Historical Analysis: Using the Past to Design the Future

Susan Wyche[1], Phoebe Sengers[2], and Rebecca E. Grinter [1]

[1] GVU Center
College of Computing
Georgia Institute of Technology
Atlanta, GA, USA
{spwyche, beki}@cc.gatech.edu
[2] Information Science
Cornell University
Ithaca, NY, USA
sengers@cs.cornell.edu

Abstract. Ubicomp developers are increasingly borrowing from other disciplines, such as anthropology and creative design, to inform their design process. In this paper, we demonstrate that the discipline of history similarly has much to offer ubicomp research. Specifically, we describe a historically-grounded approach to designing ubicomp systems and applications for the home. We present findings from a study examining aging and housework that demonstrate how our approach can be useful to sensitize ubicomp developers to the impact of cultural values on household technology, to reunderstand the home space, and to spur development of new design spaces. Our findings suggest that historically-grounded research approaches may be useful in more deeply understanding and designing for context both in and outside of the home.

1 Introduction

As ubicomp moves beyond the work environment and into a broader social and cultural world, researchers are drawing on an expanding set of disciplinary perspectives to inform design. Ubicomp developers commonly employ anthropological methods, most notably ethnography [e.g., 24,26,27]. Similarly, researchers borrow from art and design to develop novel ways to explore the home, such as cultural probes [13]. In this paper, we describe how ubicomp developers can borrow from another discipline useful for exploring domestic environments: history. Examining the past has previously been used to inspire new form factors and styles such as retro; we suggest that history can be further used to provide strategies that, like anthropology, unpack the culture of the home and, like art-inspired design, defamiliarize the home [2]. In this paper we present a study examining housework by older adults and describe how we integrate historical analysis into the design process. We then present findings from a study of older adults' experiences with housework that suggest history can be beneficial in understanding the culture of the home, in defamiliarizing the home, and in spurring designers' imaginations, thereby opening new design spaces.

P. Dourish and A. Friday (Eds.): Ubicomp 2006, LNCS 4206, pp. 35 – 51, 2006.

Specifically, our findings demonstrate that historical analysis sheds new light on recurring cultural themes embedded in domestic technology, and by extension, 'smart homes.' Questioning these themes has the potential to lead designers to rethink assumptions about domestic technology use. For example, rather than using "ease of use" as a guiding principle, elders described difficult, yet enjoyable aspects of housework that technology removed. Older adults fondly recalled products that were durable, contradicting the consumption-driven theme that arguably underlies many of the systems and devices being developed for smart homes. This leads to new heuristics for design; for example, do we assume users will be interested in constant software upgrades and stylistically new gadgets and devices or would it be more appropriate to develop products that last for decades? Historical analysis and elders' personal accounts of their histories revealed the importance of sensual aspects of housework lost with the introduction of new technologies. Participants described the isolating impact of technologies introduced to the home, specifically electric dishwashers and washing machines. Developing technologies to support one person rather than multiple people or families is a historical theme repeating itself in current domestic systems.

In each of these examples, understanding how technology has changed for better or worse in the past suggests new options for contemporary technology design. We believe using historical analysis could benefit other designers by providing an additional way to understand context and by spurring their imaginations.

2 Background

Why study history, if our goal is to design the future? One answer can be found in philosopher George Santayana's famous proclamation, "Those who cannot remember the past are condemned to repeat it" [28]. This quotation is widely used to argue that exploring the past helps us understand who we are today and where we are going. For ubiquitous computing, historical awareness can deepen designers' understanding of the context they are designing for. In addition, history can spur designers' imaginations by revealing the contingency of the present situation, rendering it less obvious and inevitable. As Bell et al. suggest [2], using history to defamiliarize the present supports designers in envisioning future domestic life less constrained by present-day cultural assumptions embedded in technology.

Historical awareness could also prompt ubicomp developers to make design decisions that have more positive social and cultural ramifications. As Bell and Kaye have argued [3], new designs for 'smart homes' often repeat themes from the past that, with reflection, designers may not wish to propagate. Critics of smart home prototypes similarly suggest that technologists' visions of the future tend to look backwards rather than forwards. Spigel [31] describes this as "yesterday's future." She uses surveillance systems to demonstrate how familiar uses of technology persist in past and present visions of the smart home. Systems that give parents the ability to survey their children's activities and to monitor unusual behavior have been touted as "the future" for the past 60 years. Even the architectural styles of smart homes demonstrate such repetition; Spigel describes how Tudor, Spanish, and colonial styles have been consistently used for smart home prototypes since their inception as a

marketing tool in the 1920's. Indeed, distinguishing the exterior of older "home of tomorrow concepts" presented at fairs and conventions from today's newer "smart homes" is difficult. If designers recognize such themes at the time of development, they can consciously choose whether they should be repeated or altered [29].

