Usability Design for the Home Media Station

Konstantinos Chorianopoulos *Diomidis Spinellis*

ELTRUN, Athens University of Economics & Business
http://itv.eltrun.aueb.gr
chk@aueb.gr, dds@aueb.gr

Abstract

A different usability design approach is needed for the emerging class of home infotainment appliances, collectively referred to as the home media station (HMS). Mass-media theory, consumer electronics engineering, content creation and content distribution play a major role towards the human-centered design of home media appliances. Different audience behavior factors, such as the attention span, and group watching, affect the design of the HMS. We have employed our approach in the design of a system offering dynamic synthesis of the advertising-break at each television set-top box.

1 Introduction

There is growing evidence from the marketplace that information technology is migrating from the PC in the office to the set-top box in the living room. The HMS category encompasses stand-alone or networked devices that range from video game consoles (Sony PS2, Microsoft XBox), MP3 juke boxes (HP dec100), digital tuners (Nokia Mediamaster), digital video recorders (TiVo, ReplayTV), as far as combinations of the above (Digeo Moxi Media Center). User access to the HMS is currently done according to the manufacturer's idiosyncrasy or by applying rules from the desktop and Internet experience (Carey 1997; Wallich 2002).

Most notable among the recent findings regarding the HMS class of devices is the realization that users' subjective satisfaction is at odds with performance metrics. In a usability test of three video skipping interfaces, users preferred the interface that required more time, more clicks and had the highest error rate (Drucker, Glatzer, Mar, and Wong 2002). Users reasoned their choice on the basis of how fun and relaxing an interface was.

It has also been widely evident, in our literature review, that the approach followed by the majority of scientific publications, regarding entertainment computing in the home, is mainly PC-centric. Since traditional HCI principles assume a task-oriented approach, where the human interacts with an application to accomplish a particular goal, computer-mediated leisure applications require a fresh view of the current paradigms.

2 Dimensions of Usability Design for Home Infotainment Appliances

The field of HCI has been benefited by a multidisciplinary approach to design problems (Marcus 2002). Successful user interfaces, apart from proven methodologies and multiple design iterations, draw from a diverse array of design disciplines. For the case of the HMS we have identified: 1) Mass-media theory, 2) content creation and content distribution, and 3) broadcasting and

consumer electronics engineering. The role of each discipline to the design of HMS applications is summarized in a table and each one of the factors is described with a reference to original source.

2.1 Mass-Media Theory

Useful insights can be gained from studying previous research, regarding the use of traditional television, published in advertising, psychology and sociology journals. Lee and Lee (1995) have identified a variety of fundamental uses and gratifications that people seek from television watching. For example, there are four levels of attention to the television set —from background noise to full concentration— which contrasts 'to the image of the highly interactive viewer intently engaged with the television set that is often summoned up in talking about new possibilities.'

Studies of media use in the home indicate that there is an important technology-driven shift in the household's media consumption patterns every decade or so. In the 80's there was the PC (Vitalari, Venkatesh and Gronhaug 1985), in the 90's there was the Internet (Kraut, Mukhopadhyay, Szczypula, Kiesler and Scherlis 1998). The current trend towards digital television transmission, local storage and manipulation of media content through home media networks (Bell and Gemmell 2002) is already apparent and has been studied by ethnographers for the case of the digital set-top box (O'Brien, Rodden, Rouncefield and J. Hughes 1999). Table 1 summarizes the most important and relevant to the case of the HMS design factors that regard the user from a media consumption point of view.

Table 1 Audience behavior factors that affect the design of the HMS

Design Factor	Description
Attention to the TV set	There are multiple levels of attention to television. One can watch television or leave it open as an electric light (Lee and Lee 1995)
Group Watching	There is either group or solitary use of television centric appliances (O'Brien et al. 1999)
Impulse Program Selection	Viewers are loyal to a small number of programs, but now they are faced with an increased number of channels and ways of viewing their favorite programs (Lee and Lee 1995)
Distribution of Functionality	Concentration of functionality on a single device (server) is incompatible with the distributed nature of home life (O'Brien et al. 1999)
Automation of Tasks	Automation is usually synonymous with relaxed use, but sometimes users prefer the hassle of control, in cases such as their privacy (O'Brien et al. 1999)

2.2 Media Content Creation and Content Distribution

The introduction and wide adoption of the Web has been promoted and attributed to the interactive content of the new medium. It often goes without much thought, that if something is interactive then it is also better and it will be preferable. However, the passive uses of the broadcasted media are either desirable, or have an implicit interactive dimension that takes place outside the medium

itself (Lee and Lee 1995). An example of the latter is the social interaction that takes place in groups of TV viewers, or the virtual-competition with the televised players of quiz programs.

