INTERACTION DESIGN PRINCIPLES FOR INTERACTIVE TELEVISION

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INTERACTION DESIGN PRINCIPLES FOR INTERACTIVE TELEVISION

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SUMMARY

Interactive television (iTV) is an umbrella term used to cover the convergence of television with digital media technologies such as computers, personal video recorders, game consoles, and mobile devices, enabling user interactivity. Increasingly, viewers are moving away from a "lean back" model of viewing to a more active "lean forward" one. When fully realized on a widespread scale in the United States, our current experience of watching television will be dramatically transformed. Because iTV is a new medium in its own right, however, standards for iTV programming and interaction in the United States remain undefined.

This document identifies and articulates interaction design principles for interactive television programming in the United States. Chapter one presents a brief survey of the field as it stands in 2005. In chapters two and three, I categorize iTV by platforms and by persistent television genres, and present representative examples for each category. In chapter four, I provide an overview of existing design standards in related areas. Insights from chapters two, three, and four all serve to inform chapter five, in which I propose principles for iTV interaction design by looking closely at existing designs (both deployed and prototyped), conventions, and patterns of interaction. My analyses are rooted in visual culture and human-computer interaction design principles, and the design principles I offer are abstracted from the applications I analyze within this framework. Finally, in chapter six, I offer some conclusions and thoughts for future directions.

CHAPTER 1

OVERVIEW

1.1 INTRODUCTION

Interactive television (iTV), or enhanced television (eTV), is any television or video programming that incorporates enhanced content or some style of user interactivity, for example, providing synchronized trivia content during a broadcast, allowing viewers to vote on the outcome of a show, or digitally recording video onto a hard drive so viewers can time-shift while watching a program. ITV is also used as an umbrella term to cover the convergence of television with digital media technologies such as computers, personal video recorders, game consoles, and mobile and wireless devices, enabling user interactivity.

The terms interactive television (iTV) and enhanced television (eTV) are often used interchangeably. For the sake of consistency, I will be using the term interactive television, or iTV, throughout this document.

The first interactive television program aired in the United States in 1953. Today, despite the mainstream success of a few interactive programs such as FOX's *American Idol*, and despite improving bandwidth capabilities and the increasing availability of digital technologies, the move toward widespread adoption of iTV programming in the U.S. remains slow, unlike in western Europe, where iTV is already beginning to drive mainstream consumer services. In a 2001 Statistical Research, Inc. study on "How People Use Interactive Television," 72% of U.S. consumers reported that they were not interested in interacting with television programs (Bartlett, 2001).

However, it is clear that television is increasingly shifting away from a broadcast, passive, linear, entertainment viewing experience; instead, it is fast becoming an on-demand, participatory, non-linear, infotainment, advertising targeted, broadband, two-way communications platform (Swedlow, 2001). As viewers become accustomed to the "lean forward" (active) model of viewing instead of the traditional "lean back" (passive) model, as well as to the habit of processing more information simultaneously (e.g., using computers or mobile devices while watching television), they are beginning to gain and demand more control over their viewing experiences than ever before. Figure 1.1 provides an overview of these shifting models as we move from traditional to interactive television.

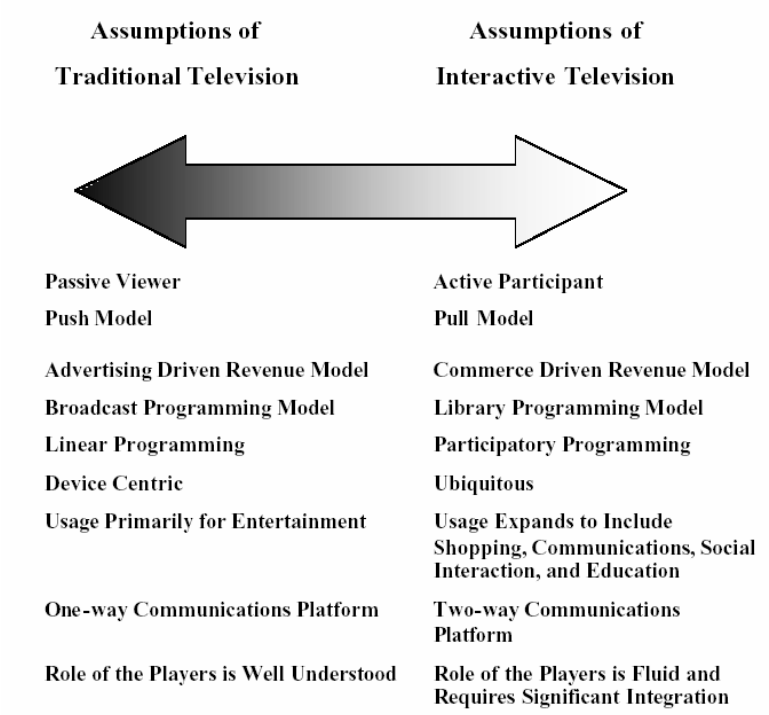


Figure 1.1 Traditional Television vs. Interactive Television

When fully realized on a widespread scale, our current experience of watching television will be dramatically transformed. However, "as computing merges with viewing, it becomes important to examine the differences between the two activities, especially if we are to bridge the gulf that lies between them" (Skelly, et al., 1994). Because iTV is neither television nor computing, but a new convergent medium in its own right, standards for iTV programming and interaction in the United States remain undefined. According to Suzanne Stefanac of RespondTV, the single greatest stumbling block iTV faces is the lack of a clear standard (Pignetti & Capria, 2001). While there have been initiatives establish technical production standards for iTV (Halle, 2003; iTV Standards, 2005), there has been very little discussion about interaction design and content. As a result, interactivity is often poorly conceived and retroactively fitted to existing shows instead of integrated into programs at their conception. Consumers are confused by a variety of platforms and interfaces, unsure of what to do as well as unmotivated to act. At the moment, no unified resource exists that defines good interaction design principles for interactive television in the U.S. This is a problem that is recognized by many professionals within the iTV industry who are now working in collaboration to advance the success of iTV in the U.S.

This document identifies and articulates interaction design principles for interactive television programming in the United States. I begin in chapter one by conducting a brief survey of the field as it stands in 2005. In chapters two and three, I categorize iTV by platforms and by persistent television genres, and present representative examples for each category. In chapter four, I provide an overview of existing design standards in related areas. Insights from chapters two, three, and four all serve to inform chapter five, in which I propose principles for iTV interaction design by

looking closely at existing designs (both deployed and prototyped), conventions, and patterns of interaction. My analyses are rooted in visual culture and human-computer interaction design principles, and the design principles I offer are abstracted from the applications I analyze within this framework. Finally, I offer some conclusions and thoughts for future directions in chapter six.

The principles I identify in this document are meant to be robust enough to support designs within a convergent system that is open-ended and continually changing. Given the range of settings in which iTV programming can be applied, the principles I propose reflect general features of iTV programming that occur across a variety of settings; therefore, the principles will necessarily guide different designs in different ways. This document was developed in collaboration with the Interactive Television Alliance[1]. It should serve as a reference for industry professionals in thinking about good design practices for this new convergent medium.

1.2 STATISTICS

The trends arising out of relevant statistics on factors conducive to successful iTV deployment (e.g., television ownership and viewing habits, broadband and digital services, computer and Internet usage, ownership of mobile devices) indicate that as these enabling technologies continue to evolve, so are viewers' media consumption habits. Most notably, while television is nearly ubiquitous throughout the United States, consumers are increasingly using it simultaneously with other media options such as email, cell phones, or blogs. The statistics in this section suggest that the timing is poised

[1] The Interactive Television Alliance is an independent trade association representing the broad interests of the entire ITV industry. Web site: http://itvalliance.org

for successful and widespread iTV deployment, both in terms of technological advancement as well as consumer habits.

1.2.1 Television

According to the U.S. Census Bureau, in 2001, 98.2% of American households owned at least one television set, with the average number of sets per household being 2.4. According to the A.C. Nielsen Company, the average American watches more than 4 hours of TV per day. It was projected that an average adult (age 18 and older) will watch 1,669 hours (or approximately 70 days) of television in 2004 (U.S. Census Bureau, 2004). However, as the section on simultaneous use of media will illustrate, while television remains the media option of choice, people's viewing habits are increasingly changing to include the use of other media technologies and devices during their television viewing time.

1.2.2 Digital Services

The Telecommunications Act of 1996 mandates that all cable industry providers offer digital services including HDTV (high definition television), video on demand, and high-speed Internet access by 2006. Since 2002, major cable companies such as Comcast, Time Warner, and Cox Communications have been offering HDTV in dozens of markets across the country. As of the fourth quarter of 2004, more than one-third of U.S. cable customers (approximately 24.3 million) subscribed to digital cable services, which provide an array of interactive features including digital video recorders (DVR), video on demand (VOD), interactive program guides (IPG), among others. As of September 1, 2004, HDTV was available in 90 million American households (NCTA, 2004). On the content side, cable programmers including HBO, Showtime, ESPN, and Discovery have become leading providers of high definition programming.

For viewers with analog television sets, a set-top box is necessary to receive and decode digital television broadcasts. It is estimated that 35 million homes will use digital set-top boxes by the end of 2006. Table 1.1 shows the top eleven digital TV platforms in the U.S. and the number of subscribers each, respectively, as of August 2004 (Broadband Bananas).

Table 1.1 Top 11 U.S. Digital TV Platforms and Subscribers

Platform Name	**SAT/CAB**	**Number of Subscribers**
DISH (Echostar)	SAT	9 million digital subscribers. 1 million of these have DVR.
AT&T Broadband	CAB	13,750,001 subscribers. Deployed digital 3,933,000.
DirecTV	SAT	10,400,000 subscribers.
Comcast Cable Communications	CAB	21,289,200 analog subscribers. Deployed digital 6,618,700.
Charter Communications	CAB	6,578,800 analog subscribers. 2,682,800 digital subscribers.
AOL Time Warner	CAB	10,938,000 analog subscribers. 4,082 digital subscribers.
Cox Communications	CAB	6,206,700 subscribers. Deployed digital 841,824.
Cablevision (iO)	CAB	2,988,600 subscribers. 46,200 digital subscribers.
Adelphia Communications	CAB	2,300,000 subscribers.
Mediacom LLC	CAB	1,585,000 subscribers. Deployed digital 200,000.
Insight Communications	CAB	1,361,300 subscribers. Approximately 150,000 digital subscribers.

Figure 1.2 shows the digital TV broadcast rollout and top 10 and 30 markets in the U.S. predicted for 2006.

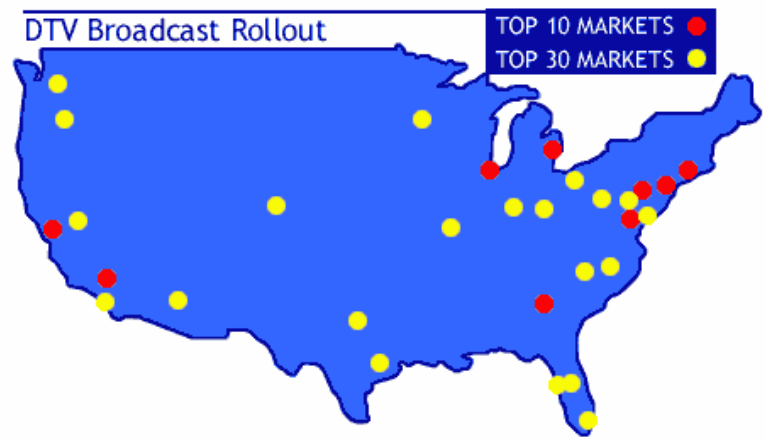


Figure 1.2 DTV Broadcast Rollout and Top 10 and 30 Markets for 2006

1.2.3 Computer and Internet Use

According to a 2004 U.S. Department of Commerce reported titled *A Nation Online: Entering the Broadband Age*, 61.8% of U.S. households owned computers in 2003, and 87.6% of those households used their computers to access the Internet. In turn, 54.6% of U.S. households had Internet connections (54.1% in households with a personal computer or laptop, plus an additional 0.5% using a mobile telephone or some other Internet access device). Figure 1.3 illustrates the growing percentage of U.S. households with computers and Internet connections from 1997-2003 according to this Department of Commerce report. Table 1.2 shows home Internet connections by technology in 2001 and 2003.

At the end of 2004, the U.S. cable industry estimated 19.4 million high-speed Internet customers. More than one-quarter of cable households were cable modem customers, and among households with Internet access, nearly 30 percent were cable modem customers (NCTA, 2004).

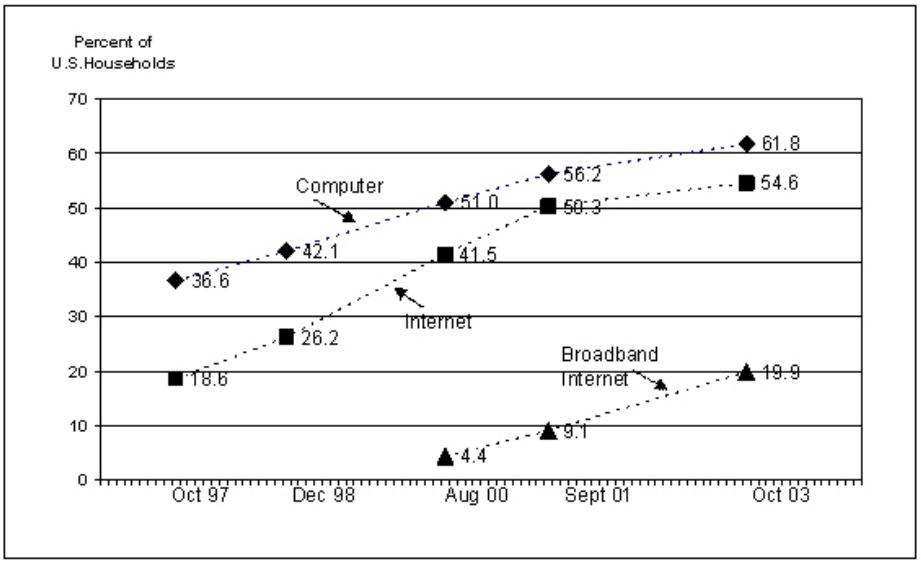


Figure 1.3 Percent of Households with Computers and Internet Connections, Selected Years, 1997-2003
Note: 2001 and 2003 reflect 2000 Census-based weights and earlier years use 1990 Census-based weights

Table 1.2 Home Internet Connections by Technology, 2001 and 2003
(Millions of Households)

	2001	**2003**	**Percent Change**
Dial-Up	44.2	38.6	-12.7%
DSL	3.3	9.3	181.8%
Cable	6.6	12.6	90.9%
Other*	0.5	0.9	80.0%
Number of Households with Internet	54.6	61.5	12.6%
Total Number of Households	108.6	112.6	3.7%

According to Nielsen//NetRatings, as of May 2003, there were about 39 million (approx. 13% of Americans) connecting via broadband in the United States. Table 1.3 illustrates that broadband users at home in the U.S. grew 49% from 2002 to 2003, while narrowband users declined 12% during the same period.

Table 1.3 Internet Connection Speed Growth Rates (U.S., At-Home)

Speed	May 2002	May 2003	Change %
Broadband Total	26,113,000	38,957,000	49.2 %
Narrowband Total	79,444,000	69,647,000	-12.3 %
Modem 14.4K	3,966,000	3,454,000	-12.9 %
Modem 28.8 / 33.6 K	12,014,000	10,118,000	-15.8 %
Modem 56K	63,465,000	56,075,000	-11.6 %
Totals	185,002,000	178,251,000	-3.6 %

Yankee Group projects the broadband growth in households in the U.S. from 2002 – 2008 as follows:

Table 1.4 Projected U.S. Broadband Usage, At-Home, 2002-2008

Year	Usage (in millions)	Increase (in millions)
2002	18.9	n/a
2003	26.2	7.3
2004	33.5	7.3
2005	41.0	7.5
2006	48.1	7.1
2007	55.2	7.1
2008	61.5	6.3

Note: includes cable modem, DSL, T1 lines, broadband wireless, satellite, first mile fiber, and powerline broadband.