There has been some mention of history's relevance in designing for the future in ubicomp and related literature, the most notable being Blythe et al.'s "technology biographies" [6]. These are a set of questions that ask participants to reflect on their present, past, and future experiences with technologies. One element of the technology biographies, "personal histories," are questions aimed at uncovering users' feelings of loss and nostalgia as they relate to technological change. For instance, a participant may be asked to remember their first home computer or how they communicated at work prior to using e-mail. These historical reflections are integrated into an ethnographic study approach.

In this paper we present a historically grounded approach that complements and reinforces history as an element of ubicomp design. Our goal in this paper is to show how history can be integrated into the early stages of design of ubicomp systems through a case study of early design for housework technology. In the following section, we outline the process by which historical analysis was integrated into early design in our case study. This is followed by findings from our study examining aging and housework. We conclude with a discussion about how historically grounded research approaches can benefit the design process.

3 Using Historically Informed Approaches to Explore the Home

Our case study was motivated by two major goals. Topically, our objective was to examine housework as a dimension of the smart home. Housework is a domestic activity largely absent from current smart home discourse (with a few exceptions [4, 5, 11, 25]). Indeed, housework is often rendered obsolete in visions of the future [4], despite the fact that even after more than a century of automation the number of hours women work in the home has remained remarkably stable [10]. Methodologically, our goal was to integrate existing ubicomp data collection methods with sensitivity to history. We intend for these techniques to supplement commonly used ubicomp data gathering methods, such as interviewing and design ethnography [7, 26].

In this section, we describe our approach. First, we describe the historical analysis we engaged in as background research for our study, which included examining historical texts, first-hand sources of popular culture such as magazines and catalogues, and patents. Then, we describe how this historical research led to the development of a new data collecting tool, the 'memory scrapbook', used to elicit additional historical data from study participants. Finally, we describe how our in-home study was structured to leverage historical awareness.

3.1 Historical Analysis

A history is an account of some past event or combination of events. Historical analysis is, therefore, a method of discovering, from records and accounts, what happened in the past [20]. In historical analysis, researchers consider various sources

of historical data such as historical texts, newspaper reports, diaries, and maps. The method is commonly used by historians to gain insights into social phenomena. Designers can similarly use historical analysis to identify themes embedded in their work, avoid re-inventing systems that already exist, and establish background prior to user observation or interviewing. Indeed, leading design firm IDEO recognizes this and includes historical analysis in the early stages of their design process [18]. As we will describe below, in our work, we drew on three particular kinds of sources to establish common themes and design opportunities for housework: we reviewed the **historical literature** to find trends that historians have already identified as relevant to domestic technology; we studied **patents** to identify previously attempted technologies and to spark inspiration for new design, and we immersed ourselves in **primary sources from popular literature** that give an experiential sense of the past and provide design resources.

History is not culturally universal. Because we were interested in domestic design in US contexts, we focused our study on the American history of domestic technology. Our results will hold to some extent for other Western contexts which have a similar history, but different histories would need to be told for other cultural contexts.

3.1.1 Reviewing Historical Texts

We began our work by reviewing relevant literature on the history of housework. Although this step took time, it helped establish a background prior to the project's next phases. We took advantage of historians at our university, who specialize in the history of American homes, to point us to seminal works in the field. Our analysis was limited to historical texts written after 1900, because the decades following the industrial revolution are widely considered a time of dramatic change in American homes [9]. We describe here three themes that emerged from the literature as particularly important to understanding the last 100 years of housework in the US: 1) the "labor saving" debate, 2) domestic technology's gendered character, and 3) loss of sensual and emotional qualities that accompanied housework.

Designers often conceive of products thinking they will make tasks easier or faster to perform. However, domestic technologies which are proposed as labor-saving and efficient historically have had a different impact. Research suggests new technologies have often increased time spent doing housework rather than decreased it [9,34]. In part this was due to the rising cleanliness standards that accompanied electric technology into homes during the twentieth century. This created higher expectations for women to produce spotless and hygienic bathtubs, sinks, and toilets. With the introduction of the electronic washer, laundering increased because there was greater demand for clean clothes. Indeed, novel cleaning approaches often divert time from one task to another, thus creating 'more work for mother' [9].

Today, women remain largely responsible for maintaining a home. The drawbacks of assuming housework is "women's work" are well documented [4,9,19,32]. Sweeping, washing, vacuuming, and tidying-up, arguably confine women to the "domestic sphere," thus making it more difficult for them to participate in the socially influential "public sphere."

Finally, as technology makes its way into our domestic lives, some of the felt qualities embedded in everyday experiences become lost. McCarthy and Wright describe *feltness* as the emotional and sensual aspects that make up humans

experiences using technology [22]. For example, before dryers, women hung laundry in their backyards where they would talk and exchange gossip with neighbors. Today, dryers are confined to laundry rooms or basements, isolating those who use them from others and thus diminishing some of laundries' felt qualities. We are careful not to downplay the technologies' contributions to removing much of the drudgery associated with housework, but use this example to suggest there are subtle characteristics that shape users' experiences with technology that we risk losing if efficiency and production drive technology development.

