores and plays back all our recorded content. It is half broken, it records but doesn't play back at the moment because I haven't had time to fix it. . . . When it was working better, before I broke it, this is where we sat and watched stuff. When you have a complicated house there are always things that are temporarily broken. (Jeremy, in interview, 2013)

Digital housekeeping is an ongoing process that is performed amidst other competing pressures. Labour is also performed in the processes of becoming expert. When one is already an expert, the

effort to complete a task is reduced, whereas, as Deborah explains, 'learning on the job takes longer' (Deborah, in interview, 2013). Those who are not yet expert, and who harbour the desire to be expert, invest additional time and effort in learning how to perform new housekeeping tasks competently.

Such labours must be repeatedly performed. Like other forms of domestic labour, digital housekeeping is cyclical. However, the material flows of technoculture mean that expertise is hard won and fleetingly held. Expertise is a constant, dynamic process, 'I think technology is moving far too quickly for me to understand it. I'm trying to grab hold of what I understand now and understand it properly so it will make sense later' (Diane, in interview, 2013). The possibility of becoming expert is constrained by the practicality of attaining a level that is incrementally mounting. Furthermore, expertise is conditional on access to ongoing opportunities.

Within the networked home, software sometimes substitutes for expertise. Donald is able to build his own website for his animal control business without comprehending code. He has little idea of how coding works, yet with particular software programmes he is able to complete tasks he previously paid a professional expert to do for him. Deborah described to us what he had been able to achieve:

> This is the website. Donald does most of the stuff on here. Each section has different things. You can see where he has played with photographs with the dogs. He photoshopped the cage out, and replaced hair and teeth. He spent a lot of time on that, on Picasso. He's written each section about each dog. He's got scrolls. All sorts of things going on. He's had to learn behind the scenes to get it all working. (Deborah, in interview, 2013)

Access to substitutions for expertise enables one to perform the role of expert without acquiring the attributes of expert. Conversely, access to expertise reduces motivation to become expert oneself. Because there are people in her household who know how to download movies and TV shows better than her, Adele has little incentive to attempt this herself:

> I don't know how to download. Tom does all that. People will come in and say, oh, what new movies have you got. Michelle will come in and ask for something on USB and she will watch in her room and come back or we will come in and say Emily can you download something. (Adele, in interview, 2013)

Whilst Adele could locate and download content herself, it requires more effort. It is, quite simply, easier and more convenient for her to defer to expertise and ask Tom or Emily.

The expectation of expertise in the role of digital housekeeping has implications for other competing household pressures, and for the way those competing pressures are distributed amongst household members. It is possible to speculate that digital housekeeping may take the place of attending to other domestic labours for the digital housekeeper, which must then be compensated for by other household members, also impacting the ways those in the household create meaningful routines for themselves in the home.

Conclusion

The home is a site of considerable immaterial labours. To the already long list of tasks performed in the home, it is necessary to add those associated with digital technologies. The home is not only a place of care, food production, education, laundering and so forth; it is also embedded within social and technological constructions of expertise. The expertise required to build, maintain and use the networked home is significant, though valued and acquired by members of households unevenly.

We have found that like other forms of domestic labour, digital housekeeping is not evenly distributed across all members of the household but clusters unevenly in particular individuals. We have also found that digital housekeeping, like its traditional domestic counterpart, is not evenly distributed across both genders, but unlike traditional housekeeping, is more likely to be performed by men. Yet, corresponding to earlier research (Morley, 1986), such practices serve to reinforce gendered social relations, framing digital housekeeping as personal interest or leisure, without significantly reducing the time other household members (i.e. women) allocate to domestic labour (Cowan, 1983).

The role of personal interest in this uneven distribution across individuals and genders has been found to be important in the eyes of our participants. Personal interest is associated with the acquisition of experience. The issue is that expertise is often constituted through a self-perpetuating cycle of interest, as others defer the work of digital housekeeping to the interested party, thus building their experience and expertise further. Personal interest and expertise are also self-perpetuating in so much as the interested expert is inclined to construct complex systems as an expression of this personal interest, rather than as a pragmatic solution to a problem. The complex system is then inclined to remain in the domain of the interested expert, rather than being a resource and a responsibility shared by all.

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