A Nation Online: Entering the Broadband Age reports that the use of the Internet for entertainment is substantially more likely among those with broadband. For example, the proportion of Internet users with home dial-up connections who listen to the radio or view TV or movies on the Internet is almost one-half of those with broadband connectivity – 17.3% versus 30.9%, respectively (U.S. Department of Commerce, 2004).

1.2.4 Mobile Devices

More and more Americans are becoming cellular and wireless subscribers. Popular shows such as FOX's *American Idol* have encouraged millions of people to

interact with television shows by utilizing their cellular devices. According to AT&T, more than 7.5 million *American Idol*-related text messages were sent by AT&T Wireless customers throughout the 2003 season. At one point during the voting, over 2,300 text messages per second were processed (AT&T Press Release, 2003).

According to the Cellular Telephone Industry Association (CTIA), there are currently over 170 million wireless subscribers in the U.S. In addition, CTIA estimates that nearly 46,000 more become subscribers each day. As Figure 1.4 illustrates, the number of handsets in the U.S. is projected to shoot up from about 3.3 million in 2003 to 34.8 million in 2006. In 2003, an estimated 92% of wireless subscribers were digital. Statistics from the Wireless World Forum indicate that in 2003, 126 million Java phones were deployed worldwide. That number is estimated to reach 32 million in the U.S. by 2006.

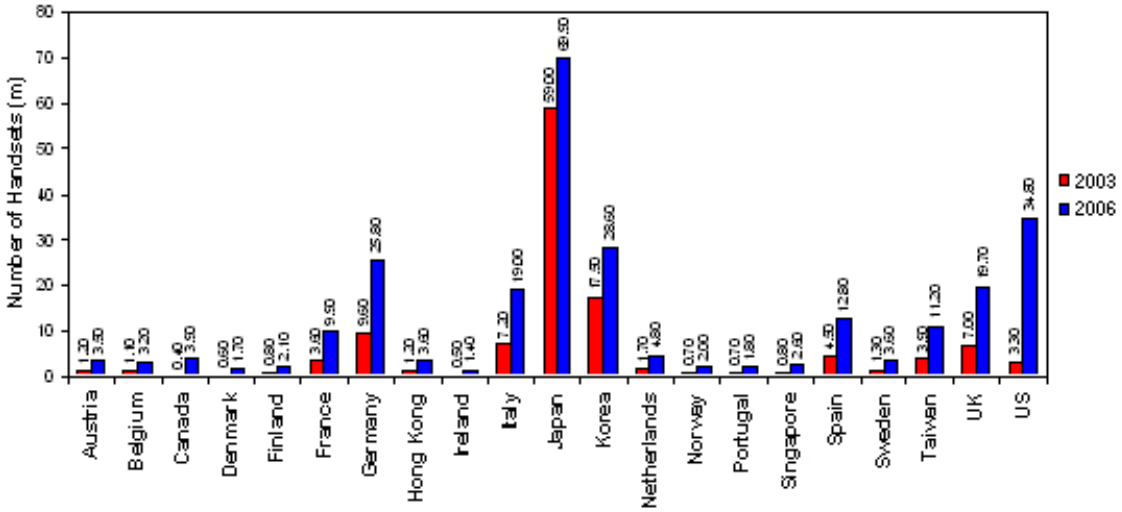


Figure 1.4 Number of Handsets, 2003 and 2006

Interactive television has already proven to be a significant enabler in driving mobile SMS transactions in Europe as well as parts of Asia such as China, Hong Kong,

and Korea. Today's 3G mobile and wireless devices now have the capacity to capture and stream high quality audio and video. These devices are fast becoming the first true personal computer in many ways, and will likely play a key role in iTV interaction in the near future.

1.2.5 Simultaneous Use of Media

According to a study of simultaneous media consumption released by The Media Center at the American Press Institute in 2004, widespread and intense media multi-tasking defines the emergent Content, or 'C,' Generation. Television remains the form of media most often paired with simultaneous usage with other media options. The fourth update of the Simultaneous Media Usage Survey (SIMM IV, 2004) reports that the top five list of simultaneous usage behaviors are:

- Reading email while watching TV – practiced regularly by 73.9% of consumers.
- Reading the newspaper while watching TV – practiced regularly by 64.5% of consumers.
- Watching TV while reading the mail – practiced regularly by 64.2% of consumers.
- Using the Internet while watching TV – practiced regularly by 62.9% of consumers.
- Reading a magazine while watching TV – practiced regularly by 59.2% of consumers.

Other key SIMM IV findings include:

- Consumer usage of New Media options continues to grow, with 74.9% of consumers saying they regularly or occasionally use cell phones, up from 68.7% six months ago.

- New Media usage is dominated by 18 to 44 year-olds, with the heaviest use of blogs and picture phones among 18 to 24 year-olds (23.3% and 29.7% respectively), and among 25-34 year-olds (22.6% and 25.4% respectively).

The SIMM IV study results are revealing. Rising behavioral trends in checking email, using the Internet, using cell phones, or even blogging while watching television are all indicators that consumers' media use habits are becoming increasingly receptive to the more active, "lean forward" model behind interactive television.

1.2.6 Summary

International Data Corporation (IDC) forecasts that by 2005, 79 million households will be enabled to access interactive TV services, representing 51% of regional TV households.

According to a report from Interaction '03, a transatlantic producer's forum on the future of iTV:

> In the US, the enhanced TV market is ripe for growth, especially as set-top boxes get more advanced. For example, capability for video on demand is set to grow from 16.5 million homes in 2003 to 38.2 million by 2008. The market for DVRs, with less than three million sales this year, is projected to expand to 44.5 million in 2008. SMS is also gaining in popularity. On audiences, Turner estimates that some 45 million people have a TV and PC in the same room, and of these two-screen viewers some 70 to 80 percent come to interact regularly (American Film Institute).

It is clear that consumer ownership of everything from DVRs to wireless devices to computers with TV tuners is experiencing rapid growth in the United States. Along with this trend and the convergence of digital technologies, consumers are beginning to gain unprecedented control over their television viewing experiences. In this context, legacy approaches to designing and producing for television will necessarily be tested.

1.3 A BRIEF HISTORY OF ITV

The first interactive television program debuted in the United States on Saturday, October 10th, 1953. At 10:00am on that day, CBS aired a black and white broadcast of a program called *Winky Dink and You*, in which a cartoon character named Winky Dink, his friends Mysto the Magician, Mike McBean, Dusty Dan, and Winky's dog Woofer went on dangerous adventures.

To interact, viewers purchased the "Official Winky Dink Kit," which contained several sheets of acetate (the "Magic Window"), crayons, and cleaning cloths. During the show, under the direction of host Jack Barry, children would place a sheet of acetate over the TV screen and draw a bridge or a rope, for example, in order to save Winky Dink and his friends from danger. At the end of the show, children would also be able to connect the dots on their television screen in order to reveal a secret word (Thomasson, 2003). Figures 1.5 and 1.6 show the Winky Dink Kit as well as children interacting with the program.

Figure 1.5 Winky Dink Kit

Figure 1.6 Winky Dink and You

The original run of *Winky Dink and You* lasted for four years. During that time, over two million Winky Dink kits were sold. In 1957, CBS cancelled the show due to parents' complaints that their children were drawing directly onto the television screen instead of using the acetate (Adams, Anand & Fox, 2001). In 1969, however, the show returned to air with 64 new episodes and a new kit.

Since *Winky Dink and You* first aired in 1953, the proliferation of digital technologies, advances in broadband, digital television, set-top boxes, and mobile and wireless technologies have continued to transform the media use habits of consumers and have all paved the way for interactive television to take off in the United States.

Table 1.5 presents brief history of interactive television from the days of *Winky Dink* through today follows, courtesy of the Interactive Television Alliance.

1.4 ITV IN THE U.S. VS. ABROAD

As a new convergent medium, standards for iTV programming and interaction remain largely undefined in the United States. In many European countries, however, particularly in the U.K., iTV programming is much more prevalent, structured, and successful. Figure 1.7 provides an overview of iTV user demographics in various European countries.

Table 1.5 A Brief History of Interactive Television

1957	Zenith "Space Command" Remote Control - with 13 VHF channels, the viewer could sit back in a Lazy Boy Lounger and switch stations without getting up from the TV Dinner.
1972	Cable TV - cable expands as HBO is launched, satellite distribution becomes viable, and regulations loosen. Cable allows the potential of over 75 channels, giving us the Set Top Box (STB) and making the remote control man's (and woman's) best friend.
1977	Qube - Warner Cable debuts iTV service in Columbus, Ohio. A limited amount of customers can now get additional information while watching a program and can participate in live polls. The system is dropped as additional benefits can not justify the cost of the equipment.
1984	1984 Cable Act - deregulation accelerates cable penetration. Cable homes increase to over 50M homes by the end of the decade.
1994	Full Service Network - Time Warner launches iTV services in Orlando FL. It works fine, but nobody wanted to pay for the $5,000 digital STB's. The newly rediscovered Internet looks more promising.
1995	Digital Satellite - TV expands to 500 channels. Almost 12M 18" dishes are sold by the end of the 1990's. The enhanced program guide becomes a necessity.
1997	WebTV - the Internet converges on the TV screen. WorldGate and AOLTV get into the act as well. Their combined base soon exceeds 1.5M.
1998	Digital Cable - MSOs start expanding the digital infrastructure to over 1.5M homes, giving customers potential access to iTV services. By end of 1990's, that number will expand past 5M.
1999	Digital Video Recorders - TiVo and ReplayTV change how we watch and interact with the TV. Including Dish Network and UltimateTV, over 3M PVRs have been sold.
2001	iTV Deployment - iTV programs started by every MSO and DBS system. Wink is available in over 6M homes. OpenTV, Liberate, Canal+, and WorldGate make important strategic alliances. Over 20M homes have boxes capable of some form of interactivity.
Today	Video On Demand (VOD) deployments are expanding in the cable world, laying the digital infrastructure necessary for new interactive applications. Satellite providers are pushing new iTV enabled projects and PVR's. Two-screen synchronous programming is becoming a necessary option to sports and event programming. Over 40M homes have boxes capable of some form of interactivity.

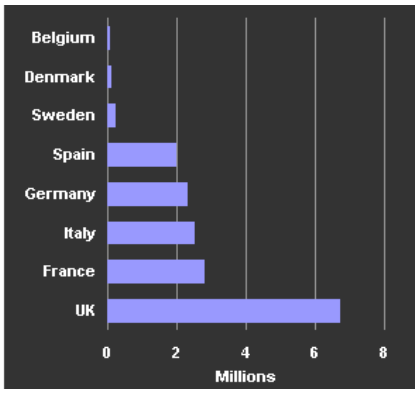


Figure 1.7 Interactive TV Users in Europe

1.4.1 BBC Interactive

As evident from Figure 1.6, the U.K. leads by far in its number of iTV users. The BBC, the "gold standard" in iTV programming for many industry professionals, is by far the largest producer of iTV in the world. In the U.K., television viewers can press the "Red Button" (see Figure 1.8) on their remote controls in order to access interactive programming. They can watch a concert or a sporting event from multiple camera angles, for example, sing along with a musical, or play along with quiz shows. The interfaces are clearly designed, consistent, and familiar to consumers. In fact, the BBC has established a comprehensive set of guidelines for their interactive programming, covering everything from typography to principles of good navigation.

Figure 1.8 The "Red Button"

The BBC Web site explains how interactive television works via satellite, cable, and with Freeview digital terrestrial set-top boxes:

> Interactive TV is always available
>
> News - the latest local, national & international in-depth news reports 24 hours a day. On Satellite and Freeview you can also select video updates from our multiscreen menu.
>
> Sport - up to the minute sports news and results. Our Sport in Vision service (via Satellite) also displays the latest scores as they happen, whichever BBC channel you're watching.
>
> Weather - high quality weather maps with comprehensive 24 hour and five day forecasts for home and abroad.
>
> CBeebies on BBCi entertains and educates your children with great interactive games featuring favourite BBC characters.
>
> Entertainment - the latest celebrity gossip, plus an EastEnders video catch-up service (on Satellite) keeping you up to date with last night's episode.
>
> Interactive programmes - BBCi brings extra interactive features including play along quizzes (Test the Nation), voting opportunities (The Big Read) and extra audio and video services (FA Cup).
>
> Source: http://www.bbc.co.uk/digital/tv/missing.shtml

Figure 1.9 provides examples of BBCi programming, including coverage of concerts, sporting events, and children's programming.

Figure 1.9 Examples of BBCi Programming (a), (b), and (c)

According to James Holden, News Research Manager of BBC Audience and Consumer Research, 93% of U.K. households tune in to BBC programming each week.

1.4.2 Additional Examples

Many other countries have experimented with interactive television to varying degrees of success, including France, Spain, South Africa, Turkey, Australia, Greece, China, New Zealand, and Italy. Not surprisingly, the most popular types of programming are sporting events and games shows. Table 1.6 presents a brief overview of the types of interactive programming being offered abroad, courtesy of Broadband Bananas.

In addition to these examples, the video vault on the Broadband Bananas Web site (http://www.broadbandbananas.com) features dozens of examples of interactive television programming from countries around the world.

In the U.S., the American Film Institute's annual enhanced TV Workshop (http://www.afi.com/education/etv/), now the Digital Content Lab, has played a key role in pairing together TV producers, directors, and creative executives with technology leaders to prototype the next generation of interactive television programming. The workshop deployed its first prototype, *Celebrity Mole: Yucatan*, in 2003. With its 2005 shift to the Digital Content Lab, however, the AFI hopes to facilitate a year-round digital production center with more ambitious goals to guide productions from prototype to deployment in the future.

The U.K. has by far the most deployed interactive television programming available today. The United States operates on quite a different model, however. The BBC is the primary media force in the U.K., and they are developing standards that work across systems, devoting a comprehensive section of their operation to interactive TV, detailing everything from how iTV programming works, how to interact, platform-specific instructions, and guidelines for iTV programming.

Table 1.6 A Sample of iTV Programming Abroad

	**France** Canal Plus France Interactive Rugby Platform: Mediahighway The interactive rugby application provides team information, scores, and statistics overlaid on the main video. A similar application structure is also used for football matches carried on Canal Plus France.
	**Italy** FantaCalcio on Stream Platform: OpenTV An iTV version of the popular Italian strategic game called "Fantacalcio Grand Prix." Starting with an initial budget of 200 "FantaBillions," each player can create and manage at least two "FantaTeams" by buying or selling football players on a virtual football market. The goal of this game is to achieve the best score among all players and win one of the rewards offered by Stream.
	**Spain** Champion's League on Via Digital Platform: OpenTV Viewers are able to choose from a number of different video feeds including replays and statistics as well as the main live feed via an interactive mosaic. While watching the game, viewers can also get in-vision statistics including the current score and also pull up information on the goals and who scored them, team changes, team line up and cards shown by the referee.

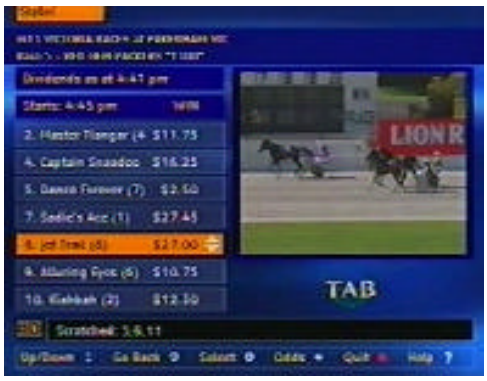
Table 1.6 (continued).

	**Greece** Localised Eurosport News on Nova Platform: OpenTV This enhancement to the Eurosport News channel superimposes localized content over the English text that is transmitted on Eurosport News' Pan-European feed. The application launches in the background shortly after switching to the channel and places a Greek language ticker and news headlines window over the English language text. This provides a highly cost effective way of regionalizing the news service beyond the simple addition of a localized soundtrack. Once loaded, the viewer is able to toggle between English and Greek text by pressing the OK button.
	**Middle East** Arab Radio & Television World Cup Demo Platform: OpenTV The World Cup interactive TV service includes a multi-screen video mosaic featuring highlights. The rest of the application provides detailed statistics on the players and the match - with regularly updated news and information being supplied by Reuters.
	**Turkey** Digiturk World Cup Service Platform: OpenTV The service features dynamic news content provided by Reuters, information on Turkey's World Cup performance, match schedules, and World Cup information. The results section allows viewers to track the scores of each team in each group.