Historical awareness enabled us to consciously choose which of these themes deserved repeating, and which we wanted to resist in our designs. For instance, we understood how housework has arguably contributed to woman's marginalization in society and acknowledged this was not a theme we wanted to perpetuate in the smart home. The final benefit of conducting a historical analysis during the initial design phase was that it helped us develop the protocol for our study's interview stage, to be described later.

3.1.2 Patent Search

In order to better understand the historical design space for domestic technology, we engaged in a patent search. The United States Patent office represents a tremendous body of original knowledge and technological innovation.[1] Online databases such as the one found on the Unites States Patent and Trademark Office's website (www.uspto.gov) and freepatentsonline.com make exploring issued patents, patent applications, and expired patents, dating back to 1790 accessible to anyone with internet access. We searched patents from a variety of years, but focused on those issued between 1940 and 1965, because this is considered the height of America's preoccupation with domestic cleanliness [17]. We broadly looked for issued patents related to cleaning technology such as vacuums, dishwashers, irons, and washing machines.

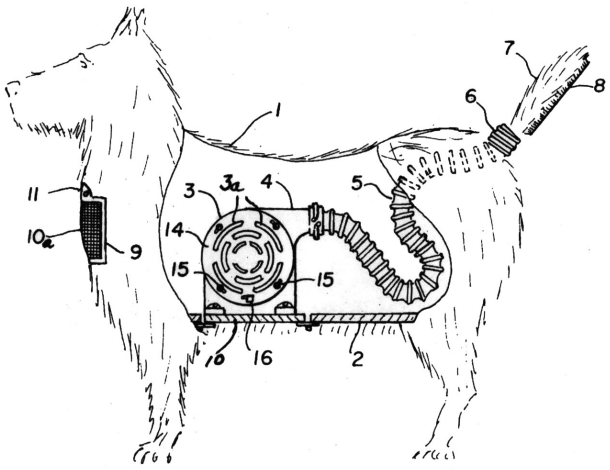

Fig. 1. US Patent no. 3,771,192 Combination Toy Dog and Vacuum Cleaner

[1] We chose USPTO because we were interested in designs that had the US market in mind.

Patent searches were useful in tracking the historical roots of many common cleaning technologies used in homes today and making us aware of inventions not mentioned in the history of housework literature. Archived in patent databases were ideas that were never made commercially available, for reasons we did not explore, including a patent for a dinner table that converts into a dishwasher [35], a vacuum cleaner that is disguised to look like a dog [37], and a prototype for a self cleaning house [1]. These forgotten examples spurred us to imagine wildly different ways to think about housework.

3.1.3 Popular Magazines and Catalogues

Recognizing that housework was not only interesting from the standpoint of technological development, but also from the perspective of consumer culture, we examined back issues of magazines and catalogues. This technique, also found in historical accounts of household technology, provides an opportunity to learn about how appliances were sold to and perceived by the public, typically using advertising, problem pages, and articles to elicit that information. We chose to look at *Good Housekeeping, Ladies Home Journal,* and copies of *Sears Roebuck* catalogues because they are considered valid sources for understanding the nature of domestic work in relation to consumer culture in the first half of the twentieth century [8,21].

Wanting to understand housework through the consumer's lens during this time, we looked through randomly selected copies of early magazines. Libraries typically have bound volumes of old magazines shelved chronologically. These primary sources supported a different kind of historical awareness than historical texts, less intellectual and more experiential. We felt like we were traveling back in time, looking at the ads and glancing at the articles in the format in which they originally appeared. Just as with the patent search, there were things to be learned about the history of housework not revealed in historical texts.

It was housework that led, in part, to the creation and rise of these magazines. At the end of the twentieth century, changing attitudes towards cleanliness and the decline of domestic servants led to the proliferation of magazines like *Good Housekeeping* and *Ladies Home Journal*. This was the time of "the great hygienic boom." Breakthroughs in germ theory were taking place and middle-class women were becoming increasingly concerned with germs and their potential to spread disease [17]. The resulting increased standards of cleanliness prompted manufacturers to develop a myriad of products to help homemakers disinfect every room in their homes. The magazines provided a forum for manufacturers to advertise their new products and to offer advice on how to properly maintain a home.

Good Housekeeping and *Ladies Home Journal* have been in continuous publication since the late 1800's and are considered indicators of the social and technical change that have occurred in American, middle-class homes [8]. We had read about the electrification of homes during the 1920's, but observing the transition from laundry tubs to electric washers in catalogues added another dimension to our understanding. The decline in household assistants, or maids, is frequently discussed in historical texts, but viewing advertisements demonstrated the significance of this change. The

sharp decline of images picturing maids to ones depicting housewives cheerfully touting various new products was clear. A particular strength of these ads and images was that they provided a rich illustration of changes occurring in the home between the years 1920-1960, in a way that could not be gotten from historical accounts alone.

