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ORIGINAL ARTICLE

Rhythms and plasticity: television temporality at home

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Abstract Digital technologies have enabled new temporalities of media consumption in the home. Through a field study of home television viewing practices, we investigated temporal orderings of television watching. In contrast to traditional pictures of television use, our evidence suggests that rhythms across households play an important role in shaping television watching. Further, we found a flexibility and openness within the patterns of television viewing that we refer to as "plasticity." Our data suggest that plasticity and rhythms co-exist and together compose the qualitative experience of domestic television time; an understanding of both aspects of temporality suggests an approach for the design of future television technologies.

Keywords Home · Ethnography · Video · Technology ensemble · Time

1 Introduction

Time and temporality are critical issues in the design of interactive technologies of all sorts. In the design of ubiquitous technologies, for example, context-aware computing has sometimes attempted to learn users' routines as a way of using the past to orient towards and act in the future [4, 28]. In CSCW, awareness of temporal rhythms has been recognized as a critical aspect of understanding and supporting practices of collectives working in concert [25].

Television is the quintessential example of technologized media consumption in domestic environments. Traditionally, it has had a fixed temporal structure as laid out by the broadcast schedule. Technologies such as set-top boxes, digital video recorders, and on demand services have allowed for considerably more flexibility in these temporal structures. Our goal here is to examine these phenomena empirically.

In our research, we investigated everyday television watching practices in 14 households over 2 weeks through diaries and in-home interviews. We took a broad view of television watching that included watching films, using the television as background noise, and watching recorded shows from various devices.[1]

We certainly found many instances of the classic image of television temporality, families relaxing together in front of the television, engrossed in a storyline—"time-using" entertainment as described by [14]. As one would expect, we also found time-shifting to adjust broadcast rhythms to one's personal schedule.

However, we also found a range of emergent, complex, temporal patterns that sit between these two extremes. We found the integration of television into the household partially explained by the ways it can be shaped to fill *plastic time* [23]—the time of activities that are interruptible and can expand or contract to fit between other activities. We explain the ways participants actually *make* television

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[1] Data was collected prior to Google's acquisition of YouTube so internet video and television was not widespread among our participants.

viewing more or less plastic through the use of technologies such as digital video recorders (DVRs) and by their choices of television content. Critically, these patterns are influenced by larger social groups—groups that extend beyond a single household.

This counters conventional wisdom that television is a passive medium, creating waters who are "couch potatoes" "glued to the tube." Literature on the effects of television describes deleterious effects such as addiction [16], obesity [15], and loss of social capital [22]. Television, present in 99% of United States homes, is a pervasive aspect of domestic life actively crafted to and actively managed and integrated into domestic work, leisure, and the many uncategorizable activities in between.

In what follows, we present previous work that we build upon and extend, before presenting our own findings with an emphasis on the concepts of temporal rhythms and plasticity. These dimensions of lived home life are important for the design of pervasive, domestic technologies.

2 Related work

Research on domestic technology in CHI and CSCW has greatly increased our understanding of social coordination and meanings of technological experiences in the home. Findings have detailed the importance of technologies of the home in mediating spatial dynamics [20], economies of mutual support [27], and leisure.

Research that focuses on temporalities of domestic television typically details how media consumption is structured by the routines and rhythms that originate external to the home. Taylor, for example, investigated "natural rhythms" of television watching, finding that "coming home" watching, "mid-evening" watching, and "later evening" watching [32] each involve different levels of engagement and different ways of finding programming. Gauntlett has also described similar temporal rhythms of television engagement based on time use studies and field work. This research typically represents the time use patterns of study participants but privileges highly institutionalized rhythms such as work and school in structuring television temporalities.

Other research has focused on the uses and effects of time-shifting television—possible since the VCR but enabled at a much larger scale by high-volume storage and interface improvements in devices such as Tivo. Several studies have documented how DVR users time-shift shows to watch them at greater convenience [7, 12]. Researcher John Carey [7] noted in his ethnography of 10 homes that time-shifting seemed to enable more engaged, mindful television watching.

Temporality is included more broadly in studies of other domestic technologies, either directly or tacitly. Some research studies the problems of scheduling a time coordination in the home, focusing on the role of artifacts such as calendars and documents organized in domestic space [33]. Other research begins to explore how particular technologies fit into the temporalities of the home. Grinter and Palen describe how IM is a "quiet technology" that can unobtrusively fit into the rhythms of the home when necessary [11]. Rattenbury et al. detail the ways the practice of internet use on mobile PCs fits opportunistically into increasingly fragmented days [23].

In analyzing accounts of television time among our participants, we draw from research on the temporality of work and reflect on its relevance for understanding domestic digital television consumption. In particular, we draw on Orlikowski and Yates' [21] account of temporalities as enacted, shifting, multiple, and heterogeneous temporal structures. In this view, individuals have agency but act in relation to normative structures that themselves emerge from aggregate individual actions and discourses. Reddy et al. [25] build on this structurational analysis of temporal structures by highlighting how temporal rhythms and temporal horizons orient individuals towards possible futures for the purposes of coordination and planning. Though such accounts of temporality are primarily drawn from workplace studies, we find similarly that people's social coordination within and between households required both anticipating activities based on rhythms, as well as trying to shift rhythms.