Table 1.6 (continued).

	**Scandinavia** Zonavi iTV Portal on Canal Digital Platform: Mediahighway This portal allows viewers to play games, purchase mobile phone ringtones, read dynamically updated news stories from a popular Scandinavian newspaper, and check the weather.
	**China** CCTV World Cup Platform: OpenTV OpenTV worked with CCTV, China's national broadcaster, to create an interactive World Cup application, offering enhanced programming features across 19 different provinces. Featuring multiple games within one screen, viewers were able to watch as many as four different matches simultaneously.
	**Hong Kong** The Interactive Channel (TIC) Platforms: HK Cable TV and HK Broadband TV The Interactive Channel is a 24/7 cross-media iTV channel that does not rely on compatibility with different set-top boxes. Instead, the channel is designed to let viewers participate via SMS and the Internet. The channel features live shows, SMS-controlled games, as well as an interactive show targeted at disabled people.

Table 1.6 (continued).

	**New Zealand** Sky NZ Betting Service Platform: OpenTV The service allows 'next race' betting for horse and greyhound racing and trots and also provides 'sports betting' for rugby and soccer. The company has upgraded the solution to provide dynamic odds that update every 40 seconds (on average the access time is 26 seconds) and the ability for viewers to place bets using their remote controls.
	**Australia** Fat Cow Motel on Austar Platform: OpenTV Each episode of "Fat Cow Motel," an interactive comedy mystery series, ended with a cliffhanger mystery that the audience can solve by paying close attention during the program or by looking for additional clues when interacting with the show online, via email, SMS, voicemail, or via interactive TV. The more platforms the viewer used to interact with the show, the more clues they received.

No such unified system exists in the U.S. Instead, the power is in the hands of major cable operators and media companies; as a result, a multitude of these competing forces are constantly trying new and radical maneuvers while looking for the killer application. This approach, together with the lack of platform standardization, makes it difficult to establish unified standards across the industry.

1.5 THE PROBLEM

Steve Curran notes that industry enthusiasm has "waxed and waned with every market test and technological advancement over the last fifteen years" (2003). Dale Herigstad, Creative Director of Schematic, Inc., and a respected iTV designer, notes that "In the early 1990s, I was involved in some of the big Time Warner tests that were taking place, and the attitude was 'it's coming.' But here we are, twelve years later, and the attitude is still 'it's coming'" (quoted in Curran, 2003). Increasingly, however, many of the business and technological obstacles that have accounted in part for the slow development of iTV in the United States are fading. At the same time, television viewers are becoming more receptive to a more active mode of watching.

However, business and technological constraints are not the only factors responsible for slow iTV development: "At the end of the day, success or failure for iTV rides on whether a consumer can pick up a remote control, instinctively understand where they can go and what they can do with interactive television, and, once there, find that value has been added to the passive experience" (Curran, 2003). To that end, good interaction design for this new interactive medium is arguably more directly critical to the success of iTV than any other factor.

Today, the study of interaction design is emerging from the foundations of human-computer interaction (HCI) and industrial design – with a dedicated focus on user-centered design. Preece, Rogers, & Sharp define interaction design as "developing interactive products that are easy, effective, and enjoyable to use from the users' perspective" (2002).

Designing effective interactive television experiences is a challenge for interaction designers. In order to effectively approach the design challenges, I will be

using a combination of visual culture and usability methodologies. The visual culture aspect will address the experience of watching television as a cultural one, filled with models and metaphors that we have become familiar with. The visual culture perspective pertains primarily to the interface design of a system. The usability perspective is concerned with the navigation of the system. As previously mentioned, however, these factors do not operate discretely. Understanding how they work together to influence viewers can offer valuable insights into designing effective interactive experiences for television.

The human-computer interaction community is becoming increasingly aware of user interface design issues in interactive television. The closing plenary for the 1995 CHI conference (the premier international conference for human-computer interaction), given by Scott McDonald of Time Warner Entertainment, focused on many of the general iTV challenges for the CHI community. Over the past decade or so, CHI participants have demonstrated a growing awareness of this new design space by presenting papers, tutorials, and workshops on subjects such as "When TVs are Computers are TVs" (Mountford, et al, 1992), "Interactive Television: A New Challenge for HCI" (Teasley, Lund, & Bennett, 1996), "Dual Device User Interface Design: PDAs and Interactive Television" (Robertson, et al, 1996), and "Interactive Television: Strategies for Designing Useful and Usable Services" (Daly-Jones & Carey, 2001). At the 1998 CHI conference, Dale Herigstad[2] and Anna Wichansky[3] conducted a workshop titled "Designing User Interfaces for Television," in which they addressed the effective design of user interfaces for iTV and Web applications used on televisions. They identified

[2] Executive Creative Director, Schematic, Inc., and prominent iTV designer
[3] Senior Director, Advanced User Interfaces, Usability & Interface Design, Oracle Corporation

many key questions that speak to the industry's awareness of design issues arising from convergent media platforms (Herigstad & Wichansky, 1998).

Among the questions Herigstad and Wichansky raised include:

- How do TV display technologies differ from high-resolution computer displays?
- How should I design colors, fonts, and screen layout for TV displays?
- How do infrared remote controls and keyboards differ from standard computer input devices?
- How do I design for pointing, selection, navigation, and data input with a remote control?
- Can I retrofit an existing computer UI for TV?
- Do TV viewers differ from computer users in their capabilities and perceptions?
- How do I test the usability of a TV UI?

Today, these are questions that still remain largely unanswered. The slow development can be attributed to people's tendency to ascribe legacy conventions to new technologies. We are, however, witnessing the formation of a new medium as it emerges: "In 1995, many people believed most Web pages would end up looking like newspaper pages. Others believed they would soon look like a television monitor. Of course, both groups were wrong. As the Web matures, it continues to develop its own look and feel. It still has a ways to go. ITV faces the same growing pains (Pignetti & Capria, 2001).

The lack of unified design principles for interactive television is a problem that is recognized by many professionals within the industry who are now working in collaboration to advance the success of iTV in the United States. This document is my contribution toward this effort.

CHAPTER 2

BROAD CATEGORIES OF ITV PROGRAMMING – BY PLATFORM

2.1 INTRODUCTION

There are many ways to approach the categorization of iTV programming. I have chosen to do so by two methods: by platform, and by television genres and programming. It seems worthwhile to sort iTV programming in the United States by platforms because so many exist. In fact, the lack of platform standardization is one of the main challenges facing iTV today. The industry has attempted to introduce interactivity into every kind of platform with both success and failure. But are all platforms conducive to interactivity? How do different platforms afford different types of interactivity? It seems useful, in beginning with a platform-based approach, to identify the affordances and constraints of each platform.

The affordances of a system can be both real and perceived. Real affordances entail all actions that are possible to perform on a system. Perceived affordances are what actions the user perceives to be possible. According to Donald Norman, in graphical, screen-based interfaces, the designer primarily can only control perceived affordances. That is, while a user can click anytime he/she wants to, the real question is: Does the user perceive that clicking on that location is a meaningful, useful action to perform? (1999). Constraints, on the other hand, fall into three categories: physical, logical, and cultural. Physical constraints are closely tied to real affordances (e.g., it is impossible to move the cursor outside the screen). Logical constraints, which use reasoning to determine the alternatives, are valuable in guiding behavior. Finally, cultural constraints are conventions shared by a cultural group (Norman, 1999). According to Norman, "A

convention is a constraint in that it prohibits some activities and encourages others. Physical constraints make some actions impossible: there is no way to ignore them. Logical and cultural constraints are weaker in the sense that they can be violated or ignored, but they act as valuable aids to navigating the unknowns and complexities of everyday life. As a result, they are powerful tools for the designer" (1999). In this chapter, I will highlight both the affordances and constraints of each platform in turn.

Because platforms will continue to evolve and converge with the advent of faster bandwidths and new technologies, however, I will, in chapter three, categorize iTV programming by television genres and general types of programming – which offer a more stable and persistent modality for analysis – and analyze designs from these genres. These two methodologies together will serve, in part, to inform the interaction design principles that I form in chapter five.

Table 2.1 presents an overview of the nine platforms that I will examine in detail, along with a representative iTV example for each. I have organized the platforms, listed below, into three loose categories based on the more generalized platform each resides on. In the future, as televisions converge with computers and game consoles, effective cross-platform design will clearly be more important than ever in the process of iTV design and production.

TV-based: PVR / DVR, VOD, EPG / IPG, Web TV

Computer / Web-based: Web-Based Synchronous, Web-Based Asynchronous, Media Centers

Other: Mobile Devices, Game Consoles

Table 2.1 Categorization of iTV by Platforms

Platform	**Representative Example**
Personal / Digital Video Recorder (PVR / DVR)	TiVo
Video On Demand (VOD)	Comcast ON DEMAND
Electronic / Interactive Programming Guides (EPG / IPG)	Gemstar-TV Guide's GUIDE Plus+
Web TV	MSN TV / WebTV
Web-Based Synchronous (Two Screen)	TNT Interactive
Web-Based Asynchronous	PBS Love & Diane: An Interactive Timeline
Media Centers (PVR, Web connection, TV feed)	Microsoft Media Center
Mobile Devices	American Idol
Game Consoles	Battlestar Galactica prototype

In this chapter, I will provide a brief overview of the affordances and constraints of each platform, and provide a representative example of each platform utilized in the United States.

2.2 DIGITAL / PERSONAL VIDEO RECORDERS (DVR / PVR)

A digital video recorder (DVR), also called a personal video recorder (PVR), records television programming onto a hard disk in digital format. Popular DVRs on the market include TiVo and ReplayTV, although many other models are offered by home electronics manufacturers. In addition, many satellite and cable companies are incorporating DVR functionalities into their set-top boxes, such as DirecTiVo from DirecTV. Many DVR models now also have the ability to record onto DVDs. According to BSkyB, movies and dramas are the two programming genres that viewers are most

likely to watching using their DVRs, while most still prefer to watch news reports and sports live (Hewelt, 2004).

2.2.1 Representative Example: TiVo

Figure 2.1 provides examples of the TiVo interface.

Figure 2.1 Examples of TiVo Interface (a), (b), (c), and (d)

2.2.2 Affordances

Because the data recorded onto the hard drives of DVRs are in digital format, the systems, in addition to eliminating the use of tapes, allow users to have a great deal of control over their television viewing experiences. The most popular DVR features pertain to time shifting, including the ability to pause live television, rewind, fast forward, show an instant replay, play slow-motion, and to skip commercials. In addition, DVRs are

capable of storing an enormous amount of data for users to manipulate. TiVo, for example, can record up to 140 hours of programming. Viewers have more control than ever over their viewing experiences by watching what they want to watch at their convenience. In addition, some DVRs such as TiVo provide personalized suggestions for additional programs that the viewer might enjoy based upon his/her previous selections.

TiVo takes advantage of the metadata already associated with programs to allow users to sort in a variety of ways. For example, with TiVo's WishList function, users can sort by and record every program or film by actor, director, category, keyword, or title.

As one TiVo lover writes in her weblog: "TiVo made me so happy. TiVo would never record the same episode of a show over and over. SDVR doesn't surprise you by taping shows it thinks you may like. TiVo does, and TiVo is always right… TiVo makes searching for shows easy and fun, with viewing ideas, trailers, categorized movie indexes" (Trisha, 2004).

Many of the affordances particular to DVRs – time-shifting, convenience factor, etc. – relate to key aspects of good interaction design, because they give users more control over their viewing experiences, as well as the ability to customize what they watch. I will discuss this in greater detail in chapter five.

2.2.3 Constraints

DVRs have a limited storage capacity, depending on the specific unit used by the viewer. Because the data is recorded onto the hard drive of the unit itself, the storage capacity and number of recordable hours vary from unit to unit; as well, recording in "high quality" drastically reduces the number of hours a unit can record. Because most DVRs only have two tuners, it is not possible to record two shows simultaneously that have a time conflict with one another. Users also report that tuner quality is often bad,

and the picture quality of recorded shows is grainier than TV. Overall, however, the majority of consumer complaints about DVRs seems to pertain to the hardware units themselves, and is not related to core DVR functionalities.

DVRs do pose a challenge to some iTV programming, however. While not all enhanced content is necessarily lost if a viewer records the show and time-shifts through it later, doing so does make many programs lose their iTV functionalities, particularly those that are tied to real-time participation such as voting and game play.

2.3 VIDEO ON DEMAND (VOD)

Video on demand (VOD) systems allow viewers to select and watch video content on their television over a network. VOD systems are either streaming, in which viewing can start as the video streams over the network, or download, in which the program is downloaded in its entirety to a set-top box before viewing starts. All download and some streaming VOD systems have time-shifting capabilities, allowing viewers to pause, fast forward, rewind, and jump to a specific frame. Viewers can watch the selected content as many times as they wish within a specified time period, usually 24 hours, and most require a fee. Near Video on Demand (NVOD) systems are streaming systems in which viewers wanting to watch a program are batched up for the next start time, which occurs in staggered intervals. True VOD operates on a pull model, where consumers choose what they want to watch and when they want to watch it. NVOD, on the other hand, is more like the traditional broadcast push model, with programming determined by the networks and content providers (Beros, 2004).

2.3.1 Representative Example: Comcast ON DEMAND

Figure 2.2 provides examples of the Comcast ON DEMAND interface.

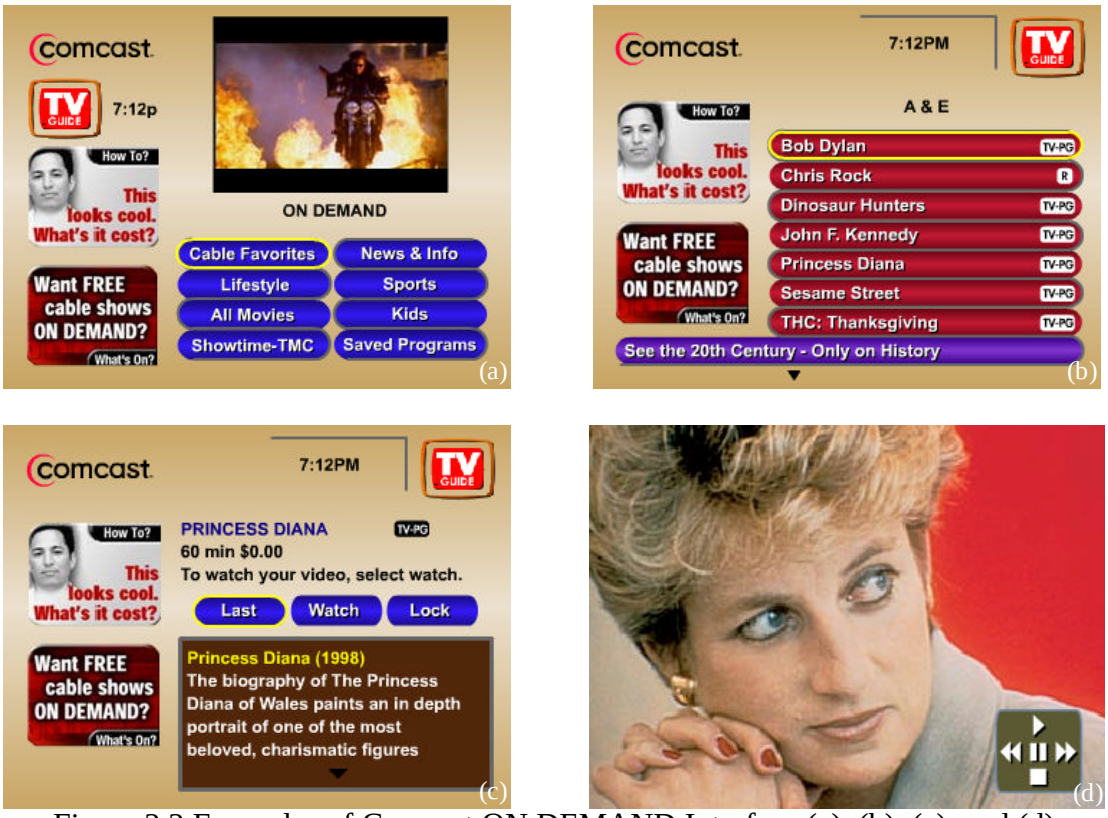


Figure 2.2 Examples of Comcast ON DEMAND Interface (a), (b), (c), and (d)

2.3.2 Affordances

As with DVRs, viewers have a high degree of control over their viewing experiences. Instead of waiting for a favorite program to air, viewers can simply choose what they want to watch at any given time. With Comcast ON DEMAND, for example, viewers can choose from hundreds of films and programs, and watch them whenever they want, as many times as they want, for up to 24 hours. Video on demand systems also allow users to time-shift, with the ability to pause, rewind, fast forward, or stop and resume a program any time.