3.2 Home Studies to Elicit Histories: Elders and the Memory Scrapbook

Reviews of historical literature, patents, and magazines identified a variety of themes and design opportunities for domestic technologies that we decided to explore in an empirical study. Again, we turned to another historically grounded approach to gather empirical evidence: oral histories. Oral histories are verbal testimonies about past events or simply stories from any individual's life [16]. We recognized that, at a time when computer networks are entering homes, much can be learned from those who experienced the past wave in which electricity was introduced into the home. Inspired by Blythe et al.'s technology biographies [6], we decided to integrate oral histories into an ethnographic home study, similar to those already used in ubicomp [7]. There were two core elements to our home study: the selection of appropriate participants and the development of a 'memory scrapbook' to help elicit stories from our informants.

3.2.1 Selection of Project Participants

In order to elicit oral histories, a decisive factor was our selection of participants. We chose to work with older adults who would be able to share their housework experiences from the years 1940 to 1965. Interviews with elders became an important way to breathe life and personal meaning into the historical data we had collected.

Specifically, we did home studies with 11 female homemakers who described themselves as being largely responsible for housework in their homes during the years 1940 to 1965. During these ethnographic-style home studies, we toured their homes and intensively interviewed the homemakers on their housekeeping practices. With the exception of one participant, all had lived in single-family household structures with children, environments similar to what we saw in the advertisements. The age range was 69-84 years old, with a mean age 76 years. Thus, the older participants in our study were approximately 20 to 54 years old during the years we focused on, while younger participants ranged from being children to young adults. Younger participants frequently recalled memories from their adult years as well as their childhoods. We recruited participants by asking colleagues and acquaintances if we could talk to their parents and/or grandparents. Participants were predominantly from the northeastern part of the US. They were compensated for their participation with $50 or a gift certificate to a popular restaurant in their area.

3.2.2 Eliciting Histories Using the Memory Scrapbook

In addition to home tours and intensive interviewing, we developed a research instrument called the 'memory scrapbook' to support collection of historical experiences. In this section, we will explain how the memory scrapbook was designed, then describe its deployment as part of our home studies.

Design of the memory scrapbook

The memory scrapbook design is based on photo elicitation, or the use of photographs to provoke a response. Photo elicitation is based on the simple idea of inserting photographs into a research interview [15]. It is used by anthropologists and historians to stimulate recollection of personal and public memories. The difference between using photos and typical interviewing techniques is that images can evoke deep elements of human consciousness, thus helping uncover richer aspects of a user's experience [20]. In addition, we hoped that photo elicitation might help offset problems with memory that typically occur as people grow older.

We chose to put the images in a scrapbook because it was an attractive and familiar medium for eliciting memories. Scrapbooking is a hobby that emerged in the late 1800s when Americans began pursuing the art of pasting letters, photos, greeting cards and other mementoes in books, as a way of preserving them for future generations [10]. We could expect our participants to be familiar with scrapbooks as a genre for stimulating discussion of the past. Additionally, we hoped the scrapbook's informal and personal nature would be useful in establishing a rich dialogue with our informants while keeping the interview grounded in housework and history.

We drew on our previous historical analysis for design inspiration, returning to the back issues of *Good Housekeeping*, *Ladies Home Journal*, and *Sears Roebuck* catalogues we had looked through earlier. In the magazines we looked for advertisements related to housework. This included products used for doing laundry, washing dishes, polishing silver, and scrubbing toilets, countertops, and floors. We avoided advertisements related to childcare and personal hygiene because we were specifically interested in house cleaning. In the *Sears Roebuck* catalogues we looked for images of cleaning instruments such as brooms, irons, and washing machines. Pictures were selected according to their graphical interest. Selected images were then scanned and catalogued according to their date and what they depicted. Approximately 100 ads and photographs were chosen to potentially be in the scrapbook. They were cropped to take out irrelevant background details so that the focus would be on the advertisement or image.

We purchased an 8.5 x 11 inch, fabric-bound scrapbook at a chain crafts store. There are a variety of scrapbook styles, ranging from ones covered in multi-colored flowers to costly leather bounds ones. Wanting to keep in line with the dated imagery inside the scrapbook, we chose a book covered in a simple black fabric with gold embossed trim. Selected images were color printed on white card stock and arranged on each page with attention to visual composition. There were 12 pages in the book and a total of 52 variously sized images from the years 1940 and 1964 (see Figure 2).

Deployment of the memory scrapbook

The scrapbook was used during our home visits. Following the home tours we returned to the living room or kitchen and asked participants to interact with the scrapbook. It was introduced after the home tour because we were interested in creating a contrast between elders' current housework experiences and their past ones.

We wanted to collect stories rather than facts, which prompted us to develop something more engaging than a typical survey. As with cultural probes [12], the scrapbook was meant to question the preconception of researchers as authorities.

