The Television Will Be Revolutionized:
Effects of PVRs and Filesharing on Television Watching

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ABSTRACT

This paper investigates television-watching practices amongst early adopters of personal hard-disk video recorders (PVRs such as TiVo[tm]) and Internet downloading of shows. Through in-depth interviews with early adopters, we describe how the rhythms of television watching change when decoupled from broadcast TV. For both the PVR users and downloaders TV watching has become less of a passive process, with viewers instead actively gathered shows from the schedules or online, and watching shows from their stored collection. From these results we discuss the 'video media lifecycle', and three new design concepts for supporting TV watching.

Author Keywords

TiVo, BitTorrent, File Sharing, TV watching, Ethnography

ACM Classification Keywords

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

INTRODUCTION

It is a peculiarity of the CHI literature that the most popular home technology - the television - has been given only passing attention. Time use studies suggest that in the US TV viewers still spend on average nearly three hours a day in front of the TV, much more time than is spent on the Internet [3]. TV schedules still play an important part in the routines and rhythms of millions, who co-ordinate their lives so as to catch specific shows. In the UK entire power stations have even been built to meet the demand during advertisements when viewers turn their kettles on [8].

Recent new TV technologies such as the TiVo[tm] and ReplayTV[tm] personal video recorders (PVRs) threaten to radically change these routines. PVRs allow recording and playback of an archive of shows recorded from broadcast TV onto a hard-disk. More radically, the downloading of

TV shows from the Internet has the possibility of breaking the existing relationships between viewer and broadcaster. Peer-to-peer file-sharing systems have grown in popularity (despite their marginal legality) with some measurements of Internet traffic by ISPs putting the amount used by BitTorrent (one popular file sharing system) at almost 75% [4]. Other new technologies even support watching TV on portable media devices such as mobile phones.

With these new developments it is an opportune time to investigate the changing practices of TV watching, and to reflect on how we can design for these activities. Although the CHI literature has covered technologies such as interactive TV [10], less attention has been given to straightforward *television watching*. Here we describe how television watching is changing using an in-depth interview study of 21 users, in particular early adopters of PVRs and those who download video from the Internet. Using a similar methodology to our earlier work studying the use and sharing of music [2], we describe how television watching has changed, from scanning multiple channels to find TV to watch ('channel surfing'), to collecting an archive of shows that are watched at viewers' convenience. This is a more active approach to TV watching, in that the selection of shows to record, choosing what to watch, and collecting an archive of TV shows become activities in themselves. TV is therefore more than simply watching programs - we argue for the importance of studying and designing for the complete 'television lifecycle'.

PREVIOUS WORK

The home has recently gained new focus as a domain of interest in CHI [1, 6, 16]. As part of this focus, home media, such as the Internet, music and interactive TV, have received considerable attention [7, 9, 10, 12]. However, despite its importance in terms of time spent, television watching and video have been relatively neglected when compared to other home technologies. Three notable exceptions to this are O'Brien et al.'s study of a set top box trial, Taylor and Harper's study of how viewers choose what to watch, and Rode et al's study of VCR use. O'Brien et al.'s study highlights the importance of routines in TV watching, as well as attempts by viewers to limit time spent in front of the TV [10]. Contrastingly, Taylor and Harper argue that channel surfing dominates the method whereby viewers choose what to watch [17], with viewers expressing

considerable dislike for onscreen electronic program guides (EPGs). Lastly, Rode et al.'s study focused on the use of VCRs within households and found that VCRs are used collectively in the household rather than by one main user [14]. Although all members of households watch recorded TV, households often have a 'recording czar' who decides what to record and programs the VCR.

Within media studies, television has received more prolonged attention, although it has remained a controversial, even nefarious, technology. Writers such as Putnam [13] have blamed television for a fall in civic engagement. Alternatively, authors such as Silverstone [15] argue that TV creates an 'ontological trust' in society through the consensus view it projects. From a narrow technological perspective, however, there is little description here of how viewers engage with technology, how they choose to watch, where, when etc.

One resource for understanding the changes in television watching, is studies of music; user studies of new music technologies can be indicative of future developments [11]. Recent work on new music technology describes the opportunities for supporting sharing beyond simple file swapping and describes social practices around music such as collecting, identity building and distinction [2].

METHOD
We conducted in-depth interviews in twenty-one households, nine recruited as users of hard disk recorders, and nine as downloaders of TV programs via the Internet. To gain some contrast we also conducted three interviews with conventional VCR users. Participants ranged in age from 18-60, and had a range of occupations. They included a retired couple, individuals living alone, students living with their family, families with children, couples living alone and flatmates sharing an apartment. Five of our interviewees were couples who we interviewed together (23%), the remaining participants were five women (23%) and eleven men (52%).