These affordances also relate to key aspects of good interaction design by giving users the ability to customize and control their viewing experiences.

2.3.3 Constraints

Programs available through VOD systems are only available to users on a limited availability. On the Comcast system, for example, viewers can only view them for up to 24 hours. Although Comcast organizes its on demand content into categories for the viewer, there are a limited number of choices available, determined in part by what cable networks the user subscribes to and by what the networks themselves offer. Finally, in many cases, on demand systems function as a pay-per-view service, where users must pay a fee in order to access the desired content.

2.4 ELECTRONIC / INTERACTIVE PROGRAMMING GUIDES (EPG / IPG)

An electronic programming guide (EPG), or interactive programming guide (IPG), allows viewers to have interactive access to television broadcast schedules and additional information about programs. Additional functionalities and features, depending on the device and service, can include one-touch recording, program summaries, search by genre or channel, immediate access to the selected program, reminders, picture-in-picture, and parental control functions. One approach to EPG strategic development is to develop it as the gateway to TV. This approach bundles all of an operator's content into the EPG and is exemplified by the Gemstar-TV Guide philosophy of "owning the first screen viewers see" (International Marketing Reports, 2002).

2.4.1 Representative Example: Gemstar-TV Guide's GUIDE Plus+

Figure 2.3 provides examples of Gemstar-TV Guide's GUIDE Plus+ interface.

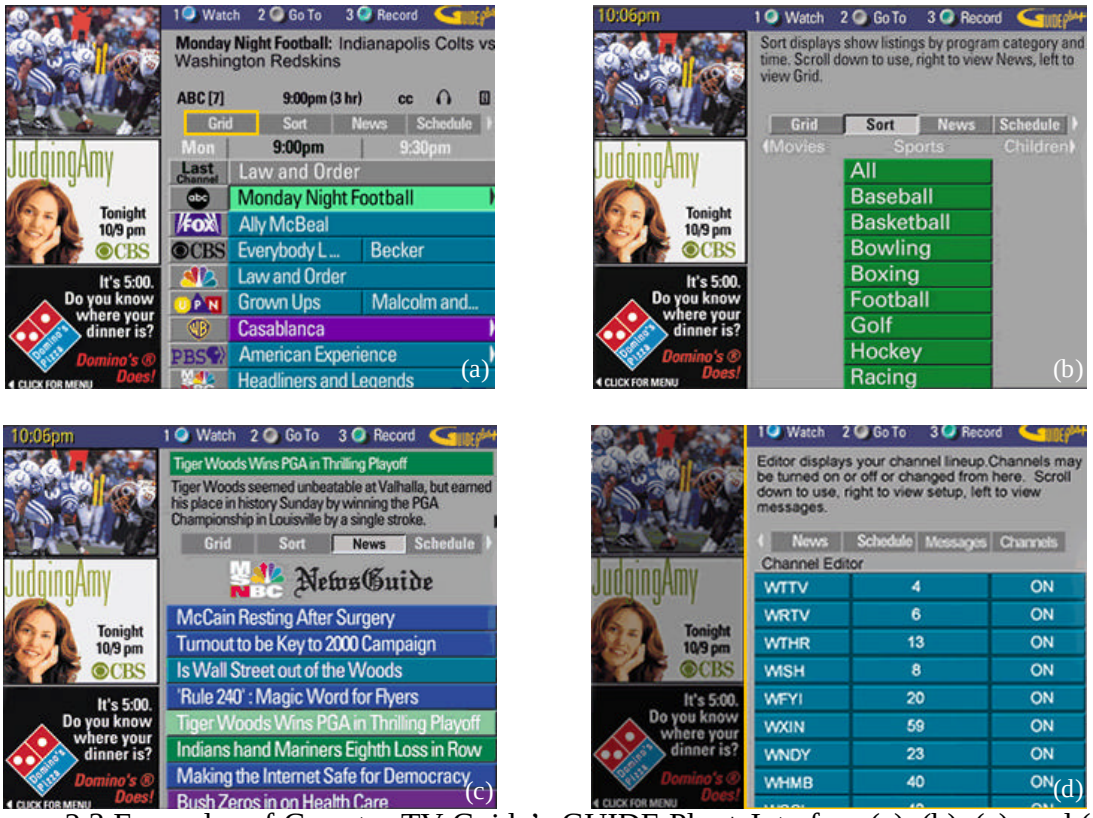


Figure 2.3 Examples of Gemstar-TV Guide's GUIDE Plus+ Interface (a), (b), (c), and (d)

2.4.2 Affordances

Unlike non-interactive programming guides that require viewers to sit and wait for the programs scroll by without any control, EPGs allow viewers to navigate the listings themselves. Viewers have the ability to sort by various categories, including by time, theme, or channel. According to a report from International Marketing Reports, two of the most valuable EPG features to consumers are the program grid and genre-based program information, or the ability to find "football" under "sports," for example.

The picture-in-picture feature available in some EPGs allows viewer to stay connected to the broadcast while browsing the EPG, and increases the length of time viewers will interact with an EPG. In addition, some EPGs provide the ability to change

the order of channels so that a viewer's favorite channels appear first, providing an excellent example of user-centered design.

Like DVRs and VOD systems, the strength of an EPG lies primarily in its ability to allow viewers to customize and gain greater control over their viewing experiences.

2.4.3 Constraints

As with any system, there is a strong correlation between the popularity of an EPG and its usability. As evidenced by Figure 2.3, the interface of the Gemstar-TV Guide EPG is extraordinarily cluttered. It is difficult to search by a particular program. The main menu is composed of many buttons that are not necessarily organized by what functions are used most often. The programming grid shows too few listings at a time, and requires the user to scroll far too much and frequently. In addition, up to one-third of the screen is used for advertising, taking space away from the primary information the user wishes to access. The interface of the Gemstar-TV Guide EPG is not optimized for the benefit of its users.

According to a report from International Marketing Reports, the majority of viewers use an EPG to browse current listings or what is on next or later that same day, rather than to plan viewing more than a day in advance (2002). If this is true, EPGs must optimize their browsing functionalities to better serve this need. Today's designs have a long way to go before they can be considered user-friendly applications.

2.5 WEB TV

A Web TV is a television set especially designed (or connected using a set-top box) to allow an Internet connection. The most popular Web TV operator in the U.S. is currently MSN TV (formerly WebTV). The most recent version, MSN TV 2, allows

users to send email, chat, and surf the Internet from their televisions. Hardware requirements include a TV, a phone line or home network, MSN TV service, and a MSN TV Internet & Media Player unit.

Television is a medium that offers high quality video and audio. The Internet, on the other hand, with its capacity for information propagation and interactivity, does not provide the quality of television broadcasts and programming content. In developing a hybrid successor to these two technologies, a number of challenges must be overcome.

2.5.1 Representative Example: MSN TV

Figure 2.4 provides examples of the MSN TV interface.

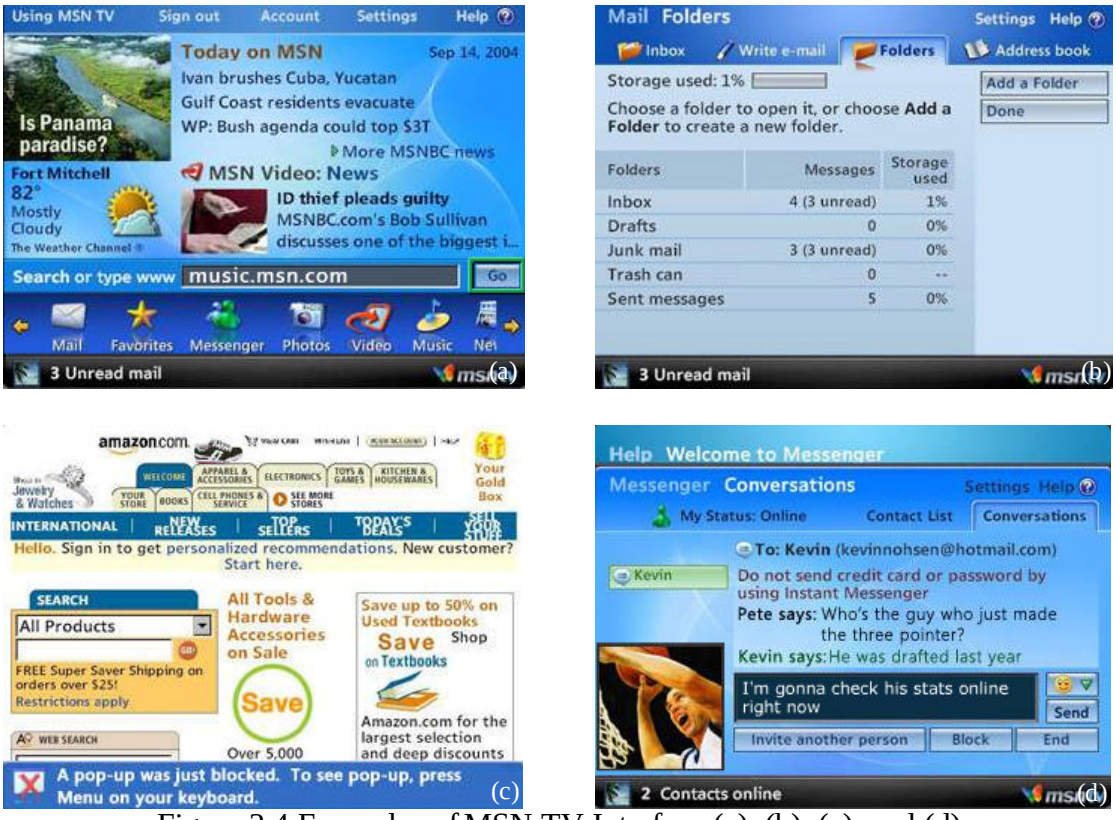


Figure 2.4 Examples of MSN TV Interface (a), (b), (c), and (d)

2.5.2 Affordances

MSN TV offers its users many services such as Web access, email, chat, music and video, and photos. Users can take advantage of these Web-based capabilities as well as watch television all on the same screen. MSN TV is an example of converging digital technologies.

2.5.3 Constraints

There are many interface design issues with MSN TV. As we can see from Figure 2.4, the interface is visually cluttered. It is inherently difficult to surf the Web on a television screen. Multitasking is difficult, as users don't have the option of switching back and forth between multiple "windows" as on a PC. In addition, a television has less versatility, power, and memory than an actual computer. Resolution is also poor in NTSC delivery. Another fundamental difference between PC users and TV viewers is the "lean forward" versus the "lean back experience." That is, PC users, with a "two foot" interface, are actively engaged with activities on the screen, while television viewers, with a "ten foot" interface, are traditionally passive consumers of content. It is difficult to force the two experiences into the television interface. Navigation and typing are also particularly difficult with a remote control or virtual keyboard rather than a mouse and real keyboard.

However, with the advent of HDTV and digital television, some of the design issues – particularly with poor resolution – will soon no longer be an issue. It will be interesting to see whether Web TV returns in popularity in the near future. In fact, a single screen for television and networked interactivity may well become the norm.

A more detailed analysis of Web TV will be discussed in chapter four in the case study comparing Web TV to the Microsoft Media Center.

2.6 WEB-BASED SYNCHRONOUS (TWO-SCREEN)

A Web-based synchronous iTV application is one in which interactivity is synchronized with the broadcast of the program itself. This type of programming takes advantage of a two-screen application in which a television and a personal computer are in the same room and are simultaneously utilized by the viewer. Content is "pushed" by the network to all computers that are logged in to the application. For example, a film is being shown on television while trivia, synchronized to appropriate moments in the film, is delivered over the Web to a personal computer. Other types of content that have been delivered via a two-screen platform include dynamic voting, polling, pictures, special offers, and chat.

2.6.1 Representative Example: TNT Interactive

Figure 2.5 provides examples of the TNT Interactive interface.

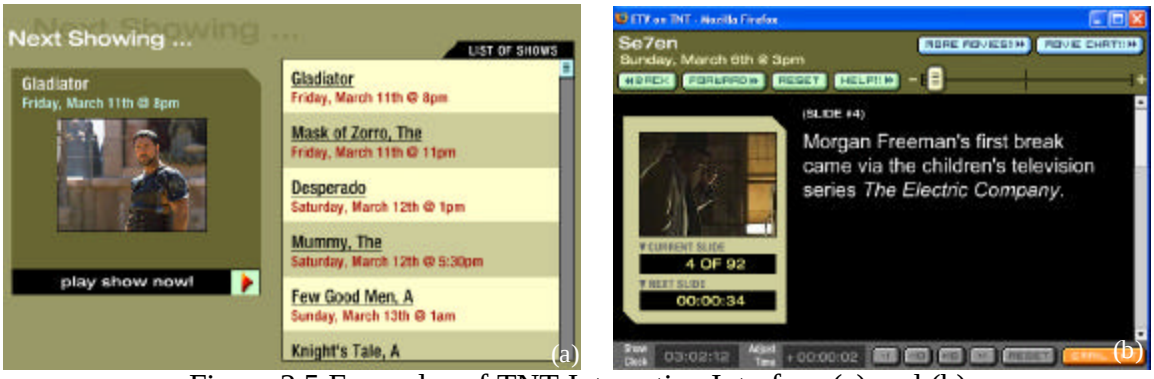


Figure 2.5 Examples of TNT Interactive Interface (a) and (b)

2.6.2 Affordances

Web-based synchronous applications take advantage of the fact that many consumers have a personal computer and a television in the same room. Statistics do indicate that viewers are increasingly actively using the computer while watching

television. Moreover, use of the Internet for entertainment is substantially more likely among those with broadband (U.S. Department of Commerce, 2004). This approach allows the television screen to remain separate and uncluttered, unlike many iTV enhancements such as overlays, which obstruct the screen. Finally, since all the enhancements are available on the Web, no special iTV hardware or middleware is necessary.

2.6.3 Constraints

Web-based synchronous iTV applications operate on a "lean back model," where users have no need to be actively engaged with the application. In the TNT Interactive example, users do not need to take further action after opening the application during the broadcast. The downside of this model is that it is difficult to maintain the interest of viewers. With their attention split between multiple screens, viewers can be easily distracted. Instead of being able to actively navigate the interactive content, it is "pushed" by the network to the users, who remain passive throughout the experience.

In addition, two-screen iTV applications to date have been used mostly as a vehicle to deliver trivia and factoids. In addition to being distracting, this approach does not make the most of the affordances of the medium and, as I will argue in chapter five, constitutes a poor example of iTV programming.

2.7 WEB-BASED ASYNCHRONOUS

Web-based asynchronous iTV applications differ from Web-based synchronous ones in that the enhanced content does not need to be delivered or viewed by the user during the broadcast itself and is not time sensitive. Instead, users can browse the

interactive or enhanced content on the Web at any time to learn more about the show and to interact with relevant content.

2.7.1 Representative Example: Love & Diane: An Interactive Timeline

Figure 2.6 provides examples of the *Love & Diane: An Interactive Timeline* interface.

(a) (b)

Figure 2.6 Examples of "Love & Diane" Interface (a) and (b)

2.7.2 Affordances

An application such as *Love & Diane: An Interactive Timeline* allows for non-synchronous but meaningful navigation of video content. In this example, the Interactive Timeline presents a visual representation of key events in the lives of Love and Diane, two main characters in the PBS documentary of the same title. Users can navigate the story both chronologically and thematically. The timeline highlights key moments in the family's life, allowing viewers an overview of the intertwined stories of mother and daughter, and providing order and orientation for a complex chronology, and making clear the events that happened before we meet the family members. The viewer can also sort the film clips thematically, exploring the dramatic parallels in struggle and resilience, defeat and achievement, across four generations.