3 Methods

Our methods consisted of ethnographic in-home interviews, guided tours, and diary studies of television and media selection and viewing events. We conducted semi-structured interviews in 14 households with a primary participant in each household and briefly spoke with secondary participants present in several households during our visits. We obtained 2 weeks of viewing diaries for each participant.

Participants were recruited by an external agency from the San Jose, CA area. They did not know one another. Using the 2005 American Time Use Survey [1], we identified factors of interest that were likely to cause variation in the number of hours people spend watching TV and balanced:

- Households with young children, households with no children
- Income
- Participants above and below the age of 35

- Full-time workers with unemployed or part-time employees

We recruited participants who had used at least one of Tivo, digital cable with OnDemand service, or Netflix, so we could witness media finding and browsing behaviors in a variety of technology environments. While our selections showed a bias for people who made TV a significant part of their life, there was a wide variety, from people for whom the TV seemed to be the center of their leisure life to people who talked about how limited their TV time was (either by choice or by life circumstances).

We chose not to reveal the company sponsoring our research to participants, as we worried that such knowledge would become the focus of discussion.

We introduced ourselves to the participants in an initial home visit during which the user told us their history and stories of various forms of media they incorporate into their life practice. We left clipboard diaries with our participants so that they could record the time and date of the viewing event, what they considered watching, what they ultimately selected, whom they chose content for, and how they made their choice. After 2 weeks, diaries were collected and we conducted a concluding interview to hear participant narratives of selected diary events and discuss other themes as they arose.

Selected diary entries were used as triggers for stories or explanations about the viewer's motivations and the context in which they selected what to watch. We designed lightweight diary prompts so logging activities would not overwhelm participants. Diaries were then used during interviews to prompt participants' recollections of specific instances of television watching. This cued recollection method was inspired by similar methods used for studies of web search, a similarly pervasive, lightweight, and difficult-to-recall activity [29]. For each participant interview, we asked questions based on that individual's own diaries so we could hone in on their particular television practices. Some participants remarked at the end of the study how their behaviors and choices surprised them, reinforcing to us the value of our diary data.

During the final visit we also sought to collect meaningful user stories around viewing experiences outside the scope of the 2-week diary period. One way we did this was by creating a story deck of approximately 50 cards displaying images selected to be evocative and/or ambiguous. We presented participants with this deck and asked them to select several cards that reminded them in any way of "finding things to watch." We asked participants to tell us stories with the goal of eliciting experiences that would not have emerged from our semi-structured interview. This method was effective in evoking stories that were discontinuous to previous conversations but very relevant to our area of interest. Rather than giving accounts of situated practice, the picture deck elicitation method was particularly useful for eliciting narratives that shed light on the meaning of television in participants' everyday lives.

In analyzing our data, we began interested in informing the design of video technologies by learning how people discover and choose television programs. Our initial analysis phase highlighted dimensions of television programs and television experience, such as immersiveness, social relevance, or participant categories of programming. The importance of temporal coordination emerged from interviews and resonated with other research on television [32], causing us to return to the data and code for temporal experiences and accounts to deepen our understanding of how these technologies fit into and shape daily life, iterating our coding scheme as we refined our analytical concepts.

Though we engaged with each household over 2 weeks, participants were spread over a 6-week period. We have noted in the analysis when significant events within this window, such as Superbowl, shaped the patterns.

4 Rhythmic television watching

Some television watching at home is repetitive and cyclical, shaped by temporal structures such as weekly broadcast schedules and repetitively structured work weeks. While this repetitiveness and predictability is often described as routine, we see as patterns of situated actions that emerge in response to many rhythms at work in participants' lives. Both interpersonal and institutional, these rhythms emerge as a result of actions within and outside of the household. Predictable television watching is situated in rhythms. These are subject to change and are negotiated, altered, and reinforced by participants' own actions. When made visible, these rhythms can also be resource for social coordination.

HCI researchers, frequently discuss household activities in terms of routines [20, 32, 34]. "Stable and compelling routines" have been named as a central concern for the design of domestic technologies [8]. Following Crabtree and Rodden, we see routine most analytically useful as describing sequences of familiar action. Our participants' experiences of periodic activity are more reflected by rhythms. We use rhythms, following its use in CSCW research [21], to denote temporal periods that shape and structure but do not determine when people do an activity. DVR technologies, for example, allowed people flexibility in the times they watched television while allowing them to adhere to a larger rhythm. Rhythms emphasize the temporal patterns that allow for coordination or predictability, rather than fine-grained, repeated sequences of action.

By reflecting on participants' reported routines and their television watching diaries, we formulate an account of television watching as situated in these broader social rhythms.

