THE HOME OF THE FUTURE:
AN ETHNOGRAPHIC STUDY OF NEW INFORMATION TECHNOLOGIES IN THE HOME

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Abstract

This paper explores the "Home of the Future" from the ethnographic perspective. It conceptualizes the home as a constellation of physical, technical, and social and cultural spaces, and asks the question of how these new information technologies fit into the household. Findings from the present research suggests that there is incomplete domestication of information technologies into the household, and that emerging technologies should pay close attention to the family's requirements for everyday living.

1. Introduction

This research is based on a project whose focus is the "Home of the Future." Within the academy, industry, and government there is burgeoning interest in the "home" as a site of accelerated technological innovation (Kraut, Mukhopadhyay, Szczypula, Kiesler, and Scherlis 1998; Venkatesh 1996). Yet, how do we make sense of these developments and what will be the impacts of the new information and technologies for the home of the future? And, what are the implications of these developments for the society and economy as a whole? To address these issues adequately requires a systemic investigation of the present use of information technologies in the home, from which we can draw insights into the future developments of home-based technologies.

Our current project examines the adoption, use, and impact of New Media and Information Technologies (ITs) in the home and how prepared these consumers are to accept "Smart Home" technologies that will be on the market in the next 3-7 years. It adopts an ethnographic methodology as a complement to previous researches that used survey and time diary techniques (e.g., Kraut et al. 1998). As part of this ethnographic study, which commenced in 1999, we recruited 50 families in the Orange County and Greater Los Angeles areas who have personal computers (PCs) with Internet access in their homes. Participating families were recruited from a series of newspaper advertisements. The study extends over a period of one year and the participating families were interviewed twice during the study period at roughly six-month intervals.

The interviews consisted of one to three hour semi-structured interviews in the homes of the participating households. The interviews focused on 1) how PCs and the Internet are currently being used in the home, 2) how life in the home is being impacted by these information

technologies, and 3) the attitudes and potential interest that members of the households have about "Smart Home" appliances that will be on the market in the next few years.

In addition to conducting depth interviews in the participating households, we also engaged in the anthropological method known as participant-observation in order to investigate 1) the physical placement of PCs in the living space and their relation to other ITs in the home, 2) the use patterns of the computer, and 3) how family members (especially parents and children) interact with each other and their computers (i.e. human computer interactions). In terms of our research into the smart home in particular, we showed pictures of futuristic homes and their networked appliances to elicit responses to them. Finally, we took digital photographs of the technological environments in the home for further analysis.

2. The Ethnographic Method

Ethnographic methods (developed primarily within the field of anthropology), based on fieldwork, participant-observation, and the comparative perspective, bring a unique took kit to the study of information technologies in the home. Ethnographic fieldwork provides a practical means of getting at the consumer's (i.e. the user's) point of view, that is, the cognitive, social, and cultural processes, that inform an individual's understanding of the role of information technology in the home. By allowing the informant to communicate their own perspective and to observe their actions in a natural setting over an extended period of time, the ethnographer is equipped to take individual, social, and cultural differences seriously and, thus, to make interpretations that account for, rather than ignore, these particularities. This grounded approach to theory building is an excellent complement to other approaches, both qualitative and quantitative, of studying technology use in the home. For example, when combined with survey

techniques, time diaries, and focus groups—as we are currently doing—ethnography serves to enhance our analysis of the quantitative data and vice-versa. In this sense, ethnography aims to bring a holistic perspective to the study of information technologies (Van Maanen 1988).

In our study ethnographic method has offered concrete advantages (and real payoffs) in the study of information technology in the home. First, it provided access to a rich dialogic context. By this I mean that unlike surveys which yield discrete kinds of information in a non-interactive fashion, the ethnographic interview, based as it is on a semi-structured discursive format, allows for both consumers and interviewers to reach a depth of communication and, thus, mutual intelligibility on a given topic of inquiry (Escobar 1994). The interviewer can easily ask for clarification of answers that he or she thinks needs further elaboration or clarification, and can even test tentative interpretations with the consumer in the course of the interview. Second, by visiting the residence of the consumer, we have been able to observe the home and its technological environment. This has provided a rich context for asking questions and for understanding the role of IT in the household. Third, observation (and limited participation) in the consumer's household provided us with insight on how ITs are actually being used by family members. This is especially illuminating with respect to children's use of PCs, because they are relatively willing and unselfconscious about being observed. This is an opportunity that is not attainable by any other research method. Lastly, the ethnographic method when successful establishes rapport and trust between the researcher and the consumer. This allows for the possibility of follow-up research and for deeper insight into the life of the household.