Fig. 2. Page from Memory Scrapbook

Indeed, older adults were the experts in our case because no one on our research team was alive during the time period we were examining. We were also sensitive to the fact that we were using an unfamiliar implementation—the scrapbook—of the oral history research technique. Participants were told that the scrapbook was an experiment on our part:

> *This is a "memory scrapbook," its a way for us to find out more about you and how technology has changed during your lifetime, ignore things you are not familiar with, and discuss things you are. There is no right or wrong answer and I hope it is fun.* –study's principal investigator

We let participants hold the scrapbook and flip through the pages at their own pace. While thumbing through the scrapbook, we stressed that we were interested in memories related to the advertisements and that, if there were images that they were unfamiliar with, not to worry and to go on to the next page.

4 Findings of the Study

In this section, we present findings from our study organized into three topic areas, including issues raised by our study and the resulting design implications. First, we examine the tension between making domestic tasks easier and the challenging aspects that accompanied housework in the past. This suggests that designers should not always make reduction-of-effort a central focus of housework technology, instead retaining some of the challenging and rewarding aspects that elders enjoyed. Second,

we discuss the decline in the quality of manufactured cleaning products and suggest that designers should work towards developing systems that are as durable and long-lasting as Fuller brushes. Finally, we analyze the historical tendency of technology to individualize domestic tasks rather than preserving appealing social aspects, and propose ways entertainment and communication devices in the home could bring people together.

4.1 "Hands and Knees"

Using the scrapbook during our interviews, we asked elders to discuss how cleaning had changed over time. Unsurprisingly, many described technology's role in making tasks easier during their lifetimes. Images of wringer washers sparked stories about preferring today's electric washing machines to the earlier manual versions. Wringer washers were commonly used to clean clothes in the 1930's and early 1950's; they were physically demanding and dangerous to use. Advertisements for the laundry soaps like *Bon Ami*, *Duz*, and *Tide* caused some to recollect when they needed to scrape and boil their own soap; all were pleased that they could buy these items at the store rather than having to make their own.

Despite the positive changes brought by making household tasks easier, many informants described missing difficult aspects of it that became less common with the introduction of efficiency driven domestic technologies. For instance, many participants preferred using their "hands and knees" to clean floors as opposed to using a floor mop.

> *I was a hands-and-knees washer. And I still am basically hands and-knees, if it really has to be done, because just swishing the mop around, you don't get the corners, you really don't do the job.* - 72 year old woman

Prior to the introduction of floor mops and the more recent Swiffer™ cleaners, hands and knees was a common way to clean floors. Though it is physically demanding and time-intensive, some elders preferred this technique because of its thoroughness, the challenge of making a dirtied floor "sparkle," and the sense of satisfaction that followed finishing the job.

> *It's a rather superficial job, using the mop. I would prefer a more thorough job like you get when you get down on the floor yourself.* - 81 year old woman

or

> *I like to have things clean. Like, I enjoy working and cleaning the kitchen floor, you know, making things look good. I feel like I have accomplished something.* - 77 year old woman

Others preferred cleaning on their hands and knees because it was a form of exercise. Indeed, rather than removing the physical effort required to clean a floor, some enjoyed it and considered it a source of physical activity.

> *When its cold or raining outside I can't go out walking, getting down and cleaning the floors is how I exercise; it's good for me.* - 81 year old woman

We have no intention of implying that technology needs to make tasks more difficult and agree that efforts to decrease the amount of time spent on housework are beneficial. However, our findings suggest that by focusing on making tasks effortless, other positive aspects of the experience may be lost.

In addition to developing systems to make tasks easier, perhaps other aspects should be considered. For instance, rather than being a chore, computational systems and devices could be developed that treat housework like a game [5]. Or designers could imagine scrubbing floors as a form of exercise and develop cleaning systems that monitor how many calories users burn, similar to the feedback workout equipment provides. If thoroughness in cleaning is a concern, perhaps that signals a need to develop systems that communicate to users how clean their floors are. If anything, the finding suggests that by exploring how housework was done in the past, designers can consider new ways of envisioning how it can be done in the future.

4.2 Designing Durable Systems and Devices

Included in the scrapbook were images of cleaning supplies taken from *Sears Roebuck* catalogues, like mops, feather dusters, wringer washers, and vacuum cleaners. These images inspired comments about how the quality of cleaning instruments had declined over time. The "Fuller Brush" ads exemplified this trend, because they elicited comments about how durable some products were in the past. The Fuller Brush Company has continuously manufactured cleaning brushes since 1906 and touts itself as creating "the best products of their kind." Indeed the quality and durability described in the brushes' ads proved true. Informants dug into their closets and drawers and eagerly showed us brushes from years ago. Despite frequent use, the participants described how the brushes' bristles always stayed in place.