When first asked about their TV watching habits, participants talked about their typical TV watching routines—their account to researchers of what their normal television watching might be.[2] They spoke of what they watched on which days, what time certain programs were watched or recorded. At least 10 of our 14 participants made statements about their routines or regular patterns. Our findings mirror previous studies [10, 20, 32] that find that television is often described to demarcate rhythms and phases of domestic life, such as waking up, coming home, relaxing after dinner, and going to bed.

These rhythms had many periodicities, but weekly television schedules, culturally specific regularities in business schedules, and holidays are all examples of how the daily, weekly, and yearly rhythms that are commonly recognized in the American suburb that we studied.[3]

Of course, shows such as the nightly news, *Jeopardy*, and the aptly named *Daily Show* occurred daily. Weekly television shows commonly included sitcoms and dramatic series. Events such as the Superbowl and the Oscars, occurring yearly, exemplify longer rhythms. Television watching in practice was situated at the intersection of heterogeneous rhythms such as broadcast rhythms, work rhythms, social rhythms, and personal rhythms. Rick, a punk rock musician, records Saturday night shows like *Saturday Night Live* and *Mad TV* on his DVR because he's usually out playing gigs on that night. He then spoke about habitually watching those shows Sunday during the day. Another participant, Stu, spoke of how he and his girlfriend had a weekly rhythm of watching *House* together. Deena described typically watching shows like Lost and Grey's Anatomy weekly.

Rhythmic watching can be either yoked to the broadcast schedule or time shifted, but even when participants queued up recordings of daily or weekly shows, they described this as an aberration. When life interrupted participants' weekly routines and they had a means to record the program, they spoke of "catching up" or "being behind" on a particular show.

In some cases, people adapted their own television watching with respect the rhythms and preferences of others in the relationship. Goldie explained how she shifts some of her TV watching so that she can watch synchronously with her husband: "Grey's Anatomy is a program my husband and I watch together. So I won't watch it until he can watch it." Rick described anticipating what he and his wife would watch when she returned home from work based on his understanding of her television preferences. He would try to make sure to watch shows that she did not like when he was alone, saving shows she liked for their time together. Lawrence similarly planned what he watched alone around what he anticipates his wife liking to watch together. Several other participants described time shifting programming to enable synchronous, collective watching experiences. In this way, our findings echo literature which finds synchronous, collective watching to be important in the social experience of television watching [12, 18]. Yet our findings emphasize how anticipating the temporal rhythms of others and choosing, in the moment, what to watch alone can have as much as a social aspect as choosing what one watches in common with others.

In-the-moment acts of choosing what to watch on TV were critically shaped by anticipation of collective experiences of watching to come in the future. This coordination based on temporal rhythms and possible futures, termed the temporal horizon by Reddy et al., is similar to the role of temporality in coordination in workplaces [25]. These anticipated collective experiences occurred not only within households, but also across them.

4.1 Temporal ties across households

While literature on domestic television use typically focuses on the household as the unit of analysis, we also found rhythms across households to be relevant to domestic television watching. Several of our participants described collective TV experiences they participated in and deliberately created with friends, coworkers, and relatives outside the household.

The most obvious case of a rhythm that was felt across many households was the Superbowl. The Superbowl is the yearly championship game of American professional football. It is typically the most watched television program of the year. Certainly it provided an opportunity for many of our participants to watch in a co-located way. However, even Stu, who did not attend a Superbowl-watching event, felt accountable for expressing awareness of the Superbowl. Though he studied for his midterms during much of the Superbowl, Stu watched the pre-game show so he "could be guyish" the next day at work. Time shifting the Superbowl beyond his next work shift would have worked against Stu's purposes of participating in workplace banter. Deena, a hockey fan, also oriented towards rhythms of sports discussion beyond the household and these rhythms bounded the amount of time it made

[2] We must acknowledge that there are many potential television practices, for example of a sexual nature, which no participant shared with the researchers.

[3] Even something as simple as a week might be very different in other cultures—in the island of Java, time is structured by coincidental rhythms of 7-day Western weeks and Javanese 5-day weeks [6].

sense for her to time shift certain programs. "If I miss the hockey game, I miss the hockey game," she explained. "The hockey game I can go see who won in a one-liner in the paper… It's a matter of keeping up." In these cases, the pervasive presence of reporting and commentary on sports events beyond the household tightly limited the bounds of time shifting. In these examples, we see people self-organizing for a larger collective media experience that is strongly structured by broadcast rhythms. That rhythm might bring the chance to shoot the breeze or it may bring a plot or game spoiler.

In many cases, the rhythmic boundaries of time shifting were more specific to particular groups. Deena described recording *Lost* to watch it at a more convenient time, but before Thursday when her bowling group often discussed the show. She recounts: "My sister, my mom, at bowling, they'll say 'hey, did you see such and such last night?'" Stu described watching the news at opportunistically, but soon before his political science class met, since it was then that he would be held accountable to knowing current events. While Stu kept up on politics, Blair kept up on entertainment gossip so she could chat about it with others day-to-day. Because *Dancing with the Stars* was a popular topic among Blair's coworkers, some of her coworkers actively reminded each other to watch the show each week. Thus, while Blair commonly time shifted shows to make them more convenient, these time shifts were regulated by the collective rhythms of television sociality. But rather than the synchronous sociality of watching more typically focused on in social television research [13, 30], much collectively watched television was viewed independently at individually convenient times that still sustained the rhythm of the collective discussion experiences.