3. The Living Space Model

Our current theoretical approach to the study of the home of the future is informed by what we are calling the "Living Space Model," which conceptualizes the home as a constellation of three overlapping spheres: 1) the physical/architectural space 2) the social and cultural space and, 3) the technological space. Examining the home in these terms of the interactions between these spaces allows us to ask new questions and gives us a structure for analyzing our observations about ITs in the home (Venkatesh 1996).

The application of our model encourages us to start off by asking: What is a "home"? That is, how has the incorporation and use of new ITs changed the implicit meanings and metaphors (i.e. the cultural concepts), the explicit physical designs and boundaries of the home, and the social and cultural dynamics associated with life in the home?

We have observed that the home is indeed a locus of several re-formulations. For example, as a result of recent IT innovations (e.g. the Internet and mobile communications), the traditional boundaries between the home as private sphere and the society as a public sphere have dramatically shifted in the following ways. First, work and domestic life are increasingly interpenetrating each other reversing a trend that Rybczynski (1987) identifies as central to the modernization of the home. In the postmodern home, people are able to work from home as well as to carry out household and personal activities from the workplace. Second, there has been a blending of home and retail shopping. E-shopping has brought the retail space into the home in an unprecedented way, and reciprocally home-based shopping has now influenced the way consumer's shop in brick and mortar retail stores (Hoffman and Novak 1996). Third, the Internet homepage and mobile communications technologies have given the "home" a nomadic quality (Turkle 1995; Markham 1998). That is, home is no longer fixed in space; we can access

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it or be accessed wherever we happen to be. The arrival of smart home technologies that allow us to interact with the home from remote locals will only intensify this phenomenon.

Concomitant with these changes, the home has become a contact zone where the tensions associated with rapid technological change are being played out. Now that the home has become a center for both productive and family life, rooms in the house are used in increasingly the multi-functional ways, and the nature of "privacy" at home is being redefined, it is not surprising that households express a wide-range of attitudes about the desirability of these innovations from enthusiastic support to disparaging critiques. Because technological change will continue to impact the home, we anticipate that these attitudes will remain quite fluid and will thus continue to change as well.

4. The Preliminary Findings

The preliminary findings are based on ten selected households from the total study sample of fifty. The analysis that follows proceeds in terms of the living space model outlined above.

4.1 PHYSICAL/ARCHITECTURAL SPACE

The home as a physical/architectural space has not undergone much in the way of infrastructural modification for new information technologies. None of the homes in our sample had been structurally altered for ITs. Additionally, the basic blue print of the suburban home in the study area is relatively stable as is evidenced by new home building which is only minimally changing its basic design for ITs. For example, we visited the Ladera Ranch, a new housing scheme under construction in Southern Orange County, which is being marketed as a "technologically revolutionary" new community. Each of the homes in the 4,000 acre

development will be wired with fiber-optic cable for easy high speed access to the Internet and the community's own Intranet. Despite these cutting edge accommodations, the interior spaces of these homes were only minimally designed for intensive IT use. The photograph below (Figure 1) of a work-space nook taken from a model home in the Ladera Ranch shows a space that is poorly designed for the PC and its peripherals.

Figure 1

While the architectural infrastructure has remained fairly static, the internal space of the home has been modified to a greater extent. This was observed in the various ways that the internal space was accommodated to IT use through furnishings and changing use patterns of rooms. To the degree that these modifications have been successfully integrated ITs into the home, we see this as a process of "domestication" of the technological space. Our latest survey data (Shih and Venkatesh 1999) shows that home computer users are increasingly using their computers in several different living areas. They are not, however, generally spending a lot of money to equip these user stations with special furniture (desks, chairs, lighting etc). These spaces are basically "make-do" set-ups, unless the computer station is used primarily as a home office for telecommuting. On the whole, chairs and desks are not being bought specially for children's use.