Because Web-based asynchronous applications are not dependent upon consumption in real-time along with the broadcast, the applications can deliver more meaningful content than trivia or factoids, for example. They can and should be intimately tied to the content of the original program. These applications afford exploration, and allow users to discover greater depth of meaning from the original content.

In the future, Web-based synchronous applications may become extended to become an alternate vehicle for VOD delivery. For example, IFILM (http://www.ifilm.com) is a site that provides video entertainment on the Web, offering short films, TV clips, music videos, sports, and a "viral videos" collection. This medium could easily distribute content that extends or enhances a television program. Currently, IFILM is one of the top ten streaming media sites in the world, delivering more than 30 million streams per month.

2.7.3 Constraints

Because the interactive content available through Web-based asynchronous applications is removed from the primary source of information, it can lack depth of information. With its physical removal, it's also much less likely that the users will find their way to this information.

2.8 MEDIA CENTERS

Media centers, or PC TVs, are personal computers equipped with TV tuner cards. They are similar to Web TV in that the functionalities of TV and Internet are integrated into one machine, but because they are hosted on a computer instead of on the television,

they allow for greater versatility, speed, power, and memory. The screen output itself can be linked to either a computer monitor or to a television screen.

The most popular media center available today is Microsoft's Windows XP Media Center Edition. Computers powered by Windows XP Media Center Edition 2005 are called Media Center PCs. They are complete Windows XP-based PCs enhanced for home entertainment.

2.8.1 Representative Example: Microsoft Media Center

Figure 2.7 provides examples of Microsoft Media Center's interface.

Figure 2.7 Examples of Microsoft Media Center Interface (a), (b), (c), and (d)

2.8.2 Affordances

Media center machines combine the television and the functionalities of the PC into a one-screen platform. Viewers can watch television as well as have full DVR control capabilities on a computer. In addition, interactive components are often easier to navigate with a mouse than with a remote. Media Centers allow users to have access to all of their media content on one platform. As with DVRs and VOD systems, Media Centers allow users to have a great deal of control over their viewing experiences. A more detailed analysis of media centers will be discussed in chapter four in the case study comparing Web TV to the Microsoft Media Center.

2.8.3 Constraints

Because computer monitors have poorer resolution than television sets do, television broadcasts on a PC remain relatively poor in quality. The extent of interactivity is still relatively undefined on this platform; for example, media center systems cannot be used as a Web browser while in TV mode. Finally, because the system is hosted on a Windows machine, consumers do experience problems with the unexpectedness of system crashes.

2.9 MOBILE DEVICES

The use of cellular and wireless devices in interactive television programming has mostly been limited to voting. The most popular application by far has been FOX's *American Idol*, in which viewers can vote for their favorite contestants. Users can vote by either dialing a toll-free number or by sending an SMS via their cellular phones. The contest is, in fact, determined by viewer participation in the show.

Networks have also used wireless devices for the purposes of polling and for delivering content such as trivia. For example, a 2004 ABC primetime special on *Sleep: How to Get the Rest of Your Life* asked viewers to participate by answering sync-to-broadcast trivia via their cellular phones or via the Internet, with real time poll results displayed after each commercial break.

2.9.1 Representative Example: American Idol

Figure 2.8 provides an example of the mobile interface for SMS voting.

Figure 2.8 American Idol SMS Voting

2.9.2 Affordances

The use of mobile devices in iTV takes advantage of the ubiquity of mobile devices in our lives. The interaction model is extremely simple, and because of the ease with which people can interact, programs such as *American Idol* garner extraordinarily high levels of audience participation. This model works particularly well for polling and voting purposes, particularly for programming such as sports and games shows, which are inherently competitive and in which audiences love to take part. Mobile devices take

advantage of the participatory aspect of many programs and easily allow viewers feel like they are part of a larger viewing community.

2.9.3 Constraints

Designing for mobile devices presents a challenge to interface designers. For example: “Processors get faster, carriers offer more services, bandwidth increases, and it results in more content being delivered to the user. But the display size doesn’t get any bigger. How do designers deal with increases in speed and information density, when they are stuck with the same little screen they had two or three years ago?” (Frauenfelder, 2005).

There is a clear absence of standards and conventions in the realm of designing for mobile devices, despite there being multiple formats available on these devices (e.g., video, SMS, voice, recorded voice, sound, games, graphics, photographs). Also, because of the relatively simplistic interaction model behind the use of mobile devices, it is difficult to adapt them for more complex and sophisticated iTV applications. Finally, revenue is also an issue with premium SMS.

2.10 GAME CONSOLES

Game consoles that come with a built-in Internet connection and / or TV tuner provide a good example of convergent technologies. For example, Microsoft’s Media Center Extender for Xbox is a new Xbox title that streams the Media Center PC entertainment experiences onto a TV or display through the Xbox console. Media Center Extender for Xbox is a packaged software product from Microsoft that runs as an Xbox game. It works with a wired or wireless connection to the Media Center PC, and also supports DVD movie playback.

The American Film Institute's enhanced TV Workshop has generated some cutting-edge iTV prototypes that merge games with television. In 2003, the Sci Fi Channel and VU Games teamed up with the AFI workshop to create a prototype for *Battlestar Galactica*:

> The team has fleshed out the designs for Battlestar Galactica's spatial navigation on the Xbox. The interface features directional mapping composed of four quadrants, each offering a different interactive opportunity for the viewer. Navigating to the left, viewers can get a closer glimpse at the artifacts of the scene they're watching by viewing maps and diagrams relevant to the storyline, giving viewers a deeper sense of immersion in the story. When viewers navigate to the right, they find visual background on the *Battlestar Galactica* characters through access to character photos and "home movies." Navigating up, viewers have access to additional B-roll footage, and moving down, viewers have an opportunity to participate in the story through interactive game play, flying aircrafts in battle along with the show's characters (American Film Institute, 2003).

2.10.1 Representative Example: Battlestar Galactica Prototype

Figure 2.9 provides examples from the Battlestar Galactica prototype.

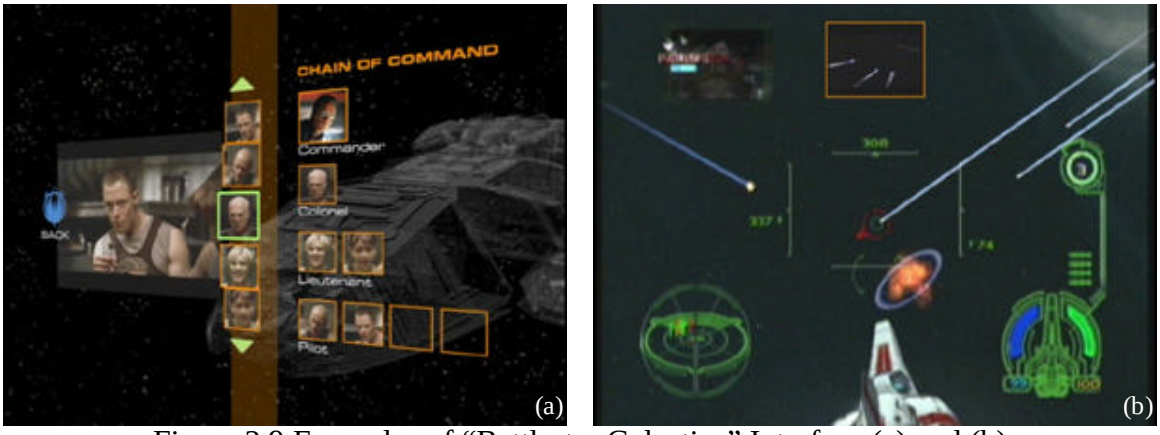


Figure 2.9 Examples of "Battlestar Galactica" Interface (a) and (b)

Similarly, in the 2004 workshop, the Science Channel teamed with the AFI team to produce a prototype of *Dinosaur Highway*, a new programming concept where a MMORPG (massively multi-player online role-playing game) merges with television.

2.10.2 Affordances

With television and game consoles merging, television viewing and game play can happen simultaneously, allowing for greater possibilities of networked gaming. If in the future our gameplay can influence the outcome of television programming, and vice versa, it will radically change our conceptions of gaming and television in ways we are just beginning to conceive. According to Dale Herigstad, "I believe that in the future, all enhanced experiences, including cable TV, are going to come through game consoles such as the Microsoft X-Box or Sony Playstation, which are capable of delivering richer media" (MIT Communications Forum, 2004).

2.10.3 Constraints

This realm is currently too new and experimental. Neither the *Dinosaur Highway* prototype nor the *Battlestar Galactica* prototype was deployed. Also, because of the highly personalized nature of the interaction, it is not conducive to multiple people watching and participating simultaneously. For the time being, however, scalability may be the biggest practical issue. Delivering games to hundreds or thousands of players, all of whom are sending information back to the system where it is processed and shared with other viewers, presents a substantial processing and bandwidth challenge (Pignetti & Capria, 2001).

2.11 FUTURE PLATFORMS

The convergence of various entertainment and iTV-enabling technologies seems to be the key theme as we move toward platforms and technologies of the future. Television and the Web have merged, with mixed results, on both the television and personal computer platforms. We are beginning to witness the convergence of traditional

game consoles with televisions and computers. Because of the amount of control they give viewers, full DVR capabilities will likely be available on every platform soon. In the near future, cellular phones and wireless devices will also act as our video cameras and remote controls. With new innovations like TiVo To Go, users can not only time-shift but also place-shift their media. These devices will free users from the constraints of consuming video from a stationary device situated in the home environment.

To echo Herigstad's comment that all enhanced experiences in the future will come through a game console, the Sony PSP (PlayStation Portable) device (see Figure 2.10), released in 2004, certainly takes a step in that direction. The PSP features a 16:9 widescreen LCD, a 480 x 272 pixel high-resolution screen, wireless connectivity, and the ability to play games, music, and full-motion video, as well as other forms of digital entertainment content.

Figure 2.10 Sony PSP

Whatever our future platforms look like, they will likely be an amalgamation of devices and capabilities that we are already familiar with, brought together in new ways and allowing for new possibilities of control and agency. Likewise, the use of media will also become increasingly personalized. A recent article in the *Financial Times* projects:

"If the 19th century was the age of the newspaper and the 20th century the age of radio and television, this century will be defined as the age of media personalization. The news you want, when you want it. The concept is simple – forget the old media that decided what was news and when and how you would consume it" (Glocer, 2005).

2.12 CONCLUSIONS

Different platforms offer different affordances for interactive television. The functionalities offered by many of these platforms speak to key features that iTV users are getting increasingly accustomed to and will most likely demand in the future, regardless of platform. Many of the observations arising from the examples presented in this chapter are key contributors to the principles that are laid out in chapter five. I offer some observations and questions arising out of thinking about iTV-enabling platforms abstractly in application to successful iTV programming:

- Viewers enjoy having control over their viewing experiences. For example, DVRs and VOD systems allow viewers to watch what they want, when they want. Viewers can also time-shift through media, skipping directly to parts of interest.
- Television is increasingly becoming an on demand experience.
- Viewers enjoy being able to customize their viewing experiences. The TiVo WishList, for example, by taking advantage of metadata already associated with programs, allows users to sort by and record every program or film by actor, director, category, keyword, or title.
- Platforms that engage the audience in activities such as voting are popular.
- Content that is "pushed" by the networks, such as the synchronized delivery of trivia, is not effective. Users prefer to "pull" desired content.

- Interactivity must be tied to original programming content in order motivate users to act.
- Web-based asynchronous applications have the disadvantage of being removed from the primary medium; however, the Web may become an alternate vehicle for on demand content in the future.
- There are a strong correlation between the popularity of a platform and its usability. The examples we have seen from Web TV and EPGs are examples of applications that are not user-friendly.
- The ability to navigate easily through an application is important. Different platforms allow for different methods of navigation. Navigation on any Web TV platform, for example, is more difficult due to constraints of the remote control.
- Platforms are converging. Devices such as the Microsoft Media Center and the Sony PSP incorporate the functionalities of many platforms into one platform. People will most likely demand all of these capabilities from their devices in the future.
- Networked platforms will allow for greater community building among TV viewers.
- What role should existing guidelines play when integrating television and PC functionalities into the same platform?
- What role will mobile devices and game consoles in the iTV experience in the future?

Successful iTV deployment must leverage the functionalities afforded by each of these platforms to its advantage. These functionalities are shaping, in part, the viewing habits of television viewers, making them more active participants who are becoming

increasingly amenable to the “lean forward” model of viewing. The effective interface and usability design of these platforms will play an important role in making these platforms as successful as possible.

CHAPTER 3

BROAD CATEGORIES OF ITV PROGRAMMING – BY PERSISTENT TV GENRES

3.1 INTRODUCTION

In chapter two, I categorized iTV programming by platforms. However, because platforms will continue to evolve and converge with the advent of faster bandwidths and new technologies, I will in this chapter categorize iTV programming by television genres and general types of programming, which offer a more stable and persistent modality for analysis.

I will be examining five genres of popular programming (sports, entertainment, reality programming, awards shows, documentaries) that have been most developed or experimented with for interactive television in the United States, as well as three genres (shopping, talk shows, dramas) that seem to offer the most potential, despite the current lack of iTV programming for these genres. For each of these genres, I will provide a representative example prototyped for or deployed in the U.S.

Clearly, different programming genres lend themselves to different forms of interactivity. The BBC identifies six types of programming that have proven successful for iTV: multistream sport, multistream factual, play-along quizzes, voting, charity donations, and entertainment. Similarly, ABC Enhanced TV, a leader of enhanced programming in the U.S., states that iTV programming works best for sports, reality, awards shows and game shows. Scott Gronmark, head of iTV at BBC New Media, predicts that "the future will be more about finding which facets of interactivity genuinely enhance each genre, and concentrating on those aspects" in order to create the most successful iTV programming (quoted in Gawlinski, 2003).

I have identified eight genres to examine in greater detail: Sports, Entertainment, Reality Programming, Awards Shows, Documentaries, Shopping, Talk Shows, and Dramas. The last three categories (shopping, talk shows, and dramas) have not been extensively developed for iTV to date, but I will discuss their potentials in this arena.

These eight genres were selected based upon three elements – depth of information, contest, and participation – that make programs within these genres particularly well suited for iTV programming; that is, effective iTV programming can leverage these basic characteristics of television programs to create more participatory, interesting, and compelling viewing experiences for consumers. Table 3.1 outlines these elements as they relate to each genre.

Table 3.1 Elements of Television Genres Conducive to iTV Programming

	Depth of Information	**Contest**	**Participation**
Sports	X	X	X
Entertainment		X	X
Reality Programming		X	X
Awards Shows		X	X
Documentaries	X		
Shopping			X
Talk Shows			X
Dramas	X		X

Depth of information refers to the sheer quantity of information that exists behind the program, much of which is typically lost during the broadcast itself. For example, a two-hour documentary must leave out hundreds of hours of extra footage, interview material, and supporting documentation. Likewise, extra footage captured from multiple cameras at sporting competitions is often lost to the viewers. An effective iTV application can make these materials available to viewers, giving them to access to greater depth of

information about the topic at hand, and offering them greater freedom to customize their viewing experiences.

The second element, contest, is an inherent element in most sporting broadcasts, game shows, and some reality shows that makes such programs highly conducive to iTV programming. Such programs are characterized by real-time contests, with game-like qualities, where the outcome is open-ended. Viewers typically rally behind favorite individuals or teams, and love to weigh in with their opinions. Producers can leverage the game-like elements of these programs and engage the audience with activities such as polling and voting.

Finally, the majority of television genres afford participation in some way. For programs with contest or game-like elements, for example, viewers are always eager to play along at home or to guess the winner. For this reason, simple iTV applications such as voting, trivia, and polling often enjoy high levels of participation. Another aspect of participation relates to convening a community. Many types of television programs enjoy a loyal following, or a community that convenes around the show. Sports, reality shows, talk shows, and dramas are good examples of such types of programs where viewers love submitting input. ITV programming can put viewers more directly in touch with the community of existing viewers loyal to the program, and "remediate" the experience of watching television alone (Bolter & Grusin, 1999). For example, an application as simple as a poll, with live and near-instantaneous feedback, allows any viewer to see how his/her opinion falls in relation to the hundreds or thousands of other viewers also watching the broadcast at that moment. Unsurprisingly, this element appears to be the most important factor related to successful iTV programming.