In some cases, people took action to support others in staying in sync on a show they held in common socially. Blair's coworkers reminded one another to watch *Dancing with the Stars*. Deena and Goldie both recorded *Lost*, on a tape and DVR, respectively, for friends who missed an episode so that their friends would not fall behind. In these cases, people remind each other or even time shift for one another, providing technical support for the creation of a social television experience.

These collective rhythms were produced in part by participants, rather than defined by some structural outside force. In one case, rhythms across two households were actively negotiated to craft the collective, if asynchronous television watching experience. Deena had been introduced to Grey's Anatomy by her adult daughter, and they regularly discussed it. When Deena started watching it on Monday, rather than the broadcast day, Sunday, because of time constraints in her life, her daughter shifted to watching it on Monday, so that they could discuss it when it was fresh in both their minds. Rick and his wife had also converged on a rhythm of watching Saturday night comedy shows on Sunday night, since Rick commonly performed with his band on Saturday nights. Here, time shifts can produce new rhythms.

The use of television to produce collective experiences in support of sociality echoes much previous research. However, we highlight the roles of temporal rhythms and awareness of those rhythms in the tacit as well as explicit coordination and production of those experiences [3, 17, 18]. We also emphasize that social television is not only television watching that happens together or concurrently, but it is also television watched asynchronously with the anticipation of a future collective experience. And it can even be the television one watches solitarily to so that he or she might watch something else socially at a future time.

5 Making television plastic

While rhythms emphasize that which shapes the times when our participants watched television, it leaves much about the qualitative experience of television unexplained. It also fails to describe the many opportunistic, arrhythmic, variously interruptible ways participants fit television into their days. We find that *plastic*, a metaphor for how technologies integrate into everyday practice, aptly described some important temporal dynamics in how participants chose, managed, and watched television. We draw on plasticity as an analytical metaphor for understanding television practices but also suggest refinements to Rattenbury et al.'s [23] account of plasticity.

Rattenbury et al. [23] use the term *plastic* for the qualitative experiences of time that meet five criteria.

1. They are unplanned and opportunistic;
2. Plastic instances of time can shrink and expand until they are interrupted—they are flexible in how much time they take;
3. Plastic time is not part of people's cognitive models of their behavior; it flies "under the radar;"
4. Plastic time is non-immersive, lending itself to interruption.
5. Plastic time resists categorization—it does not easily segment into themes such as productivity and leisure.

Loosely put, plastic time activities are the variable, ad hoc time that fits between or along with other activities. Rattenbury et al.'s discussion of plasticity is framed as a discussion of how a particular technology is or is not plastic. Rattenbury et al. argue that web-browsing experiences on fast-booting ultra-mobile PCs (UMPCs) are particularly plastic, as one can do very short-duration tasks on them and can walk away from the browser and return to find it in the same state. Thus, the pacing is driven by the

user. Such browsing can also stretch to fill longer, unpredictable durations, stretching and compressing to fit between other, more highly planned for parts of a person's day.

By contrast, Rattenbury et al. cite video as a medium that is not plastic because it is immersive, noting that at most 4% of mobile PC use in their study could have been video. At first blush, TV watching might seem to be anti-plastic. Television shows are fixed length and when one walks away from the TV, the show keeps going without the viewer—at least if the viewer does not have a DVR. Even with the ability to fast-forward, television is crafted to engage and immerse the user—at the very least, this is helpful for product placement and other advertising.

However, we argue that many of our participants make television more plastic, both by choosing particular sorts of programs and by watching TV through various home entertainment ensembles. We describe how people can make video more plastic by compressing it, coping with interruptions, making interruptions acceptable, and moderating TV's immersiveness.

Thus, we draw on the five criteria of plasticity as enumerated by Rattenbury et al. but also refine understandings of the framework by arguing that plasticity is not a property essential to the nature of a medium, such as text or video. By showing how participants make TV more or less temporally flexible, we show how plasticity of time is a property of specific, situated configurations of media in use rather than an essential, perpetual property of a given medium.

Below, we discuss television watching practices according to the five criteria for plastic time: opportunistic watching, experiencing TV "under the radar," shrinking and expanding time, managing immersiveness, and resisting categorization.

5.1 Opportunistic watching

Despite the importance of rhythms in domestic life, seemingly random temporalities remain part of daily life. As Silverstone puts it, "social life proceeds somewhere between the imaginary extremes of absolute chaotic conflict and anarchic improvisation" [31]. While we have described many of the ways television can be predictable above, Silverstone recognizes the many ways television is watched in an opportunistic and ad hoc fashion.