The most common modification of the interior space we observed involves accommodating ITs to the existing furniture. These consist of make-do set-ups, which often produce a cluttered and inefficient IT environment (Figure 2). We characterize these arrangements as exhibiting low domestication.

Figure 2

Less common is the purchasing of furniture to accommodate the introduction of new ITs into the home. These configurations allow for more flexible use of space. For example, Figure 3 shows how armoire-styled computer furniture is used in the kitchen, which gives the parents the ability to supervise their three-year-old son while doing meal preparation, while at the same time when not in use it can be closed up to fit into the overall decor of the space. Set-ups like this demonstrate a much higher degree of domestication than in the previous example.

Figure 3

The third, and least prevalent, modification of the interior space for ITs involves building customized furnishings. In these configurations the household users have taken an active role in domesticating the space to their needs. Figure 4 demonstrates how under severe space constraints a small bedroom was modified to double as a home office.

Figure 4

The previous three scenarios illustrate varying degrees of domestication of IT to the home's interior space. We believe the reasons for the incomplete domestication are as follows. Under the present condition of rapid product development many consumers are reluctant or not able to invest in special modifications (e.g. purchasing furniture) because they are unsure about their future needs. As a result, the ITs are treated something like "visitors" rather than a permanent part of the household landscape. Because PCs are frequently replaced by upgraded equipment and an ever changing array of peripherals (e.g. zip drives, digital cameras, scanners etc.) the IT ensemble is perceived as a temporary part of the home. It is thus not treated as a permanent appliance (i.e. a fridge) or as furniture (i.e. a sofa). Money is put into upgrading hardware rather than domesticating the space to accommodate the machinery. Not surprisingly, the appearance of the PC and peripherals was of very little importance to these users. Also, as the PC moves out of the confines of the home office or den, users are unsure how to integrate it into the unfamiliar surroundings.

4.2 THE SOCIAL AND CULTURAL SPACE

Our analysis of the social and cultural space examines the patterns of adoption and use as well as the impacts of ITs in the home. The ten households in our preliminary sample were generally optimistic about their adoption of ITs in the home. The two most prominent reasons for adoption were related to work and children's education (Venkatesh and Vitalari 1992).

Pragmatism and price sensitivity characterizes their technology purchasing decisions. Users of home-based computers and related technologies are savvy consumers and we found an attitude that we could call an "appropriateness ethic" with respect to adoption of new technologies. They weigh their purchases against several factors, including price, intrusiveness,

whether it fills a perceived need, and the desire to stay current with the latest innovations. Overall, these users were not lead adopters. Rather they were fairly risk adverse preferring to "let the bugs shake out." Also, they show a low level of brand loyalty being more sensitive to price than make of their equipment.

In contrast to research findings from the 1980s (Venkatesh and Vitalari 1987), women and children are becoming increasingly important "change agents" (those who introduce new ITs into the home and generally disseminate information about them) (Lindlof 1992). Women are just as likely to have knowledge of computers as men, and in of the homes I have studied they have been the adopters and teachers of computer skills at a roughly equal rate to men. Additionally, children are using their computer knowledge and skills they have acquired at school or through friends back to the home and influencing their parents IT related decisions.

The use of ITs in the home on the whole is increasing by all household members. To meet this demand families are resorting to scheduling computer time and purchasing additional machines. The advent of Internet has had a revolutionary impact on PC use making it "virtually essential to family life." While the PC is not yet as ubiquitous as the TV or as central to family life, interestingly the PC is generally seen as more positive, productive, and educational in nature (Orleans and Laney 2000).

Current uses of the PC are not only increasing, but also expanding into new areas (especially those opened up by the Internet and the World Wide Web). The PC and the Internet are on the whole seen as easy to use, fun, and creativity enhancing. A relatively high degree of frustration persists with software difficulties and hardware glitches, however (Norman 1998). There is a lingering perception that PCs easily malfunction and among new users there is a fear that "pressing the wrong button" will cause the computer to be destroyed or all the data will

instantly vanish. For both children and adults, playing games is a way to get familiar with the computer and to overcome any sense that it is fragile or unforgiving of any mistakes.