These three elements are clearly not mutually exclusive from one another. For example, although it is possible for a program to enjoy a loyal following without having competitive elements, programs with strong competitive elements often draw a strong community, whether for the duration of a single event or through a prolonged series of episodes. These two elements combined can then be leveraged to engineer an even more successful iTV deployment. Major sporting events, which have typically enjoyed the most success in the iTV realm, may well be so successful because they offer a great deal of information, are driven by competition, and consistently have a large, loyal fan base.

However, it is also important to note that these elements themselves do not lead naturally to successful iTV applications. Many other factors must fall into place – e.g., clean design, compelling interaction, good navigational scheme – before an iTV deployment might be successful. These three elements can only be thought of as inherent factors that make certain television genres more likely candidates for successful iTV programming.

3.2 SPORTS

Major sporting events currently comprise the most popular and successful arena for interactive television programming. ITV applications can provide multistream viewing, trivia games, polling, on-demand access to statistics and other relevant information, and allow viewers to predict plays and calls. ABC Enhanced TV currently offers or has plans to offer interactivity for events such as Monday Night Football, The Bowl Championship Series, College Football, The Indianapolis 500, and The Super Bowl. During Super Bowl XXXIV, ABC's Enhanced TV page attracted 650,000 visitors. In a subsequent survey conducted by ABC, 96 percent of viewers who visited the site

said they would do so again in the future (Swann, 2000). Similarly, Fox Sports has, for multiple seasons, added mobile enhancements to FOX Sports NFL, MLB, and NASCAR programming. FOX Sports' broadcast of the 2002 Super Bowl was the first use of mobile phones in the U.S. for iTV.

According to the BBC, multistream sports have proven to be an extremely successful arena of iTV programming. Multistream takes advantage of the fact that there are already multiple cameras filming at any given sporting event to allow users to choose from various video feeds, such as tennis games being played simultaneously on different courts, or the same game as viewed from multiple camera angles. Viewers are also able to choose from multiple streams of audio commentaries. Figure 3.1 (a) shows the iTV application for the Commonwealth Games in the U.K., where viewers can choose from three live events and two replays. Figure 3.1 (b), from the 34th Ryder Cup in the U.K., illustrates that viewers are able to choose from multiple camera feeds, such as Master, Star Match, Key Holes, and Head to Head.

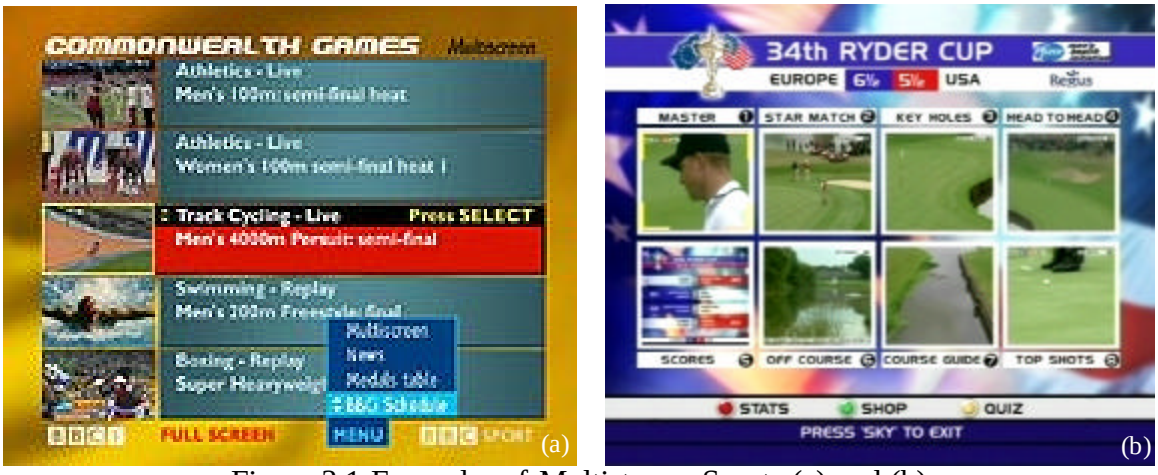


Figure 3.1 Examples of Multistream Sports (a) and (b)

In the summer of 2004, the BBC'S interactive coverage of the Olympics drew a record 6.13 million viewers who utilized the service by pressing the "red button." The interactive multistream coverage allowed an extra four sports to be watched. BBC Sport's Andrew Thompson, Head of New Media, Sports News and Development, said: "The Olympics are perfect for interactive television because there are so many events happening at the same time… Before we had interactive option, hundreds of hours of footage disappeared down a black hole. But now with interactive television they can enjoy the Games wherever and however they want" (BBC Press Release, 2004). The previous record for the BBC was during 2004's Wimbledon, when 4.1 million people utilized interactive services for one minute or more.

Thompson's remark speaks directly to the depth of information inherent to sporting events. Multistreaming is an effective iTV method for leveraging this content; not only does it provide a channel for those hundreds of hours of extra footage, but more importantly, it provides viewers with a more satisfying viewing experience by allowing them to have greater control over what they want to watch.

The competition that drives sporting events is an element that participants and spectators alike revel in. It is this element that also forms a community around each event. In the U.S., where multistreaming is not yet a common offering for iTV, much has been done to leverage the competition and community elements of sporting events for interactive television.

3.2.1 Representative Example in Sports: The 2004 Summer Olympics

Network: NBC, Bravo, and Telemundo
Platform: AT&T Wireless

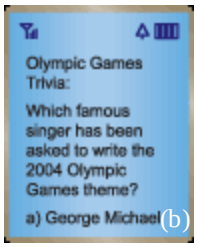


Figure 3.2 The 2004 Summer Olympics (a) and (b)

During the 2004 Olympic Games, AT&T Wireless offered a suite of mobile entertainment applications promoted on-air with NBC, Bravo and Telemundo, including trivia, polling, text alerts, and "guess the gold" games. AT&T also featured a "Highlight of the Games" application (see Figure 3.2 (a)), which ran nightly. Viewers were able to text in their choices for the greatest moment of the past day's games, and NBC displayed the audience's choices on-air. Figure 3.2 (b) shows an example of a SMS trivia question.

In addition, AT&T's "mMode Olympic Games applications" were accessible through mLogic-enabled mobile devices. Customers were able to set up customized alerts to follow their favorite Olympic sports, access videos including interviews, promotional materials, and in-game video highlights. Users were also able to set up Fantasy Olympic Games with customized Olympic teams.

3.3 ENTERTAINMENT

Entertainment programs, in particular game shows, are highly conducive to viewer interactivity because of their competitive nature. During a game show on television, iTV programming can allow viewers to play along by participating via a synchronous application on the Internet or by using a mobile device. Broadcasters can take the top iTV player scores and feed them back into the live TV broadcast in order to create a sense of community among players at home. This sense of community can be enhanced by allowing mobile players to chat with one another. Finally, a 24/7 version of the game can be made available to cultivate the community between broadcasts.

Notably, a series of iTV events utilizing IQ tests (known as *Test the Nation* in many countries), enjoyed tremendous success around the world. During the live show, participants both live in the studio and at home could take an IQ test. Viewers at home were able to participate directly through set-top boxes, using mobile phones, on the Internet, or just using pen and paper. By the end of the show, viewers could calculate their own IQ scores. The event's highest scorers, both in the studio and on the Internet, were identified. National IQ tests have been a huge success in every country they've been held, including the Netherlands, Belgium, Italy, France, the UK, Spain, Hungary, the Czech Republic, Turkey, Portugal, Norway, and New Zealand. For example, *Test Australia: The National IQ Test 2002* was the highest rating program in Australia in 2002. The German version drew over 11 million viewers, and the BBC's National IQ Test (see Figure 3.3) attracted well over nine million viewers. In the U.S., FOX's *Test the Nation* in 2003 drew over 10 million viewers. Approximately half a million people from all fifty states participated online.

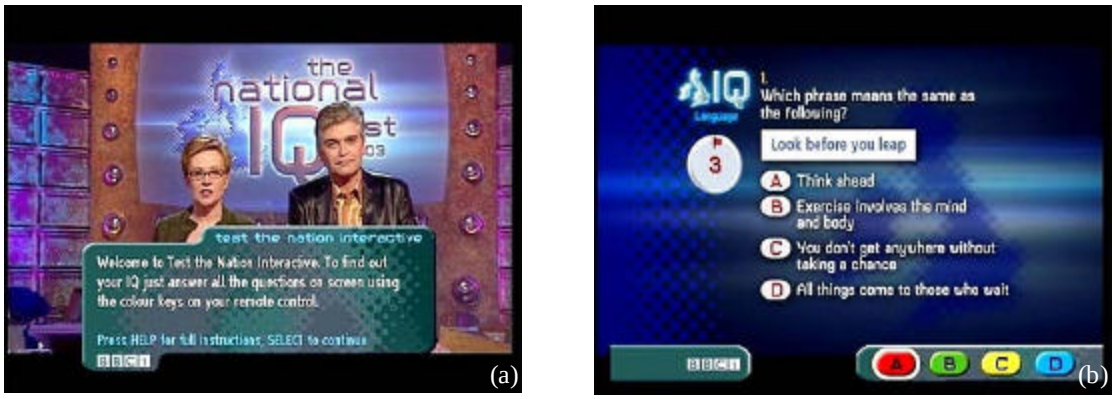


Figure 3.3 Test the Nation on BBC (a) and (b)

These *Test the Nation* events allowed viewers to calculate their own IQ tests and come away with personalized information. However, this is possible to do at any time with a paper- or Internet-based IQ test. The element that made these iTV events so compelling for viewers was the idea that they were competing live with contestants in the studio, as well as against millions of other viewers across the country. The competitive nature of the interaction model and the community it created made *Test the Nation* a successful iTV event around the world.

In the past few years, U.S.-based company Spiderdance, under the direction of Tracy Fullerton and Chris Swain, has created a series of iTV programming for game shows, including *WebRIOT* for MTV, *History IQ* for the History Channel, and the *Weakest Link* for NBC. All of these applications took advantage of the fact that viewers are increasingly using the Internet while watching television. Spiderdance's applications were synchronized two-screen interactions where quiz content was delivered via the Web along with the related broadcast on television.

ITV betting or gambling, already popular in many European markets, is another area of iTV entertainment that is beginning to emerge in the United States. European

interactive gaming revenues were expected to reach $15.4 billion in 2005 (Kingsford-Smith, 2003).

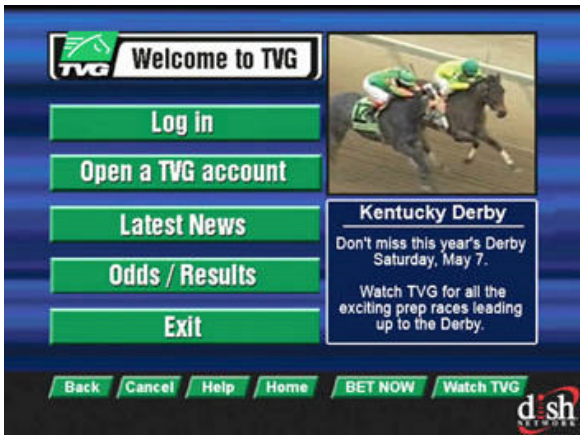


Figure 3.4 TVG Interactive

In early 2005, the Gemstar-TV Guide-owned horseracing channel, TVG Network, launched an interactive TV channel (see Figure 3.4), marking the first time that iTV gambling has been offered in the United States. Prior to launching its iTV channel, TVG's Web- and phone-based wagering services processed over $300 million in wagers in 2004, up 42% from the previous year (Swedlow, 2005c). With its new channel, TVG Interactive allows viewers to access horseracing news and results, live odds, information on probable payoffs, picks and handicapping information, and reports on race conditions. More importantly, in states where it is legal, TVG Interactive allows viewers to place pari-mutuel bets on races using their TVG wagering account and remote control (Swedlow, 2005c).

According to Tracy Swedlow, such services have already proven highly lucrative in the U.K. For example, during the second half of 2004, revenues from BSkyB's SkyBet

interactive TV betting service totaled £118 million, up £27 million from the comparable period (2005).

3.3.1 Representative Example in Entertainment: American Idol

Network: Fox
Platform: Mobile

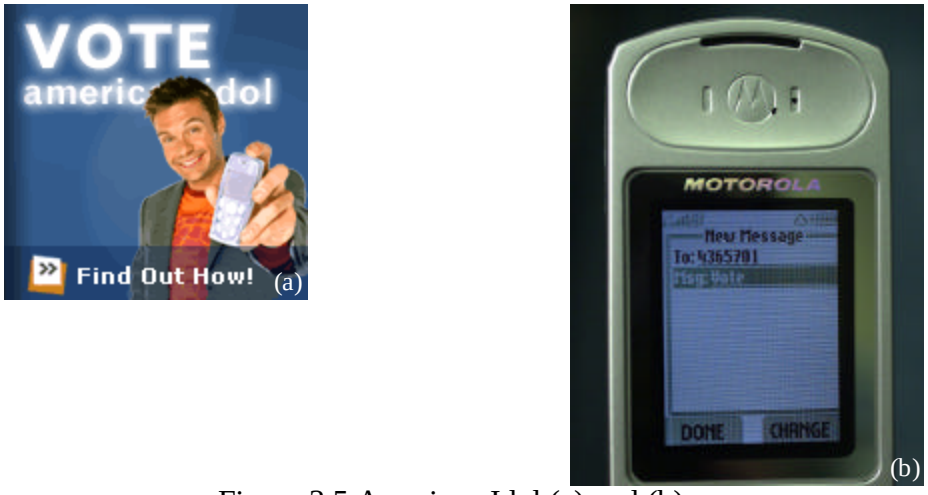


Figure 3.5 American Idol (a) and (b)

In the U.S., the most successful example of iTV programming for an entertainment program remains FOX's *American Idol*, in which viewers can vote for their favorite contestants by dialing in to a toll-free number or by sending a text message via their mobile devices (see Figure 3.5). The winner of the contest is, in fact, ultimately determined by viewer participation in the show. Though the interaction model is extraordinarily simple, the show continues to draw record numbers of people throughout its multiple seasons. As reported in chapter one, more than 7.5 million *American Idol*-related text messages were sent by AT&T Wireless customers during the 2003 season.

3.4 REALITY PROGRAMMING

Reality shows, which are engineered to be suspenseful from episode to episode, lend themselves extremely well to viewer interaction, as they typically amass a loyal audience base through the season. In many reality programs, contestants on the show are pitted against one another. Audiences have been eager to speculate, for example, which suitor the bachelor/bachelorette will eliminate next, who will be fired from the job, who will win the ultimate prize, etc. Some reality programs allow votes from viewers to determine, in part, the path of future episodes. Within this genre, ABC Enhanced TV has offered interactivity for *Super Millionaire*, *The Bachelor*, *The Bachelorette*, and *Celebrity Mole: Yucatan*, among others.