Television allows for such ad hoc use by making content quickly available to fill unplanned spaces of time. Television has always had this capability in the sense that, in the US at least, whatever time of day it is switched on, there are a wide variety of programs available, even if they are of poor quality. One participant, Stu, described such opportunistic viewing: "I felt like watching something, but didn't have anything in mind so I cruised around to see if anything else was on." Part of the DVR's success is that it allows people to watch shows they enjoy with greater extra-routine flexibility, as it supports opportunistic playback of recorded content. Blair talked about how pre-recorded shows fit into opportunistic viewing for her, "I come home after work and watch shows I record. Lately I've been catching up on the TV because I've been behind."

Unplanned segments of time could be of various time increments, from a few minutes to an entire day. It might have simply consisted of channel surfing while waiting for a partner to get ready to leave the house. Or it may be an hour of "serenity time" that single mother Gabrielle captures when she can. For Gabrielle, Netflix (where DVDs are delivered to subscribers via postal mail) was insufficient to fit into the temporal dynamics of unpredictable serenity time because Netflix required anticipating one's mood and time availability several days in advance of having the DVD available. Instead, she relied heavily on OnDemand cable television, which allowed her to browse a list of shows, find one that fit into her anticipated amount of time, and immediately begin watching. OnDemand provided the ability to pause and rewind, similarly to DVR.

Channel surfing while waiting for a partner or choosing videos based on program duration is consistent with the sort of plastic, non-immersive time described by Rattenbury et al.

5.2 Shrinking and expanding time

The second characteristic of plastic technology is that it can shrink or expand to take up windows of time that become arbitrarily available. Participants made television more plastic by using time-shifting technologies to compress the amount of time it took to watch the show to fit it into their windows of opportunity and desire. The most common example of this was using DVR to record a television show and then skipping the commercials while watching the recording. Yet two participants also reported adjusting the content of programs they watched, speeding it up with the fast forward functionality. Lawrence explained that he records wrestling so that he can fast forward "through all the garbage they do between fighting." Similarly, Blair describes recording the news as she watches it, and fast forwarding through stories she finds boring. As Blair explained her fast forwarding through the news, she also described interruptions and competing demands for her attention from her children, suggesting that the compression of television is dependent on factors other than simple interest or lack thereof—it also depends on responses to events.

Some kinds of television viewing also expanded to fill available time. Broadcast television is especially designed

to go on as long as the viewer doesn't intervene. This is a feature both of the technology design, as programs flow continuously by default, and the content design because a stream of continuous new programming comes through home televisions. In contrast, television designed for public spaces, such as waiting rooms and classrooms, often has a much shorter amount of programming, in the range of one to 2 h and which then repeats exactly [19]. Our participants described getting sucked into movies, when they intended to just watch a short program before bed, or watching "movie after movie" on a cable channel. Peggy also described getting a DVD collection of a television show, which customarily has multiple episodes to a disc: "We'll watch one more, just one more. So it's like 20 h of shows."

Television's potential to expand in time was often described as a problem. People frequently described getting absorbed in watching when in hindsight, they might have been using their time otherwise. The immersiveness of some television, however, made it difficult for people to pull themselves out of the experience to reflect on whether they wanted to continue unless an interruption occasioned a break in attention.

5.3 Television flying "under the radar"

Third, Rattenbury et al. argue that plastic time experiences often fly under the radar because uses do not have a cognitive model for those activities. Television viewing could similarly blur or become forgotten. Many of our participants described their television viewing in terms of habits and regularities that were easily describable and memorable to the interviewers. Yet upon reviewing a calendar representation of their diary entries, some participants were surprised by their actual patterns declaring that their viewing did not match their "patterns." Yet an equal number of participants described the visualization of their watching to be about as they expected.

In particular, many instances of ambient and interruptible television were part of our participants' mental models of how they watch television. They may not have remembered every instance of television watching, and they may in some cases watch more than they realize, but they were aware that they watch television in these ways that we might otherwise qualitatively describe as plastic.

In these ways, we found television watching to be less "under the radar" for our participants than mobile computer users in Rattenbury et al.'s study. Cultural narratives of television watching, as compared to those of computer use, may explain some of why what flies "under the radar" for television watching may be different than that which is elided in mobile computer use. While we have insufficient data to do more than speculate, one woman was surprised to see that she watched less news than she imagined. While in Rattenbury's study of US computing use, the poles of freneticness and regular discipline were valued by participants, one might imagine that with American television, different personas—such as the "news junkie," "sports guy," or "informed citizen"—may be in play. This means we might expect different sorts of things to fly under the radar.

The shaping of recollection by cultural narratives of identity is methodologically consequential for those researching technologies through interview and self-report.

For us, forgettability better characterizes the nature of opportunistic, interruptible television than "under the radar." This sort of television was so pervasive that few specificities stood out among the grazings, flipping through channels, and randomly watching. But forgettability does not suggest that one's model of his or her behavior has no recognition of the general practices.