Enthusiasm for the Internet is very high. It is seen as a revolutionary information tool with an awesome power to access information and news. As an educational medium, parents perceive the Internet as crucial for their children's future (Lindlof 1990; Papert 1996). The convenience and cost saving attributes of Internet communications (primarily e-mail, but also home pages, user groups, instant messaging, and chatting) are also extremely popular with users. The entertainment dimensions of the Internet are not yet as critical as the above functions, but users spoke of it having a promising future.

Even though interest for the Internet is high, there are still a number of frustrations and concerns associated with its use. First among these is speed and reliability of the Internet connection. Nearly every household expressed frustration with the slowness of their dial-in access (only one of the ten households had a cable connection). Second, users were concerned with the access to "objectionable" content, especially as it impacts young users without the ability to discern what reliable information is or who seek out pornographic or violent web sites. Third, consumers expressed worries about the security of web-based transactions, primarily those involving credit card purchases. Fourth, and this closely related to the previous case, there is strong feeling among households that Internet use is compromising their families' privacy. Fifth, a few families talked about the potential or actual problems associated with over-use, even addiction to the Internet. In this regard, most users felt that the danger of addiction generally declined once the novelty of the Internet wore off. Six, families members had concerns that the Internet could disrupt family life. Because the PC is most often not in a communal space but in a home office, den, or bedroom, users talked about how extended Internet use isolates the user

from the rest of the family. A few of the families intentionally placed the PC in the living room or kitchen to avoid this problem.

At present there is only moderate interest in E-Shopping. Families anticipate a growth in their interest, especially because of its perceived convenience. The reasons for current reticence include: lack of price competitiveness, fears about credit card security, loss of ability to touch and inspect products, a resentment of the dot-com mania, and an attachment to the ritual of retail shopping (e.g. a chance for the family to spend time together on a regular basis).

The use of IT in the home affects, and is affected by, the families social structure and culture. In terms of gender roles, there is a marked difference between the general orientation of women and men (Turkle 1984). On the one hand, women have what we are calling a "tool/task orientation," which is characterized by a "I just want it to work" mentality, a lack of concern for what is "under the hood," a preference for user-friendly features (like the AOL user interface), and low interest in the style of their equipment. On the other hand, men have what we are calling an "object/pleasure orientation," which is characterized by a fascination with hardware "innards" (i.e. processor speed, memory, and the latest components), they are in their own words often "gadget freaks," see that having a powerful machine is a status symbol, and have almost no interest whatever in the style of their equipment.

When it comes to the generational differences within households, we found that children and adults are practicing different learning styles in their acquisition of computer proficiency. According to their parents, children tend to learn more intuitively than they do by "pressing buttons" in a trial-and-error fashion. Their children's facility with computers and the Internet amazes parents, and reinforces their feelings that the computer is important to children's education. In contrast, parents are relying on a wider range of learning techniques (formal and

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informal instruction, reading manuals, and the trial-and error method) and having a more difficult time gaining comfort with ITs. While there were no seniors in this restricted sample, respondents voiced their concerns about older users being left behind by the PC/Internet revolution.

Much of the observation time in the respective homes focused on children's use of ITs. As stated above, the educational needs of children were a primary reason for households to adopt ITs. Computers are seen as necessary for education and there was a strong feeling that homes without PCs would hinder their children's education and employment in the future. A number of families have used the metaphor of the "library" to discuss the truly awesome access to information that the World Wide Web provides. They are generally encouraged by this availability and are especially optimistic about the opportunities it provides their children for learning and school projects. In general, the use of the PC by young children is highly mediated by their parents (especially going on the Web), while older children and teenagers gain progressively more autonomy in their use as they get older.

Parental concern about IT use is focused on gaming, Internet content, and the potential anti-social aspects of overuse. With respect to games, parents universally expressed a preference for educational over entertainment oriented programs. They were especially worried about the violence of many games designed for boys. Lastly, they expressed mild concern that too much time on the PC might have negative implications for their child's social development and should be balanced out by a well-rounded schedule of activities.