> *They were high quality you know . . .very good quality . . . they say bristles don't come out, well they don't. Of course years ago most of our products were well made you know . . . its different today.* - 79 year old woman

This sharply contrasted with informants' attitudes regarding products today, which many described as lacking the quality evident in older products.

> *I remember the Fuller Brush man; his brushes were expensive but wonderful. And they lasted forever. Not like the ones you get at [a chain department store] today.* -68 year old woman

And

> *Oh yes, Fuller Brushes, they were the best brushes ever made, I still have two of them, they are nice, not made out of that cheap plastic you get today.* – 71 year old woman

This claim was further supported by elders' comments during our in-home tours. We discovered that participants continued to use some of the same tools to clean that they had used decades earlier. When asked about why they chose to use these older versions, many describe quality as being key.

> *I think back then we care more about things and make them last. Today they don't. You just go buy new ones. I mean I could use this to death [referring to feather duster] and it wouldn't fall apart. Now they throw 'em away. Everything is replaceable today. And back when I was growing up, it wasn't.* - 70 year old woman

One design implication is clear. Rather than designing computational devices and systems that will become outmoded in a limited amount of time, i.e. incorporate planned obsolescence, designers should consider borrowing from Fuller's Brush Company's mantra of making "making things last." Today, computers are becoming almost as disposable as toilet brushes. Monitors fill up landfills and hard drives abound in thrift stores because they no longer work or are out of fashion. The opportunities for new devices in future homes is an opportunity to subvert planned obsolescence and potentially develop ubiquitous computing devices that are sustainable and long-lasting.

4.3 Design to Support Togetherness

Five of the 11 participants had fond memories related to washing dishes when they were growing-up. They described missing the social interaction that accompanied this common household chore. This finding personalizes a theme common in historical accounts, that technology has made housework more isolating. Indeed, as technology made its way into homes, the unplanned interactions that were a common part of housework tended to disappear.

Prior to the electric dryer, garments were dried outside on clotheslines. When electric dryers were introduced, homemakers ceased to go outdoors to hang their washing out, instead going to their own indoor basements or laundry rooms to dry clothes. This led to decreased opportunities to serendipitously interact with neighbors.

> *We lived in a row house. So of course backyards were backyards. . . . but every Sunday, there would be a lot of wash on the line. And I would go and help my grandmother bring it all in. And there would be neighbors there and we would all talk. And my mother, when she would go out and hang wash, we would always talk to our neighbors outside. We always hung wash - we didn't have dryers.* -81 year old woman

Others fondly recalled domestic life prior to electric dishwashers. For many, manual dishwashing was an activity that supported informal conversations among family members.

> *Well, one of the things I apparently like doing, oddly enough, is washing dishes. I hardly use my dishwasher. Because when I was growing up, the only time I really had a relaxed communication with my mother was when she would be washing dishes, and I would be drying. That became a – and also with my kids, when they were growing up, it became a nice, easy communication – non-threatening communication time.* - 69 year old woman

And

> *I think we have lost something because of the dishwasher that used to be kind of a good time to talk about things and discuss what had been going on in the day and what was bothering you. If you were doing it with your sisters and brothers, or your mother or maid or anybody, it was a nice time. We didn't realize it at the time. We didn't care for doing the dishes, but we have lost that now.* - 77 year old woman

Indeed, we see this trend of designing home entertainment and communication technologies for one user rather than multiple ones repeated today. We use *personal* computers at home and TiVo® recording systems note preferences for one user, instead of multiple family members, something which has been empirically seen to cause tension in the group-oriented setting of the home [14]. Rather than having a shared landline, we increasingly see people relying on their personal cell phones when communicating, thus limiting the opportunities for serendipitous interactions with others.

Once again, we are aware that advances in technology have vastly improved how housework is done today, but we also want to draw attention to the sensual qualities of users' experience that have been lost over time. We are arguing that ubicomp developers should design systems and devices to support collective as well as individual activity in order to preserve the social interaction that were an important part of our users' domestic chores.

5 Discussion and Future Work

What became clear from our use of historical methods to understand housework was how different domestic life was 50 years ago. It was effective in helping us understand the subtle changes that have resulted with the introduction of new domestic technologies and in opening new space for design. Although the historical texts already revealed themes pertinent to ubicomp design (i.e. labor-saving debate and technology's gendered character), by drawing on popular texts, patents, and interviews with elders as well, we learned things that could not easily be gleaned from texts alones. For instance, cleaning fluids used to be packaged in glass rather than plastic bottles, the "super sized" packages that detergent are sold in today did not exist, and rather than having dozens of brands of window cleaner to choose from people used to have two or three. Indeed it was primarily the sensual or felt aspects of the domestic experience that appear to have been lost with the introduction of domestic technologies motivated by efficiency. With current interest in restoring felt experience as central to design [22], we believe that historical analysis is an important

source for becoming aware of sensual aspects of experiences that have become lost but could be addressed in new forms of technology design. In particular, the multidimensional aspects of our analysis—not only reading historical texts but also looking at patents and images and talking to elders with images as a stimulus—support the development of a rich sense of the felt experience of the activity we are seeking to redesign.