5.4 Managed immersiveness

The fourth criterion of plastic time is that the technology be non-immersive. Different sorts of television are designed to be variously immersive. Shows like *Lost* inspired strong devotion among many of our participants and immerse even beyond the TV screen as communities that analyze the show on the Internet, while music videos more easily comingle with other attentional demands. Participants actively manipulated and chose the sorts of television they watched at different times so that the television integrated well with other activities that were likely to interrupt.

5.4.1 Ambient television

Participants' management of television immersiveness strongly relied on practices of overlaying television with other activities in the home. Rather than television being one in a sequence of many household activities, television could be a constant presence as people's attentions ebbed and flowed towards and away from the screen. Though this sort of television is sometimes described as being in the "background" [12], it is more accurate to describe the television as something that can ebb in and out of focus as other concurrent activities demand primary focus. "Ambient" captures the way the television is on and present but not forced into focus (McCarthy also analyzes "ambient television," but focuses on televisual displays in public space [19]).

Previous, larger-scale surveys have found that 40% of respondents reported having television on all the time, whether or not they were watching [17]. We even witnessed this ubiquitous television in action as seven participants left the television on during all or large parts of the interview. We often observed participants' eyes darting

over to the television during lulls in the interview conversation. Less understood is why people do this, beyond accounts of needing "background noise" [10] or television addiction [16].

Many participants described how they chose the sorts of television that they would have on while doing other tasks. In these cases, they knew their attention would be unpredictable and that they strove not to get "sucked in." Interruptions were guaranteed but could not be scheduled. Three participants described watching shows they were already familiar with as a way of staying entertained while doing things with unpredictable demands for focus. Roy, for example, watched *Two and a Half Men* reruns while doing pilates on the floor because, at 30 min, it was the "right amount of time" to last the length of his anticipated workout. Both Stu and Blair had DVDs of favorite television series, *Simpsons* and *Friends* respectively, which they put on while cooking, putting together furniture, or cleaning the house. Blair explained that because she was rewatching things she had previously seen, she could focus on cooking when she needed to, but when she turned to the television again, she could continue to follow along. Others chose highly repetitive programming, such as news, as plastic television so their attention could ebb in and out without negatively affecting their understandings or enjoyment of the programs.

Managing immersion means deferring certain kinds of programming. Stu contrasted shows he'd seen, which he felt he could turn off any time, with *Law & Order*, which for him would take the whole hour since he did not know the show and what would happen. Similarly, Tracy, a single working mother, puts off watching programs she thinks she'll get overly absorbed into until she has a sufficiently large, free period of time.

Participants anticipated this sort of "sucking in" on the scale of hours or even weeks. Stu, for example, tried not to watch television shows that had long, involved story lines because he knew that between school and work, he could not consistently spare the time required to enjoy such shows.

Despite participants' efforts to manage immersiveness, however, sometimes the television pulled them away from other things they were doing, captivating them. Gabrielle described getting sucked in by "a crying woman" on *The Tyra Banks Show* during her evening chores. As previously described, television is wonderful at expanding to fill available time, but it also has a force to do so in a way participants described as problematic. Even the phrase "sucked in," used by several participants, implies being overcome by a force outside oneself and losing control. That one can get "sucked in" points to how television, even with the most judiciously chosen programs or the ability to record for later or switch the set off, can go from semi-immersive to immersive. Thus, plasticity of television viewing may be more tenuous than the UMPC web browsing that Rattenbury et al. theorize as plastic. Yet we still find plasticity analytically useful, as people manipulated their qualitative experience of television time, attempting to control its immersiveness, by their choices of different types of television—whether reruns, news, or programs with short or non-existent storylines.

The resistance to being "sucked in" distinguishes plastic television from "multi-tasking" because plastic television was always described as programming the filled the spaces available in relation to another task or activity that had priority. Plastic television watching did not demand completion; it was secondary to the demands of the activity structuring it.

5.4.2 *Coping with interruption*

Participants also used the capabilities of technology ensembles, especially the "rewind" and "pause" on their DVRs, to make TV more interruptible, thus making it more plastic. Blair described watching Oprah with her mother while they were watching the kids, "so it was 70% watching together, 30% of the time one of us was with the kids, we'd go back and forth and rewind if one of us missed something." She went onto describe her interruptions: "I get interrupted with the kids, or the phone, or I'm making dinner… it's always the kids, and I end up having to rewind to see what I wanted to see." She was highly engaged in watching shows like Oprah, but considered it an interruptible activity. Katherine also watched Jeopardy, knowing it would be interrupted by dinner; she would pause to finish watching later. She described "rewind" as a way to recover from her husband's interruptions while watching *Lost*. In these cases, people typically described *recovering* from interruptions rather than watching television that was unproblematically interruptible. Engrossing, immersive television was not chosen to be interruptible in the way that ambient programming was. Thus, engrossing, immersive television watched with a pause and rewind button is less plastic—less interruptible, less ad hoc—than ambient television.

5.5 Resisting categorization

Rattenbury et al. described a fifth characteristic of plasticity as those episodes of use that resist categorizations such as productivity and leisure. They cite the fine-grained interleaving of browsing that might be personal, leisurely, work related, etc. into continuous temporal flows of internet activity.