4.3 THE TECHNOLOGICAL SPACE

Our analysis of restricted sample does not permit a detailed report on the technological space. We can summarize our finding as follows. Overall, households have a generally positive outlook on computers and the Internet, but they have concerns and fears about some of the potentially negative consequences on their families and the society at-large. We've found a strongly developed sense of what role IT should play in their homes and the ability to reflect on the potential anti-social influences these products may have on society, especially on young children's access to inappropriate Internet content and the loss of face-to-face social skills. Users grapple with their desire for new forms of access and control versus their worries about losing traditional forms of control, such as the privacy of the home. For the most part, progress is seen as inevitable and there is thus a need to stay current with the latest IT innovations (Pfaffendberger 1992). Along with this need to keep up with latest developments is a pragmatic questioning of the necessity of every new product that reaches the market (Coyne 1995). On a whole, families are searching for balance in these times of rapid change.

With respect to children's use of PCs, we identified an area of special concern that we would like to discuss here. Namely, our observations of how children and parents interact with while playing together on the computer and the Internet. From our field research it became apparent that the PC remains only partially adapted and integrated to the special needs of families and home-based users. That is, the PC has not been fully domesticated for family usability.

While many computer manufacturers share the goal of moving the PC into the mainstream of family life, the legacy of the desktop user interface (UI) has proved in many ways a difficult obstacle to surmount. One of the persistent shortcomings of the desktop UI is its single-user orientation. Even though many software products (primarily in the areas of education

and gaming) support multiple users, the typical configuration of the PC in the home (i.e. the single keyboard, mouse, monitor set-up) does not optimally facilitate these interactions. And, while this problem area was not always immediately apparent to the parents during our interviews, it did become obvious to them once we pointed it out to them. In turn, they responded that the PC is really designed as a "one person at a time thing." Beyond this, we believe that it is awkward, and even dangerous (especially small children), and ultimately inefficient for multiple-user interactions (see Figure 5).

The following product scenarios seek to offer potential solutions to these problems. Once identified, we envisioned three new Family and Multi-User Interfaces which could potentially alleviate many of the above inefficiencies. The first is the Remote Access Monitor, a handheld device that gives each user their own display terminal. The second is the Split Screen Monitor, which accommodates two or more users simultaneously. And the third is the Parent-Child Tandem User Interface, which uses specially designed seating and peripherals for parent and child use. We more fully elaborate these in the document that presents our new product scenarios.
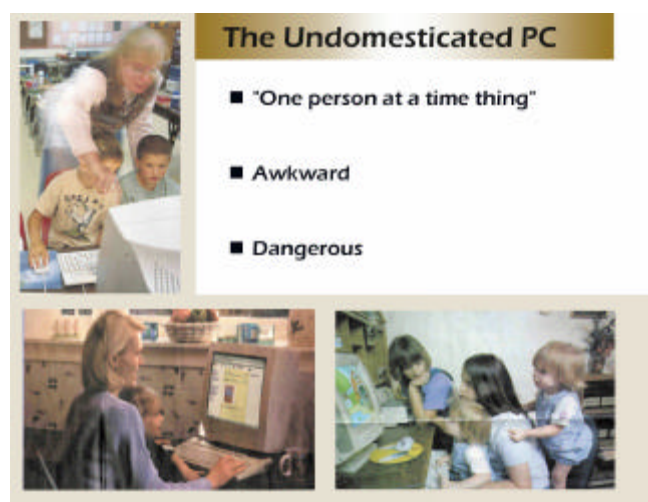

Figure 5

4.1 REMOTE ACCESS MONITOR

The first of these concepts is the Remote Access Monitor (RAM), which are handheld displays linked to a central PC. They share the same "vision" as the main monitor, and can alleviate the uncomfortable user configurations depicted in the pictures on the previous page. Instead of being confined to the immediate area around the computer's main monitor, each user is provided with his or her own Remote Access Monitor so the activity can be viewed anywhere in the room. This RAM feature can prove to be useful in home and conference room environments where there is only one computer, but multiple users.