In addition to revealing how felt qualities are altered with the introduction of new technologies, another benefit of our historically grounded approach is its potential to inspire radically novel design concepts. A collection of speculative design proposals resulted from our process [see 30 and 36 for details]. Like ethnography, history forces designers to become more aware of their preconceptions about a topic. Because of its ability to defamiliarize the present, history can be a powerful recourse for inspiring innovative computational devices and systems.

5.1 Broader Implications

Although our study focused on housework, we believe the same strategies would be useful for other aspects of the domestic environment, such as cooking, childcare, or entertainment, as well as for other activities outside the home. For example, during our interviews, many older adults described massive changes in how they shopped for household goods; exploring this changing history of shopping could reveal design opportunities for e-shopping today. Even the design of workplace systems could arguably be inspired by an understanding of how work has changed over the last century.

Central to our techniques for historical analysis is a carefully designed, material artefact which stimulates oral histories. Other than a scrapbook, we believe other mediums have potential for eliciting stories from the past for the purpose of inspiring design. For instance, a view-master with a slide reel from the early games and toys could be an evocative way to elicit stories about how gaming systems have evolved over the last 40 years. Specially-designed recipe books could be deployed to understand how kitchen technologies have changed over time, while researchers exploring urban computing could use old maps and atlases to elicit stories about how urban space has changed. In all these cases, carefully designed artefacts can provide an evocative and engaging focus for conversation with users.

6 Conclusion

In recent years ubicomp researchers and developers have increasingly been influenced by methodologies deployed by designers, sociologists, and anthropologists. In this paper we extend this trend to include methods from the discipline of history and demonstrate how doing so can contribute to understanding the domestic environment for the purpose of design. The process of historical analysis that we developed involved four major steps. First, we analysed historical texts to identify major themes in the development of technologies (often automation) for the activities under investigation, in our case housework. Second, we gained a broader understanding of

the existing technological design space through the search of patents. Third, we developed a personal sense of the changing nature of housework through examination of primary sources from popular culture. Finally, as part of broader fieldwork we gathered oral histories from older people, using a designed, material artefact that reflected the popular history of housework to stimulate memories and reflections. Through these steps, we both developed a better understanding of the activities under design and defamiliarized ourselves from the standard technology design process, opening up new spaces for technology design in the home.

Acknowledgments

We would like to thank all of the homemakers who kindly let us into their homes to talk about housework. We would also like to thank Paul Dourish, Giovanni Iachello, Kris Nagel and Amy Voida for their supportive advice on how to structure this paper, and the anonymous reviewers for helpful comments, criticisms, and suggestions. This work was supported by a research grant from the S.C. Johnson and Son Co. and by NSF Grant IIS-0238132.

References

1. Bateson, F.G. (1984) "Self-cleaning Building Constructions." United States Patent and Trademark Office. Patent no. 4,428,085.
2. Bell, G., Blythe, M. and Sengers, P. (2005) "Making by Making Strange: Defamiliarization and the Design of Domestic Technology." *Transactions on Computer-Human Interaction (TOCHI)*, Special issue on Social Issues and HCI, vol. 12, no. 2, pp. 149-173.
3. Bell, G. and Kaye, J. (2002) "Designing Technology for Domestic Spaces: A Kitchen Manifesto." *Gastronomica*, vol. 2, no. 2, pp.46-62.
4. Berg, A.J. (1999) "A gendered socio-technical construction: the smart house," in *The Social Shaping of Technology*, D. MacKenzie and J. Wajcman (eds.), Second ed. Buckingham: Open University Press, pp. 301-313.
5. Blythe, M., and Monk, A. (2002) "Notes Towards an Ethnography of Domestic Technology." *Proc. DIS 2002*, pp. 279-282, London: ACM Press.
6. Blythe, M., Monk, A., and Park, J. (2002) "Technology Biographies: Field Study Techniques for Home Use Product Development." Extended Abstracts *CHI 2002*, pp. 658-659, Minneapolis, MN: ACM Press.
7. Consolvo, S., Arnstein, L., and Franza, B.R. (2002) "User Study Techniques in the design and Evaluation of a Ubicomp Environment." *Proc. UbiComp '02*, pp. 73-30, Göteborg, Sweden: Springer.
8. Cowan, R.S. (1976) "The 'Industrial Revolution' In the Home: Household Technology and Social Change in the 20th Century." *Technology and Culture*, vol. 17. pp.1-23.
9. Cowan, R.S. (1983) *More Work for Mother: The Ironies of Household Technology from the Open Hearth to the Microwave*. Basic Books Inc.
10. Fram, E. (2005) "The Booming Scrapbooking Market in the USA: Despite Phenomenal Growth, the Future's Unclear." *International Journal of Retail & Distribution Management.* vol. 33, no. 3, pp. 215-225.