While on first look, our participants commonly categorized some television watching as for the kids, and for relaxation, much of the watching—especially among the women in our study—was harder to define. Watching television in the background while doing household work,

for example, was very common. But how should that television be defined? One might argue that it is leisure overlaid with home labor. After all, *Simpsons* and *Friends* are certainly commonly thought of as entertainment. Yet the ambient television we described was often chosen for the ways it would integrate with the work or caregiving acts it accompanied. On the other hand, Gabrielle described watching financial news programs while she did housework so she could learn more personal finance. Here, what might be considered education and labor are intermingled.

Thus, we suggest that it is the integrated nature of some daily practices, mixing the technological and non-technological, that that render plastic television difficult to categorize. This has both methodological consequences for how technological time use is measured as well as design consequences for assumptions that can be made about television content categories.

5.6 Gendered plasticity

While plastic time can be experienced across genders, we found that plastic time figured particularly heavily into the lives of the six mothers in our study. Whether working or not, each of our mothers seemed to bear primary responsibility for childcare. They commonly described accompanying cooking and cleaning with ambient television and coping with interruptions from children and husbands through Tivo's pause and rewind.

Our observations are consistent with a multinational time use study that found that while women report similar amounts of leisure time to men, their leisure time is more fragmented by interruptions and domestic demands [5].

5.7 Nearly plastic

Many of the instances of plastifying television we have described may not meet every one of Rattenbury's requirements for plastic time. Plastic time's articulation of opportunistic watching, stretching and shrinking durations, and non-immersiveness strongly characterized an important way television fit into the lives of our participants, giving us analytical leverage and helping us see new connections in our data. Yet we note that television experiences often varied in degrees of immersiveness and temporal flexibility. In contrast to Rattenbury's conception of plastic as a property that a medium does or does not possess, we instead suggest that plastic can be a matter of degree.

6 Discussion

The two forms of temporality—rhythms and plastic time—that we found at work in the experience of television watching may initially seem somewhat opposed. The predictability and regularity implied by rhythms seems to contrast with the ad hoc, unpredictable, opportunistic quality of plastic time. Yet we argue that the two notions of temporality fit together in accounting for the experience television temporality in the lives of our participants.

However, rhythms are not prescriptions. While rhythms are used to anticipate possible futures, those temporal horizons can situate ad hoc in the moment decisions about what to do as much as they can inform more formal planning and scheduling [24]. Rhythms did not determine when a program would be watched, but instead created a space of possible times it would make sense to watch—a temporal window.

Our participants tended to have flexible attitude about much of their television watching. Even those that reported being "creatures of habit" did a fair amount of opportunistic browsing—channel surfing, browsing the electronic program guide (EPG), or dipping into their Tivo library. We had a strong sense that our participants usually did not make schedules for watching. The Superbowl, an event of national scope, was the exception.

For programs that had a temporal window of relevance, such as programs people kept up on with friends, that window was conceived as a window in which they could watch the programs. Time shifting technologies store these programs until people have a chance to fit the show into their day.

Time shifting means that the broadcast schedule does not prescribe when a program is watched. Yet the broadcast schedule remains an important rhythm in shaping a show's window of relevance and interest, within which one might opportunistically catch up with it. The fixity of the schedule is context that gives the show meaning for viewers. One performs their devotion to or casual interest in *Lost* in large part by when they watch it in relation to the broadcast schedule. Were broadcast schedules to disappear, we speculate that people would find other structures around which to create common experiences.

In summary, though prescriptive temporal norms may weaken [23], overlapping and intersecting rhythms continue to generate temporal windows that may be filled with plastic time, planned time, or even other qualitative types of time we have not yet conceptualized.

7 Limitations

Our goal in this analysis is to provide a framework for understanding how temporal organization of television watching emerges as situated, social, and embodied practice. As with all analyses of situated action, the specific

instances of orderings and patternings emerge from the specificities of the people and context of our study. It is the practices of coordination, ordering, and plastifying that are more broadly relevant. Studies with different contextual factors, such as locally available televisual technologies, labor practices, weather, or discourses around television, may reveal additional modes or organizing television watching. Longer studies may reveal different rhythms and periodicities. Rather than enumerating patterns that occur, our analytical goal has been to suggest ways of thinking about diverse forms of patterning and coordination within and between homes.

8 Design implications

8.1 Supporting asynchronous sociality

The importance of rhythms both within and between households also suggests that designs that support temporal awareness, such as situated awareness tools, may support the sociality of television. Visualizations of rhythms to aid reflection and coordination have been explored in the workplace [4, 9], but less so for domestic technologies. Al Hasan [2] reported that a conceptual evaluation of published viewing histories evoked privacy concerns, so any awareness tools must consider how to safely share activity awareness socially. This might be achievable through approaches such as opting into share or selective sharing only certain shows.