In the interviews, we asked viewers about their live-TV watching, how their TV watching had changed, and about their routines around the TV. Since TiVo (the most popular PVR in the US) is not widely available in the UK, we interviewed users of 'Sky+', a comparable system sold as part of BSkyB's satellite TV service (www.sky.co.uk). Sky+ has achieved considerable popularity in the UK, with just under a million subscribers, or around 3% of UK households. For TV downloaders we recruited households who had downloaded and watched a TV show or film from the Internet in the last week, and lastly for our three VCR viewers those who had recorded and watched a show with their VCR in the last week. Participants were recruited through contributors to a UK Internet forums discussing TV, and through an email distribution across the university. The interviews took place in the interviewees home, enabling us to see and photograph their setup as well as assist the interviewees in remembering and explaining their

viewing and recording behaviour. Due to practical constraints three interviews were conducted over the phone with a single household member.

RESULTS
Our interviewees were all regular television watchers, confessing to watch an average of 2.3 hours of TV a day (self reported figures - 2.4 for the PVR users, 1.7 for the VCR and 2.5 for downloaders). For 15 of the PVR/downloading viewers the vast majority of their TV watching now came from pre-recorded or downloaded shows, rather than live TV.

Personal Video Recorders
In the Sky+ using households we interviewed, it was clear that the technology had had a major impact on how television was watched and arranged. For 8 of the 9 Sky+ households we interviewed they had moved almost entirely to watching pre-recorded shows from the PVR. Some interviewees even struggled to name the last show they had watched on live TV. This was a large contrast with the VCR users, who recorded only on average 2 shows a week, compared to 7 new shows a week for our Sky+ users.

Rather than channel surfing to find suitable TV to watch, viewers would 'queue up' recordings to be watched from the episode guide, or automatically record entire series using 'season passes'. Through maintaining a sufficient buffer of recorded shows, TV watching then took place almost entirely from the archive of shows that was collected. In this way programming watching was decoupled from when shows are broadcast.

For those who worked or lived on different timecycles from that of 'standard' TV, this was particularly valuable. For one viewer who worked shifts as a bar manager, the PVR meant he could watch 'primetime' TV early in the morning when he came in from work. For a family with children, they could watch their favourite soap operas in the late evening when they had put their kids to bed. The random access nature of PVRs, however, also supported practices that went beyond simple timeshifting. For example, by allowing viewers to start and stop recordings quickly, without loosing their position in a recording, multiple films or shows could also be 'grazed' with viewers moving between multiple shows, before deciding on a show to watch. Viewers also often collected an archive of the same show that would allow multiple episodes to be collected together for viewing in one sitting. An evenings TV would then be selected from the store of a complete series.

Just as much of the impact of mobile phones comes not only from their mobility, but their integration of a host of previously rare features (such as Caller ID, voice mail, SMS and so on), so does PVRs bring together a range of new features as a package. Much of the value for those we interviewed came from how they used the different features in combination. For example, shows can be queued to be recorded in advance using an onscreen program guide, with

"season passes' recording shows whenever they are on. Yet season passes for shows can often clash, particularly as TV Networks often put popular shows on in competition with each other. The ability to record two channels simultaneously (offered by Sky+ and the DirectTV TiVo) thus develops more value with the use of season passes. In turn this interacted with a third feature: live TV, when watched, would usually be watched on a short delay from the actual time of broadcast, as this allowed viewers to skip through advertisements. When two programs were being recorded, this required the ability to record *three* channels simultaneously. Thus four different features would work together in use – season passes, dual record, watch while recording and watching from a live buffer.

While PVRs users were generally enthusiastic about this technology, its use was not without problems. In particular lost recordings caused considerable upset, since their devices infrequently would fail to record shows. The PVR was also not seen as a reliable medium for long term storage of programs. Whereas some viewers copied shows to recordable DVDs and deleted them, others waited and bought shows on DVD, expressing displeasure in having to delete shows to make space on their PVRs.

Downloading from the Internet

Although downloading video from the Internet makes use of very different technology than PVRs, the use of hard disks in both enables a more random-access mode of viewing video. To download video files our downloading participants used peer-to-peer software, in particular Bittorrent, as well as Internet newsgroups. As with sharing music online, this downloading is controversial, although we would argue that despite this there is value in understanding a technology practice that is so widespread.

The downloaders we interviewed belonged to two distinct groups. Four of our nine downloaders were 'suplementors' in that they still watched broadcast television and downloaded shows or movies around once a week. For these participants the Internet was a way of obtaining shows that were difficult or impossible to obtain in the UK. In particular American TV shows often have a long delay before they are broadcast on UK TV, or released onto DVD. As one downloader put it "For *Six Feet Under* [one popular show], the third series, I just wanted to see if the guy died or not. When I found out he was alright, I went back to the TV". Internet discussion forums about shows also contributed to the desire to get the latest shows downloaded from the Internet. As one user of online forums explained, if they did not watch the most recent shows they would be a season or so behind what was actually being discussed online.