The RAM can also be used for security purposes. By carrying a RAM, a user can monitor his or her computer terminal when he or she is away. Another scenario involves the family. A parent can keep track of his or her kids' computer activities from afar via the RAM. If a child is web surfing and wanders into an objectionable website, the parent will know, and he or she has the option to shut down the computer remotely.

Figure 6
Remote Access Monitor

4.2 SPLIT SCREEN MONITORS

The Split Screen Monitor will work like any other monitor, except the view space will be wider. The wide-screen will be especially effective when watching wide-screen format CD-Rom

or DVD-Rom movies. The monitor splits into two halves. If a user wanted to run two applications simultaneously, he can devote one screen to each application. A ball joint behind each half connects each half-monitor to the main stock. The Split Screen Monitor enters private mode when both half-monitors are tilted back in a 45-degree angle, away from each other. Designed with dual users in mind, we realized that some people would rather work

Figure 7
Split Screen Monitor

4.3 PARENT-CHILD TANDEM USER INTERFACE

This concept is developed for the parent-child computer interactions. Frequently, parents assist their younger children when they use the computer. Young children usually need help surfing the Web, typing, or operating applications, yet the typical seating and UI arrangement for the parent and child(ren) is often less than ideal. The parent has to straddle the child, or the child has to stand besides or behind the parent. The Tandem User Interface provides an ergonomic alternative to these scenarios. The Tandem User Interface is an ergonomic Tandem chair, which features a frontal segment that seats a small child. The parent and child no longer have to share the same seat cushion. When the front segment is not in use, it can be detached, or it can fold down and act as a footrest.

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Figure 8
Parent-Child Tandem User Interface

5. Smart Home Technologies

The final section of this report examines how prepared households are to accept "Smart Home" technologies that will be on the market in the next 3-7 years. We attempted to gain insight into the attitudes and potential interest that members of the households have about the home of the future by eliciting responses from a series of photographs and illustrations of smart homes and appliances (e.g. Figure 6). The general tenor of their reactions were markedly different than our discussion of technologies now present on the market. Most of the adults' responses were inflected by an aura of detachment, humor, awe, and mild repulsion. Because the interviewees had not interacted with these technologies there was some reluctance to offer detailed opinions. The most frequent response alluded to the Jetsons cartoon. The children who I spoke with, however, had been exposed to the idea of the home of the future through films, such as Disney's "Smart Home," and they felt that it was "cool."
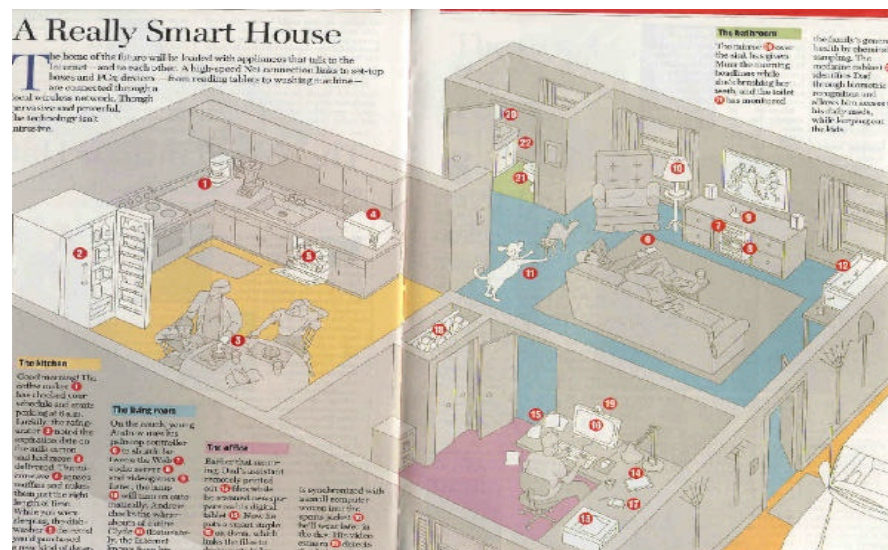
Figure 9
From Newsweek
(May 31, 1999)

Currently, adults in the households we interviewed were highly attracted to the potential overall convenience that the home of the future promises to offer. In terms of particular features of the smart home, highest interest was for the ability to monitor and remotely control the temperature/climate, lighting, and for the area of home security. There is a medium-level of interest in having the home's computers connected by a Local Area Network (LAN) and for the integration of all information and communication devices. There is low interest in the Internet refrigerator and for robotic intelligent devices.