Designs that support asynchronous sociality might also leverage the willingness we found of some people to help others keep up with television shows. For example, several participants recorded a show for a friend who would have to miss an episode, especially when they had the show in common. Others recommended programs and reminded friends and colleagues of what to watch. Not everyone described doing this television rhythm work, though they might support their friends in other arenas. This recalls Rode and Toye's domestic economy [27], in which members of the household specialize in skills that they share with one another. How might one enable the enthusiastic minority to generate interest and support common television experiences across households?

In calling for attention to be paid to asynchronously social television, we do not claim that synchronously social television is undesirable. Watching together was particularly important among families, as well as among friends and neighbors. However, enabling synchronous, especially remote, social television is already promisingly explored in HCI [13, 26, 30]. We suggest that asynchronous television sociality is a fruitful area for design exploration.

8.2 Supporting plastic television

Though we found our participants made television more plastic already with technologies available to them, television has not developed the level of plasticity evident in mobile PCs, according to Rattenbury et al. Yet plasticity can emerge in the design of system assemblages over time. Internet browsing on mobile PCs did not become plastic by initial design. Instead, an ecosystem of technologies and design patterns such as RSS, "recently updated" lists, and page based browsing, and easy access histories have emerged in response to technology use over time, developing the plastic potential of PCs [23]. Thus, while plastic television is already supported in some ways, designers can consider additional ways to increase plasticity, enabling qualitatively new ways of integrating television into daily life.

As an illustration, when one has a relatively short chunk of time of unknown duration to fill (e.g., waiting for one's ride to arrive), one might imagine having a selection of very short (ranging from several seconds to several minutes) video segments. Although one might argue that channel surfing provides just this, the quality of plastic TV watching with channel surfing is highly variable. Rattenbury warns against treating plastic time as "downtime" or "killing time" [23], though sometimes it may be just that. So can plastic television be designed that can fit variable, interstitial time chunks while still providing content that is likely to be meaningful to the user? For example, one might imagine making television plastic in new ways while providing "social grease" [18] and social capital by providing quick access to small clips collected from explicit friend invitations or socially based recommender systems.

Understanding TV as attentionally plastic also suggests that there is an opportunity to provide people with video that is engaging but not totally immersive—or at least not get in the way. Recall the prevalence of engaging with TV while cooking, exercising, or keeping an eye on kids. We suggest that set-top boxes and networked video services can do far more than make recommendations of that which is new and unseen. Design interventions that provide television that does not "suck you in" might include a channel that plays already favorite shows and videos, or might shuffle through a list of "background" viewing that users might create in advance. Because what people counted as background viewing was highly personal and often related to personal history, we would guess that inferring immersiveness with AI will be extremely challenging.

We observed people using current DVR technology to both handle interruptions (by rewinding and pausing) as well as compress content (by skipping less interesting sections of content or commercials). In a system based on

pre-recorded or streaming media, demarcating meaningful segments in the media would better facilitate these practices. One way of supporting compressing television would be by segmenting programs at meaningful breaks, such as between segments in segmented genres such as talk shows, news programs, or skit-comedy. This might allow people to skip content that is boring or even save favorite segments for later rewatching as low-attention chunks. Another way of supporting such compression might be simply allowing faster playback that retains the comprehensibility of the audio.

8.3 Timely recommendations

The importance of plasticity within rhythmic windows also points to design implications for recommendation engines. Only one of 14 of our participants liked the recommendations Tivo provided. We venture that recommendation engines have several challenges.

First, recommendation engines are typically based on collaborative filtering and have no sense of how to recommend shows that people, whether acquaintances or broader communities, are currently talking about. Recommendation systems would likely benefit from working on their sense of timing and social awareness, and realizing that timing in television can be just as important as the stories or genres presented. Second, recommendations on systems such as Tivo discourage grazing and plastic time by providing textual lists of shows that must be navigated piecemeal with little variety in length. The interaction design of channel surfing and even zippy EPGs are far more suited towards grazing unknown programming. Such systems might benefit from the ability to navigate by program duration or even may consider segmenting certain genres of shows, such as news programs, into smaller chunks.

9 Conclusion

The opening credits of the television show *The Simpsons* presents a traditional image of domestic television temporality. A family numbly sits together before the glowing screen while Marge, the wife, busies her hands knitting. While we certainly observed evidence of these typical notions of television watching, we also found considerable openness and flexibility in these practices.

Rhythms shape the temporal spaces in which television is watched in the home. These rhythms can be institutional, biological, and interpersonal. The rhythms emerge in response to other rhythms within the home, outside the home, and in the sociality between households. Television watching is fit amongst these rhythms in the flow of one's day. Television watching also gains social meaning by its relation to the collective rhythms of others experiencing the programming.

Plastic temporalities also characterize much television watching in the home, allowing television to integrate with other activities and interruptions. A plastic approach to media consumption shows the diverse roles television can have in a complex domestic ecology.

The complexity of practice lies in the ways these two different temporalities get woven together. From these and other lessons, we hope to build an empirical foundation for moving towards delightful and supportive designs for diverse and interconnected domestic landscapes.

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