Computer-like menus, pages and navigation look irrelevant on a TV screen, even when used by experienced computer users (Lekakos, Chorianopoulos and Spinellis 2001). Therefore, there is a need for television-values information design and story driven content (Jaaskelainen 2001). Furthermore, interactivity and informational elements should be used to augment entertainment content (Livaditi, Vassilopoulou, Lougos and Chorianopoulos 2003). Table 2 summarizes the factors that affect the design of the HMS from the perspective of media content creation.

Table 2 Content production and distribution factors that affect the design of the HMS

Design Factor	Description
Infotainment	Both information and entertainment should be offered in a relaxed way (Livaditi et al. 2003)
Interactivity	Current television patterns of use are passive, but interactivity can improve certain television experiences (Lee and Lee 1995)
Content Patterns	Television viewers are accustomed to stories and characters in contrast to computer users who prefer objects and actions (Lekakos et al. 2001)
Personalization	Television provides shared experiences that people can talk about, which contrasts with the effort for personalization (Lee and Lee 1995)
User control	Television experience has been linear and story driven so far, but the video-games industry has invented ways of adding user control within a story (Jaaskelainen 2001)

2.3 Broadcasting and Consumer Electronics Engineering

The broadcasting model of computing encompasses a radical shift in the mentality of application development process and tools. Milenkovic (1998) highlights the differences with the client-server mentality, describes the concept of the carousel and explains why the characteristics of the networking infrastructure are an important factor in the type of feasibly deployed applications. Digital local storage technology (Whittingham 2001) takes viewer control from simple channel selection with the remote to non-linear local programming (Chorianopoulos and Spinellis 2002). However, storing copyrighted content locally is against the interests of media owners (Bell and Gemmell 2002). Apart from the rise of digital rights management issues networking and transferring content between devices in the home poses a number of significant maintainability issues (Spinellis 2002). Table 3 summarizes the design factors that affect HMS use from the perspective of technology.

Table 3 Technological factors that affect the design of the HMS

Design Factor	Description
TiVo content	Both stored and broadcasted programming should be available and complementary to each other (Whittingham 2001; Milenkovic 1998)
Networked Storage	Local storage and networking at the home is a favorite, but copyright holders are concerned (Bell and Gemmell 2002)

Maintainability	There are numerous opportunities for networking between diverse home appliances, which come at the cost of maintainability (Spinellis 2002)

3 Usability Design for Personalized Television Advertising

The dynamic insertion of advertising, during the play-out of copyrighted media content in the home, is a form of substitution for the royalty rights that have to been paid to media owners (Bell and Gemmel 2002). Moreover, the television advertising-break has a fixed duration, small hard-disk storage requirements and is relatively simple to integrate with real-time broadcasts. Next, we describe the iMEDIA system that offers dynamic construction of the advertising-break at the television set-top box for each home. The iMEDIA system has been designed and tested with the purpose of replacing the broadcast television's advertising-break, but can be extended to handle similar cases of dynamic advertising insertion, such as television programming stored on a hard-disk or MP3 music. The design of the iMEDIA system is described in Table 4 on the basis of the factors that affect user interface design for home media applications and the respective resolution strategy that was followed.

Table 4 The resolution strategy for each design factor for the case of the iMEDIA system

Design Factor	Resolution Strategy
TiVo content	The advertising-break is dynamically created for each set-top box. The overall experience is seamless for the viewer
Group Watching	The break may be personalized on the group or the individual level
Interactivity	Some advertisement spots may have additional interactive content available for later browsing
Infotainment	Interactive content of a commercial offers opportunities for informative material in the form of a micro-web-site
User Control	The users may choose to opt-out from receiving personalized advertising-breaks
Personalization	The advertising-break is targeted to household viewers, while some of the spots within it may be the same across different households

4 Further Research

Additional case studies of important television programming include news and music video-clips. Music video-clip programming from channels such as MTV may offer a personalized 'top 20' for each week. Moreover, receiving trivial and lyrics —through Internet resources— offers personalization of the overlaid information. While there have been various treatments to adapt multimedia content to the user (e.g. content and collaborative filtering), the results of further research should address prominent HCI questions such as the feasibility of an agent-mediated (using MS Agent) dialog interface for leisure applications and how to evaluate a user interface when the goal is to be relaxing and fun to use.

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