3.4.1 Representative Example for Reality Programming: Celebrity Mole: Yucatan

Network: ABC
Platform: Microsoft Media Center

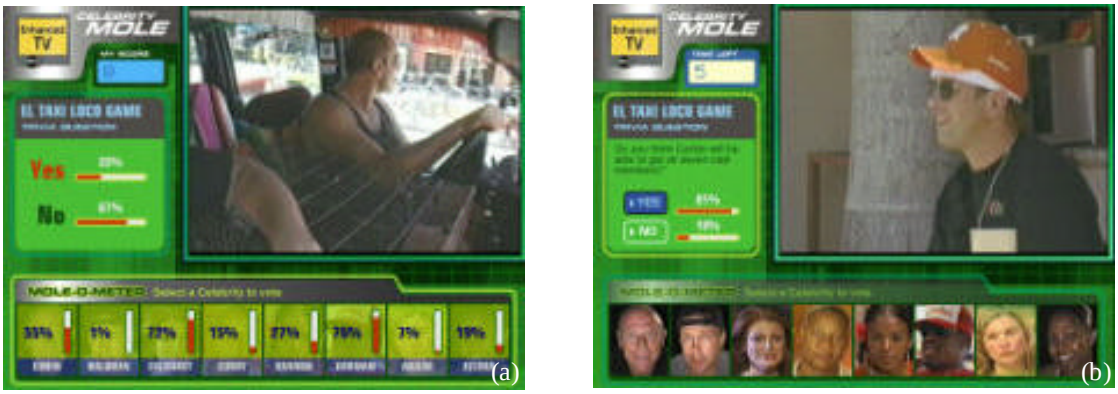


Figure 3.6 Celebrity Mole: Yucatan (a) and (b)

In 2003, ABC Enhanced TV collaborated with the AFI eTV workshop and deployed an enhanced version of *Celebrity Mole: Yucatan* (see Figure 3.6). It was the first prototype from the AFI eTV workshop to ever be deployed in the market. In addition to being available on ABC's proprietary two-screen interactive television platform, the

application was also available on the Microsoft Windows XP Media Center Edition PC, making it the first show ever to be enhanced on this platform. The application was entirely controlled with a remote, and required only an initial download and installment from ABC's eTV Web site.

Celebrity Mole: Yucatan offered a series of challenges and competitions synchronized with the broadcast. Viewers could vote on the "Mole-o-Meter" for the contestant whom they believe is the mole, and see immediate feedback on how other viewers are voting. For example, as illustrated by Figure 3.9, viewers who voted for Corbin Bernsen would see that they are among 33% of viewers who believe Corbin to be the mole. In addition, viewers could also place a bet on the most cunning contestant, and buy a "Mole Not Mole / Clue" with the accumulation of points (American Film Institute, 2003).

In 2004, The *Celebrity Mole: Yucatan* application won an Emmy for Outstanding Achievement in Interactive Television from the Academy of Television Arts and Sciences.

3.5 AWARDS SHOWS

Similar to entertainment and reality programming, awards shows are highly conducive for iTV programming because they engage the audience by allowing viewers to vote on and discuss topics such as potential winners, fashion trends, and celebrity gossip. Awards shows typically draw large numbers of viewers; the telecast of the 76th annual Academy Awards, for example, attracted 43.5 million viewers. As with other voting and polling applications, effective iTV programming within this genre can foster a sense of community among viewers of the program.

3.5.1 Representative Example: The 76th Annual Academy Awards

Network: ABC
Platform: Two-screen synchronous

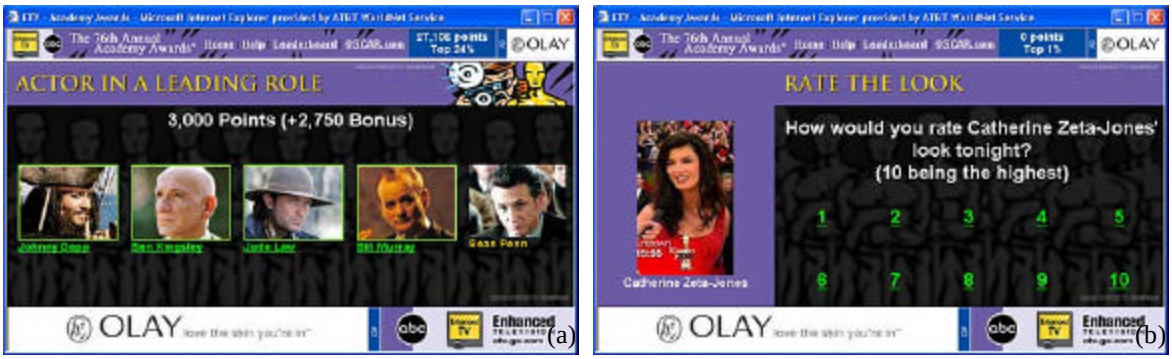


Figure 3.7 Interactive Academy Awards (a) and (b)

ABC Enhanced TV has offered interactive Academy Awards telecasts since 2002, enabling viewers to interact live on their home computers (see Figure 3.7). ITV applications included a "Guess the Winner" game (users won points for correctly guessing the winner in each award category), interactive polls (live polls that related to the on-screen action, with immediate results), trivia, user comments, and "push channel" (real-time graphics and information accompanying the broadcast). Users could see in real-time how they scored against all other players across the country on the "Leaderboard," and prizes were awarded to top scorers.

In 2002, ABC reported that over 460,000 users enjoyed Enhanced TV's coverage of the 73rd Annual Academy Awards, staying connected to the application for an average of 39 minutes. Rick Mandler, Vice President and General Manager of ABC Enhanced TV, noted that "The numerous interactive opportunities offered to viewers, including the friendly competition of the 'Guess the Winner' game, help keep those at home glued to

the ABC telecast throughout the evening" (ABC Enhanced TV Press Release, March 18, 2002).

3.6 DOCUMENTARIES

Documentaries lend themselves well to interactive programming due to the encyclopedic nature of their content. Documentaries are meant to be informative, educational, and engaging. While documentaries traditionally do attract viewers with competitive elements, nor do they draw large communities of viewers who are eager to interact in real time, the incredible depth of information available – that is, the hundreds of hours of extra footage and archival materials that would otherwise never be available to viewers – can be strategically leveraged by iTV producers to produce a more personalized and compelling viewing experience. By giving the viewer options to explore various aspects of the subject matter more deeply, he/she can play an active role in "determining how the documentary is represented and how much information is conveyed, as much as producers and directors do when filming" (Curran, 2003).

In 2001, BBC Science aired *Walking with Beasts*, a major digital animation series accessible to digital satellite, digital terrestrial, Web, broadband, and cable television viewers across the U.K. As illustrated by Figure 3.8, the iTV program allowed viewers to customize their viewing experience by selecting from different audio and video components, choosing between multiple narrators, active pop-up fact boxes, or watching synchronized picture-in-picture clips highlighting scientific evidence behind a discovery or presenting information about the making of the program itself (Curran, 2003).

Figure 3.8 Walking with Beasts Interactive (a) and (b)

In the U.S., PBS and its various affiliates have been active participants in the American Film Institute's eTV Workshop for numerous years. The workshop has generated prototypes for enhancing many documentaries, including *Woodrow Wilson* (American Experience), *Two Towns of Jasper* (POV), *Fidel Castro* (American Experience), and *Cisco's Journal* (American Family).

In particular, WGBH, the public broadcasting company that invented closed captioning in the 1970s, has looked to iTV features to build upon what its audience has come to expect from its programs. Two possibilities include multiple language offerings and content aimed at different learning levels (Pignetti & Capria, 2001). These options will allow viewers to gain a great degree of personalization over their viewing experiences.

3.6.1 Representative Example in Documentaries: Woodrow Wilson

Network: KCET / CPB
Platform: DVD / Television-ready

Though designed as an interactive DVD prototype, the *Woodrow Wilson* application is also television-ready and can be deployed on a variety of set-top box

platforms. The navigation is timeline-based, allowing viewers to browse through DVD through the history of the story (see Figure 3.9).

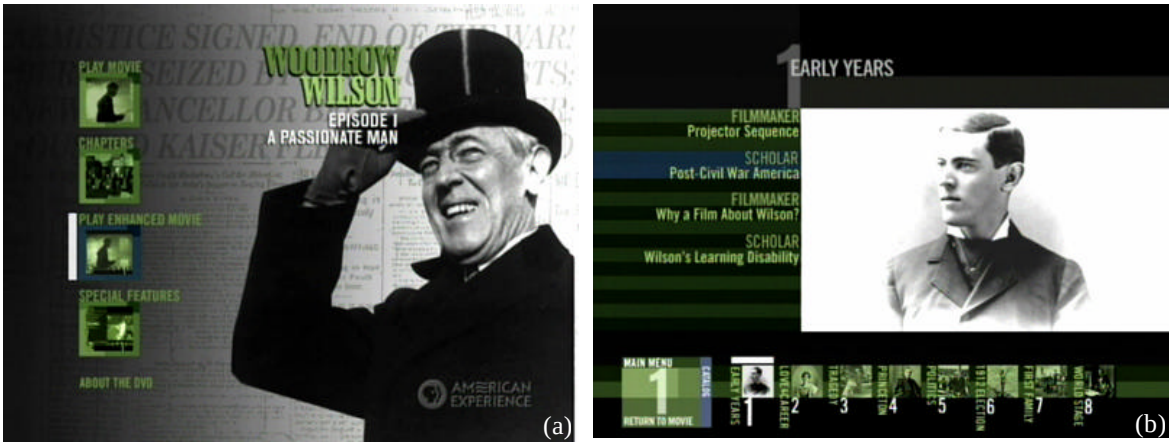


Figure 3.9 Woodrow Wilson (a) and (b)

Viewers can watch the documentary without enhancements, or watch a version that has simple graphic indicators alerting them to additional information. In these moments, viewers can pause the film and access "minidocumentaries," comments from the filmmaker, photo galleries, and biographies of key figures. *Woodrow Wilson*, designed by Dale Herigstad of Schematic, Inc., was awarded the prestigious Communication Arts Interactive Design award and a BDA Gold award for DVD Design (Schematic, 2005).

In the 2004 AFI eTV workshop, a similar application was created for American Experience's *Fidel Castro*, with the goal of providing viewers with more context surrounding the characters and events in the film (see Figure 3.10). Viewers are able to bookmark significant moments in the film in order to "unlock" and access archival materials including video footage, images, and background interviews. In addition, in order to promote community-building surrounding the documentary, a "Share Your

Views" section allows viewers to submit comments, via the application or SMS, to a series of forums on topics related to the documentary (Swedlow, 2004b). The *Fidel Castro* prototype illustrates that in addition to taking advantage of the depth of information to enhance documentaries, it is also possible to build community around topics relevant to each film.

Figure 3.10 Fidel Castro Prototype (a) and (b)

The *Fidel Castro* prototype was also forward thinking in its use of technology. In addition to the set-top box prototype, the team also conceived of a mobile application supporting the "Unlock the Archives" feature. That is, viewers were able to bookmark supplemental content by texting a keyword to a shortcode using their mobile devices. Later, when visiting the American Experience Web site, viewers could log in using their mobile phone number and access the list of links to the content they had bookmarked. Content, such as important speeches, could also be sent directly to the mobile devices after the documentary (Swedlow, 2004b).

3.7 SHOPPING

Shopping, or purchasing goods and services through the television, is also known as "t-commerce." According to Digitsoft.tv, T-Commerce is attractive to consumers because they do not need to purchase any additional equipment or learn a new technology: "The iTV experience is simple, uses the familiar remote control and potentially reaches a wider audience than the Internet… Gallup research found that 42% of respondents over the age of 50 would be interested in purchasing items via iTV although they may be uncomfortable using PC technology" (http://www.digisoft.tv). Similarly, research out of Murdoch University in Australia indicates that "it's not about how the iTV technology is technically superior or in some way safer than the Internet. It's about the social context through which iTV transactions are facilitated… people trust their TV more than the computer" (Kingsford-Smith, 2003).

Adams, Anand & Fox forecast that the following three types of t-commerce will emerge (2001):

> *Push Commerce:* Push commerce will give users special offers through commercials or programs. For instance, WebTV viewers in San Francisco were recently offered a 30% off coupon for Melissa Etheridge CDs from CDNow. This interactive ad's response rate was 22%, as compared to the typical >1% online response rate.
>
> *Enhanced Shopping Channels:* Enhanced shopping channels will give consumers the opportunity to make a purchase online. Enhanced shopping channels are expected to increase impulse buying.
>
> *Virtual Mall:* The virtual mall will give consumers access to a catalog of products that users can browse, access, and place an order in, at any time.

In 1999, twenty percent of U.S. households made purchases from a home shopping network. According to TechTrendes, 46% of U.S. consumers are interested in t-commerce, and 80% of active home shopping network users are interested in t-

commerce, among whom 27% are willing to pay a monthly fee for the service (Adams, Anand & Fox, 2001).

3.7.1 Representative Example in Shopping: HSN iTV

Network: Home Shopping Network
Platform: one-screen, Cable / Satellite

Figure 3.11 HSN iTV

The HSN iTV application, schedule to deploy in the second half of 2005, will allow viewers to use their remote controls to make purchases. As illustrated by Figure 3.11, viewers will be able to purchase the item currently being showcased on HSN's broadcast, as well as the two items that were showcased immediately before it. In addition, viewers will also be able to purchase HSN's "Today's Special" item each day, throughout the day. According to Sean Bunner, HSN's director of distribution research and ITV project manager, HSN's chief aim was to ensure that the interactive experience would be as user-friendly as possible: "The thing I'd really stress up front is that we really, really want to keep the front-end simple… While we've brainstormed and whiteboarded all sorts of cool things we plan to do in the long run with this application, ITV is still new in the US, so we want our customers to have as simple a user experience

– and as close to the regular experience of ordering from our channel – as possible" (quoted in Swedlow, 2005a).

3.8 TALK SHOWS

Talk shows, as a genre, have not been widely developed for iTV programming, although there seems to be great potential in this arena. Talk shows in general enjoy a loyal following, and audience participation – particularly in shows that are debate oriented – can be a key entrant into successful interactive programming. Successful iTV programming for talk shows can foster a sense of community among its viewers by allowing them to send questions, comments, and polling data into the TV broadcast. Viewers can also chat with other viewers, purchase featured products, or receive additional information relating to the subject at hand.

The Interactive Channel, a new 24/7 cross-media iTV cable channel in Hong Kong, features a talk show called "iTalk." According to its creator, Robert Chua, iTV-enabled talk shows are "appropriate for any country, because what it does is simply ensure that a talk show is topical and driven by the interests of the audience, whatever those might be" (quoted in Swedlow, 2005b). As illustrated by Figure 3.12, iTalk allows viewers to text in their questions, chat in the chat-room section of the screen, or call in with their videophone or 3G cellular phone and have their picture displayed on the television screen as they interact with the show's host and guests. Internet users can also text in messages to the chat room and appear on TV using their Webcams. Real-time voting allows the audience and the hosts to know instantly where the votes are going for the discussion subject (Swedlow, 2005b).

Figure 3.12 iTalk on The Interactive Channel

The rise of the political talk show genre on cable TV during the mid-1990s cleverly tapped into populist political rhetoric through an emphasis on interactive technologies. The prominent display of viewer faxes and e-mails and remote video conferences provided a new relationship to the audience as well as a more vivid presentational style (Rose, 2003). As we see from the example below, these tactics still work.

3.8.1 Representative Example in Talk Shows: CNN Crossfire Interactive

Network: CNN
Platform: Two-screen synchronous

Figure 3.13 CNN Crossfire

CNN Crossfire, broadcast in front of a life audience, is a now-cancelled debate show that examines the political and social issues impacting the United States. In May 2004, CNN launched *Crossfire Interactive*, a 6-week synch-to-broadcast initiative (see Figure 3.13). Viewers were able to interact with the show hosts by visiting the CNN Web site during the broadcast. The iTV application featured trivia and background facts, such as additional information on the topics being discussed and the people discussing them. More importantly, viewers were able to declare political affiliations, so that opinion poll results, which were tabulated in real-time, were reported along partisan lines. This tactic is particularly well suited for a political debate show, and tapped into an important feature of the show while convening an audience.

3.9 DRAMAS

Dramas as a genre have not been widely developed for iTV programming. RespondTV's Rebecca Stefanac notes that "Dramas are probably the least friendly type of program for iTV. People really just want to submit to the narrative and don't generally want a lot of background or commentary" (quoted in Pignetti & Capria, 2001). However, few programs possess more long-term loyal viewing communities than dramatic series, and effective iTV programming can allow dramatic programs to extend the broadcast beyond the hour of showing each week.

A notable application in this genre is *C.S.I. Interactive*, developed by H Design for the Microsoft iTV platform. H Design had the unique opportunity to conceptualize the feature set and framework for the iTV component and to write, produce, and design original interactive content for the entire first season. According to Curran, "Much of the content in the application is presented to the viewer in a carefully choreographed manner

that enhances the story line of the show by providing, for example, a sense of place, explanations of forensic techniques shown, or detail shots of scenes for closer observation. Viewers can view additional content like cast-member bios, maps of locations around Las Vegas, information on specific forensic techniques and terminology, and synopses of previous episodes. Viewers can also participate in the investigative process by answering questions presented in the lower part of the screen" (2003). Figure 3.14 provides examples of the *C.S.I. Interactive* application.