These occasional downloaders were often critical of the experience of downloading – finding the process slow, full of effort as well as passing doubts about the video quality of some of their downloads. Indeed, boxed DVDs of TV shows that had been downloaded were still purchased by

these users – explained by their desire to own the high quality 'definite article'.

Alternatively, 'replacers' (five of our nine downloaders) watched little or no broadcast television, downloading all their TV from the Internet. These viewers would regularly check Internet resources to find the 'new' tv and films available, constantly downloading a queue of video which would be watched when convenient. Unlike the suplementors, replacers were also serious about building up an archive of TV shows and films downloaded. Indeed, three of the 'replacers' we interviewed had over a terabyte of compressed video, stored on PC hard disks (over *three months* worth of video). Collecting video in this way was a source of considerable pleasure, in particular having complete TV series available. As with earlier observations concerning music collectors, the collection itself seemed important, as much as the utility of being able to watch shows from the archive [2].

All downloaders made use of the selection of shows by 'seeders', users who make shows available for download. Encoding TV, cutting out the adverts and distributing it takes considerable effort, thus the shows that are shared are essentially a selection of what those with the technical skill and motivation consider valuable. As one would expect, availability of SciFi is high, cookery and quiz shows low. Downloaders would browse through the new uploads often downloading shows which they had not previously seen – the presence of a downloadable version of that show acting as a recommendation. Although the limited availability of content could be frustrating for downloaders (particularly as rare shows would be much slower in downloading or unavailable) it also acted as a filter on shows. Indeed, one inherent aspect of peer to peer file sharing is that popular shows in high demand will be shared quicker.

The television lifecycle

For both downloaders and PVR users, new video technologies allowed then greater choice in what to watch. Particularly downloaders could choose from a potentially vast array of video available on the Internet, and in their own archive. However, many files are unavailable, or too rare and thus slow to download. This means that in practice it was mainly the most popular files that were downloaded. Accordingly, both for PVR users and downloaders the changes in their TV watching followed similar patterns. Rather than 'video-on-demand' both made selections for potential viewing, in advance, from a limited selection of shows. While watching TV, shows would be selected from the archive of current available shows with newly downloaded shows taking priority. Since shows are available to be watched in any order, viewing strategies such as watching complete series together were popular.

TV watching has always been a mix of 'lean forward' and 'lean back' - close viewer engagement with shows, versus less active (and possibly less positive) 'couch potato' watching [15]. These new technologies appear to encourage

a more active engagement with television. This even went as far as to change how some shows were watched. PVR viewers could fast forwarding through adverts, and downloaded shows usually are distributed with adverts cut out. However, this was taken further by some users who would watch shows 'on fast forward', as one user put it, scanning through slow or undesirable scenes. The random access nature of shows also meant that bookmarks could be set and shows returned later to quickly find the 'good bits'.

More broadly this emphasises the importance of seeing TV watching not simply as the act of sitting in-front of the TV. The 'TV lifecycle' includes finding out about new shows, selecting what to record, choosing what to watch, collecting an archive of shows, and sharing and discussing those shows with others. As studies of music consumption also show [11] consumption is more than simply the act itself – one must consider the complete lifecycle– from finding out about a new program, all the way through to storing it in a personal archive.

FURTHER WORK
We have been using the results from this study to inform the design of new video technologies that could enhance and better support the lifecycle of television watching. One area we are exploring is the collecting of television shows, and providing better interfaces for navigating through large archives of video. Indeed, it is worth noting that while video-on-demand has long been seen as the most desirable format for video distribution, a pure video-on-demand system would provide very little support for the *collecting* of video files that was popular amongst our downloaders. We are thus exploring interfaces that could support the collecting shows, and displaying that collection to others as recommendations. A second aspect we are investigating is the ability to share information about what parts of shows tend to be fast forwarded, and what parts are best to watch. Through monitoring what sections of shows are repeatedly played, and what sections are skipped, one can build an overview of a show on a timeline, providing better support for navigating (as explored in a different way in [5]).

Lastly, we are exploring new ways to support choosing what to watch. While some PVRs use collaborative filtering to recommend shows, a way to go beyond this is to program a whole evenings entertainment from recorded shows, much like the shuffle play in iTunes. Alternatively, popular scenes from shows could be selected and edited to produce an 'attract' mode of TV of edited highlights which is played in the background, allowing viewers to focus attention when they see something of interest, possibly choosing to then watch that show in full.

To conclude, while this paper has only described the practices of early adopters, we argue that these results are suggestive of the shape of future changes in TV watching. We see considerable potential for new technologies that support the complete lifecycle of TV watching, beyond simply *watching TV*.

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