11. Forlizzi, J., and DiSalvo, C. (2006). "Service Robots in the Domestic Environment: A Study of the Roomba Vacuum in the Home," *Proc. Of Human-Robot Interaction 2006*. Salt Lake City, Utah: ACM Press.
12. Gaver, W. (2001) *The Presence Project*. Computer Related Design Research, RCA London.
13. Gaver, W., Dunne, A., and Pacenti, E. (1999) "Cultural Probes," *Interactions*. vol. 6, no. 1, pp 21-29.
14. Grinter, R.E., Edwards, W.K., Newman, M.W., and Ducheneaut, N. (2005) "The Work to Make a Home Network Work," *Proc. of the Ninth European Conference on Computer-Supported Cooperative Work* (ECSCW'05). Paris, France.
15. Harper, D. (2002) "Talking About Pictures: A Case for Photo Elicitation." *Visual Studies*. vol. 17, no.1. pp. 13-26.
16. Hoopes, J. (1979) *Oral History: An Introduction for Students*. Chapel Hill, NC: The University of North Carolina Press.
17. Hoy, S. (1997) *Chasing Dirt: The American Pursuit of Cleanliness*. Oxford University Press.
18. IDEO (2003) "IDEO Method Cards: 51 Ways to Inspire Design." San Francisco, CA: W. Stout Architectural Books.
19. Lupton, E. (1993) *Mechanical Brides: Women and Machines from Home to Office*. New York, NY: Cooper-Hewitt National Museum of Design.
20. Marshall, C. and Rossman, G.B.(1998) *Designing Qualitative Research*. Newbury Park, CA.: Sage Publications, Inc.
21. Martens, L. and Scott, S. (2005) "The Unbearable Lightness of Cleaning: Representations of Domestic Practice and Products in Good Housekeeping Magazine: 1951-2001." *Consumption, Markets and Culture*, vol. 8, no.4, pp. 379-401.
22. McCarthy P., and Wright, P. (2004) *Technology as Experience*. Cambridge, Mass.: MIT Press.
23. Modell, J. and Brodsky, C. (1994) "Envisioning Homestead: Using Photographs in Interviewing" in *Interactive Oral History Interviewing,* E. McMahan and K.L. Rogers (eds.), Hillsdale, NJ: Erlbaum.
24. Rode, J.A., Toye, E.F. and Blackwell, A.F. (2004) "The Fuzzy Felt Ethnography - Understanding the Programming Patterns of Domestic Appliances." *Personal and Ubiquitous Computing 8* , pp. 161-176
25. Rode, J. (2005) "Appliances for Whom? Considering Place*."* *Proc. of the 3rd International Conference on Appliance Design*. Bristol, UK.
26. Salvador, T., Bell, G. and Anderson, K. (1999) "Design Ethnography." *Design Management Journal*, vol. 10, no. 4, pp. 35-41.
27. Salvador, T., and Anderson, K. (2003) "Practical Considerations of Context for Context Based Systems: An Example from an Ethnographic Case Study of a Man Diagnosed with Early Onset Alzheimer's Disease." *Proc. UbiComp '03*, pp. 243-255. Seattle, WA: Springer.
28. Santanaya, G. (1953). "Reason in Common Sense." *The Life Of Reason,* Rev. Ed. New York: Charles Scribner's Sons.
29. Sengers, P. (2004) "Doomed to Repeat? How History Can (and Should!) Inform Home Technology." Position paper presented at CHI 2004 Workshop on "Designing Culturally Situated Technologies for the Home." Available online: www.cemcom.infosci.cornell.edu/ papers/doomed-to-repeat.pdf
30. Sengers, P., Kaye, J., Boehner, K., Fairbank, J., Gay, G., Medynskiy, E., Wyche, S. (2004) "Culturally Embedded Computing." *IEEE Pervasive Computing*, vol. 03, no.1, pp. 14-21.

31. Spigel, L. (2001) "Yesterday's Future, Tomorrow's Home." *Emergences*, vol. 11, no. 1., pp. 29-49.
32. Strasser, S. (2000) *Never Done: A History of American Housework*. New York, NY.; Henry Holt.
33. *The Sears Roebuck Catalogues of the Thirties: Selected Pages from the Entire Decade*. (1978) Franklin Square, N.Y.: Nostalgia, Inc.
34. Vanek, J. (1974) "Time Spent in Housework." *Scientific America*, vol. 231, pp. 116-120.
35. Wilson, W. (1961) "Combined Dining Table and Dishwasher." US Patent no. 2,971,519.
36. Wyche, S. (2005) "Designing Speculative Cleaning Products for the Home." Proc. DUX '05. San Francisco, Ca.: ACM Press.
37. Zaleski, A.M. (1973) "Combination Toy Dog and Vacuum Cleaner." United States Patent and trademark Office. Patent no. 3,771,192.