Concerns about the impact of the smart home on families were quite extensive. Nearly every respondent expressed worries about the loss of control that these technologies might pose. They wondered if there would be sufficient ability to manually override the smart home automation. They also talked about not wanting to be replaced by automation. In specific, they said that they fear becoming dependent of these machines and had doubts if "convenience" in

every aspect of life was good for the health of families and society at-large. Expressions of their

hesitancy are reflected in common refrains such as these: "What will I do with myself?", "I like

challenge in my life", or "Have we gone too far?". Other areas of skepticism about the smart

home related to its affordability and whether this would become an exclusively elite technology

which would cause a deeper "digital divide."

The attraction and repulsion—namely, ambivalence—to the smart home is discussed in

an excerpt from an interview with the following upper middle-class man in his late 40s, who is

married and a father of two teenage girls:

> Q: Does anything scare you about more automation in the home?
>
> A: No. The only thing that—and I don't want to sound paranoid, but it does
> concern me a little bit if the information that I'm sharing on the Internet in the
> computer, if somebody has access to that. You know, I don't—I've a little bit of
> a big brother kind of a feeling. If that stuff is actually being captured someplace
> and kept on file. Just because I feel, you know, your own private life is your own
> private life. You shouldn't have to be worried about that. **It's kind of a two-
> edged sword** (our emphasis), I mean, you can't get there without, you know,
> being on there. So that worries me a little bit. It's not like I lay awake at night
> and think about it. It doesn't keep me from using it. But no, I don't worry about,
> you know, other technology and stuff like that. It's proven to be pretty
> dependable. We've had, you know, a lot of computers in our cars for a long time.
> Shoot, you don't see cars sitting on the side of the freeways because the
> computers went out. It's usually a flat tires, or out of gas, or like.

Or the following example, from a husband (H) and wife (W) in the their late-twenties with a

nine-year-old daughter:

> Q: So do you think there's a possibility that the smart home has an anti-social
> potentials?
>
> H: Yes. It's surprising that I would say that. We've coped with having the net,
> having cable, having a lot of stereo equipment. We've found ourselves reading
> books and just being a very close-knit, **non-electronic family** (our emphasis).
> But I can see, I don't think with us, but I think if we'd all grown up with this sort
> of thing, it would be easy to be detached. Very electronic. But it also does look a
> lot more convenient.

W: I'm reading this. This is very good. The kitchen thing is great.

Q: Like they're talking like these refrigerators would have a computer screen built into the door.

W: And you could tell when the milk is expired and stuff.

Q: A complete inventory of your kitchen. Because everything would have like a zebra code and you could just read it into the door, or actually even the more advanced, the transponder you drive on the freeway. It could just read everything as you put it in.

W: It would help in shopping. There's a good and bad….

H: I still think there would be more good than bad. It should be tempered but I'm more for it. It looks great.

6. Conclusion

This research presents findings from ethnographic fieldwork on computer use in the home and home of the future. We found that home is a site of technological innovation and rapid change. However, despite the influx and diffusion of technologies into various activity spaces in the home, we observed that many of the technologies are incompletely integrated into the domestic life of the household. Specifically, the single-user desktop interface, and the solo nature of computers in general, are inadequate for typical family use. The current home PC configuration causes substantial frustration among users and such problems need to be resolved before further domestication can take place. Here we presented some preliminary product scenarios and concepts as a starting point for some of the needed potential design solutions.

In designing the home of the future, product developers and marketers need to pay particular attention to the concerns and requirements for everyday living in the home. Some of the ambivalence expressed by our interviewees regarding these smart home technologies may be

roadblocks to their successful diffusion and integration. Future research should be sensitive to these issues and explore them in greater detail.

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