3.9.1 Representative Example in Dramas: C.S.I. Interactive

Network: CBS
Platform: Microsoft iTV

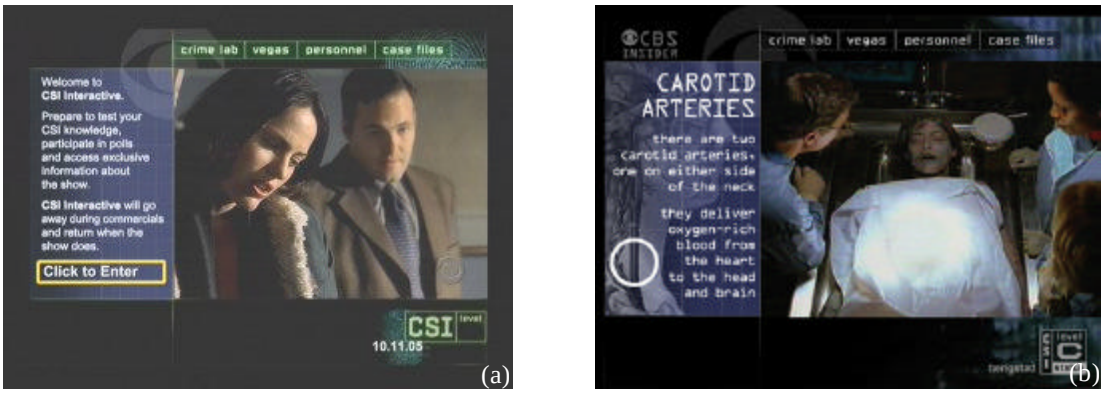


Figure 3.14 C.S.I. Interactive (a) and (b)

Examples of features from *CSI Interactive* include a "lingering pictorial remnant" of an interesting detail that was shown too quickly in the regular episode, such as a fingerprint; "multiple camera view," where the audience can view a scene from other angles or from the perspective of other characters; and "eye editorial," where viewers can choose what they want to look at, processing the story in a different way (MIT Communications Forum, 2004).

Dramas may need to operate under a different model of interactivity. Many viewers may resist interactivity during the first viewing of a fast-paced drama, for example, but they may be more willing to access enhancements during a repeat. In this model, perhaps interactivity can breathe new life into syndicated content. Herigstad, who designed *C.S.I. Interactive*, agrees: "The model for what we are doing is extended media. We think that most of the people who watch *C.S.I. Interactive* would have already seen the regular broadcast, and wanted to deepen their experience of it" (MIT Communications Forum, 2004).

Not all dramas are enhanced effectively, however. In 2004, the producers of NBC's *Law & Order: Criminal Intent* decided to implement an interactive component allowing viewers to vote to save or kill one of its running characters, a first for network television. Viewers were to decide whether the character Nicole Wallace, an adversary of the show's Detective Robert Goren, would live beyond the fourth episode of the show's fourth season. Two versions of the ending were shown: viewers in the Eastern time zone saw one ending, while those in the Central, Mountain and Pacific time zones saw the other. Both endings were available to viewers on the NBC Web site. Following the broadcast, viewers were able to visit NBC online to vote on which ending they prefer, and the results were broadcast the following week.

According to Janet Murray, as quoted in the *New York Times*, "They're putting the viewer in the role of the executioner… In some way, that violates the premise of the series: How do we live together as a society, while containing antisocial impulses? Allowing the viewers to vote completely undermines the 'order' part of 'Law & Order.'" (Carr & Gross, 2004).

3.10 CONCLUSIONS

Unlike platforms that continually evolve and converge based on technological advancements, television genres have existed for decades and offer a more stable modality for analysis. In fact, as noted by Gronmark earlier in this chapter, the success of future iTV programming will depend upon finding those aspects of interactivity that appropriately enhance each genre.

Depth of information, contest, and participation are three elements inherent to many genres of television programs that make them particularly well poised to take advantage of what iTV can offer. Many of the observations arising from the examples presented in this chapter are key contributors to the principles that are laid out in chapter five. I offer some observations and questions arising out of thinking about television genres abstractly in application to successful iTV programming:

- Programs with a high depth of information can benefit from iTV as a vehicle to meaningfully deliver the additional content. The use of multiple camera angles and audio streams for sports and documentaries are examples of effective applications.
- Viewers enjoy the ability to customize their viewing experiences, as evident by the success of multistream sports offerings around the world.
- Programs with an element of contest allow viewers to experience a greater sense of agency, of even being a player in the game itself.
- The simplest of interaction models, such as voting, polling, and trivia often garner the highest levels of audience participation. These methods work by tapping into the contest and participatory aspects of the programs.

- The participatory aspect of many programs can be harnessed by iTV to convene existing communities or to create new viewing communities surrounding programs.
- Not all programs are effectively enhanced. The *C.S.I. Interactive* provides a good example in that enhancements must be intimately tied to the primary video content in order to be compelling for users.

Successful iTV programming must leverage the depth of information, contest, and participatory elements inherent to television programs to its advantage. ITV applications can extend the life and range of programs beyond their airing time, draw audiences by enabling participation, communication, and fostering the growth of viewing communities surrounding each program.

CHAPTER 4

EXISTING DESIGN STANDARDS AND CHALLENGES

4.1 INTRODUCTION

Many design standards currently exist for television and the Web, the two base platforms for interactive television. While new potential platforms such as 3G mobile devices and the Sony PSP are beginning to enter into the market, bringing with them new sets of design issues, the vast majority of iTV applications are intended for output onto either a television screen or a computer monitor. It is important, therefore, to understand existing design standards for these two mediums.

It is clear that effective cross-platform or convergent design will be essential for successful iTV programming in the future. The television and the Web each afford very different types of user experiences, and designs created for television rarely translate directly to a compelling or functional experience on the Web, and vice versa. By briefly surveying common design problems and existing standards for television and the Web, I examine the ways in which we might adapt these guidelines, and make recommendations based upon the functional differences between the two mediums, in order to contribute toward the establishment of the best set of guidelines for iTV design.

I begin with some basic elements that are applicable to principles of good design in general, regardless of whether the target is a television screen or computer monitor. Subsequent sections will expand on the different standards for each of the two mediums in greater detail.

4.1.1 Grid-Based Design

Grid-based design is essential to the development of effective information systems. Grids are the backbone to any effective visually-perceived design, regardless of the medium, as they help to promote consistency and predictability, two essential elements of any well-designed system (Lynch & Horton, 2002). According to Jute, "the primary purpose of the grid is to create order out of chaos. The grid helps the consumer to find material in the expected place every time… This primary purpose holds true even with projects which tend by their very nature toward disintegration. Thus it forces the designer to think constructively, and in a structured manner" (1996). He goes on to outline the three practical purposes grids serve:

- *Repeatability.* Repeatability is achieved by using one or more of the application tools of the grid to make similar pages in multi-page designs look the same, or to give multiple single designs a unity of appearance, or to give a multiplicity of designs for varying purposes a "corporate identity" for a single organization… Many people value the benefit to readers of finding material in the expected place every time so highly that they would consider repeatability the chief ornament of the communication function of the grid.
- *Composition*. The grid incorporates the compositional wisdom of the ages into a format that is rigid in aspects where flexibility would be disastrous, and flexible in varying degrees precisely as required for matters where you must apply initiative and taste.
- *Communication*. The purpose of graphic design is to communicate the message. Period. Positive communicative aspects of the grid are that readers can: rely on finding given elements in the same place; rely on the designer to guide them to

important elements via compositional and type variation plus the disposition of space.

Source: Jute, 1996.

Design grids that are used for well-produced print media are equally important in computer or television layouts, and the same principles outlined here apply regardless of the platform. It is worthwhile to note that in recent years, two different layout conventions – overlays and the embedded "L design," used most effectively by Dale Herigstad, have emerged in the realm of iTV interface design. The merits of these design layouts for iTV will be discussed in detail in chapter five. In general, however, iTV interaction designers should keep in mind that constructing an effective and consistent grid makes an iTV application both functional and aesthetic: it can aid a design by helping to communicate an intended message, script user interactions, create and maintain a brand identity if desired, and be user-friendly, promoting consistency and predictability within the system.

4.1.2 Gestalt Laws

The Gestalt laws apply to patterns in human visual perception. The Gestalt approach, formed at the beginning of the 20th century, emphasizes that we perceive objects as well-organized patterns rather than discrete parts. The psychologists who formulated the Gestalt laws understood them to be principles that have universal validity (Thissen, 2004). We can extrapolate these laws to the realm of interaction design, where they certainly have relevance to the design process:

- *The Law of Proximity.* Elements that are close to each other spatially are perceived as belonging together. Group the elements that belong together close to each other.

- *The Law of Similarity.* Elements that look like each other are perceived by human cognition as belonging together. Mark elements that belong together so that they are similar visually.
- *The Law of Symmetry.* Elements that are arranged symmetrically to each other as interpreted as a unit. Symmetrical arrangements create strong structures; asymmetrical arrangements cause the elements to be lost on the screen.
- *The Law of Good Continuity.* Visual elements that are arranged in a certain continuity (for example, along a line) are perceived as belonging together. Arrange elements that belong together along a line.
- *The Law of Simplicity.* Visual perception tends toward a simple and consistent organization of elements. Simple and self-contained structures stand out better from their background. Provide structures that are as simple as possible.
- *The Law of Experience*. Visual perception always goes back to already existing experiences and automatically completes patterns that are incomplete.

  Source: Thissen, 2004.

Taking note of these general principles and applying them appropriately in the design process can help interaction designers create interactive TV systems that are not only aesthetically pleasing, but more effective in functionality as well. The Gestalt laws can be applied strategically in graphic interfaces – whether on a television screen, a computer monitor, or a PDA screen – to guide users by creating appropriate mental models or patterns, and to direct and focus attention upon specific elements of interest or importance.

4.1.3 Color

Donald Norman, author of *Emotional Design: Why We Love (or Hate) Everyday Things,* notes that "positive affect makes people more tolerant of minor difficulties and more flexible and creative in finding solutions. Products designed for more relaxed, pleasant occasions can enhance their usability through pleasant, aesthetic design. Aesthetics matter: attractive things work better" (2002).

Colors play an important role in both aesthetics and functionality; in addition to playing a role in orientation, structure, and clarifying differences between visual elements, they can also facilitate access to information. Colors are frequently perceived unconsciously, and they always trigger emotions. There are three primary influences on our subjective perception of color: biological (e.g., we have more sensory cells for the colors red and green than for blue), cultural (e.g., black embodies death and evil in western culture, rebirth and resurrection in Egypt, and understanding in Hebrew culture), and individual (e.g., we all have our preferences and aversions for specific colors). So-called cold colors (e.g., green, blue) have an unobtrusive and low-key effect. They are very suitable as background colors and provide a quiet and unobtrusive framework. Warm colors (e.g., red, orange) have a cheerful and activating effect. They are quite dominant and loud, and should be used selectively (Thissen, 2004).

In addition, literature in the field indicates that extroversion is predominantly associated with high color contrasts, saturated hues, and bold or sharp-edged shapes. By contrast, introversion is often related to de-saturated colors, green hues, and thin or round shapes (Karsvall, 1992).

Interaction designers should keep these types of color perception in mind when designing iTV applications. Using colors selectively not only help to make an interface

more visually pleasing, but can help to orient users and provide better structure to the application.

4.1.4 Viewing Patterns

Effective page design maps a viewer's route through information with visual cues. Our left-to-right, top-to-bottom reading culture influences how viewers perceive a screen in terms of what they look at first and subsequent eye movements. For example, as illustrated by Figure 4.1, when viewing Web pages on a computer monitor, viewers' eye movements begin in the upper left-hand corner and gradually move to the lower- and upper-right hand corner of the screen; as illustrated by Figure 4.1, this typical page-scanning pattern form a "Z" shape (Ruel & Outing, 2004; Sevilla, 2002).

Similarly, research indicates that viewers scan television screens from the upper left-hand corner down to the lower right-hand side. Due to reading habits, this behavior is stronger with text heavy iTV applications than with conventional broadcast television (British Broadcasting Corporation, 2002). Figure 4.2 depicts the basic layout of a standard BBC interactive application interface; the arrow indicates how the page directs the viewer's eye.

Figure 4.1 Typical Page Scanning "Z" Pattern

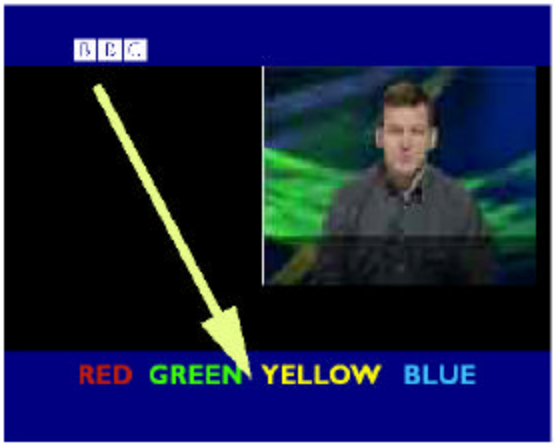


Figure 4.2 BBCi Viewing Pattern

The basic design elements discussed in this section, grids, color, and the Gestalt laws, are all relevant to the overall screen interface; each of these factors, in turn, play a role in directing the viewer's eye movements across the screen. Understanding how these design elements function can allow interaction designers to create applications that guide the user's attention and script their interactions appropriately.

4.2 DESIGNING FOR TELEVISION

4.2.1 Aspect Ratios

Two aspect ratios are in common use for television: 4:3 (standard) and 16:9 (widescreen). In addition to standard American television (NTSC), applications that use the 4:3 ratio include standard DVDs, console and computer video games, computer presentations, and VHS tapes. The 16:9 ratio is used for HDTV broadcasts, widescreen DVDs, and select console and computer video games with special adaptors. Figure 4.3 illustrates the difference between the two aspect ratios.

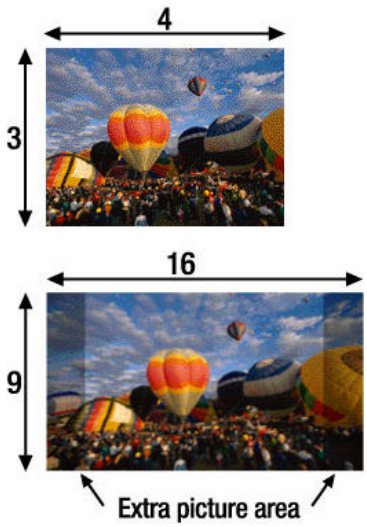


Figure 4.3 TV Aspect Ratios

Although there have been about 14 different broadcast standards in use at different times throughout the world, the National Television Standards Committee (NTSC) is the basic system that serves the U.S. today. The 4:3 aspect ratio, which was adopted by the Society of Motion Picture Engineers as the first film industry aspect ratio standard, was also adopted by the television industry in 1941 when the NTSC proposed standards for television broadcasting (Cringely, 1998).

In the 1950s Hollywood began to experiment with widescreen formats. The 16:9 ratio was developed in the 1980s using a formula that took into account all the common cinematic aspect ratios, and it is currently the most common theatre screen aspect ratio in use. The 16:9 standard was then adopted by those responsible for developing HDTV in the U.S. and worldwide. Widescreen movie formats and HDTV screens are formatted to more closely approximate the way humans see, as our field of vision is more rectangular than it is square: “when we view movies in widescreen format, the image fills more of our field of vision and has a stronger visual impact” (Cringely, 1998).

In designing for television, going from a 4:3 aspect ratio to a 16:9 aspect ratio will stretch the image without losing any information. However, when going from 16:9 to a 4:3 screen, the image is either cropped at the edges (center cut-out), or the entire image is shrunk by 25%, with black bars on the top and bottom of the image (letterboxing). Figure 4.4 illustrates the difference between these two methods.

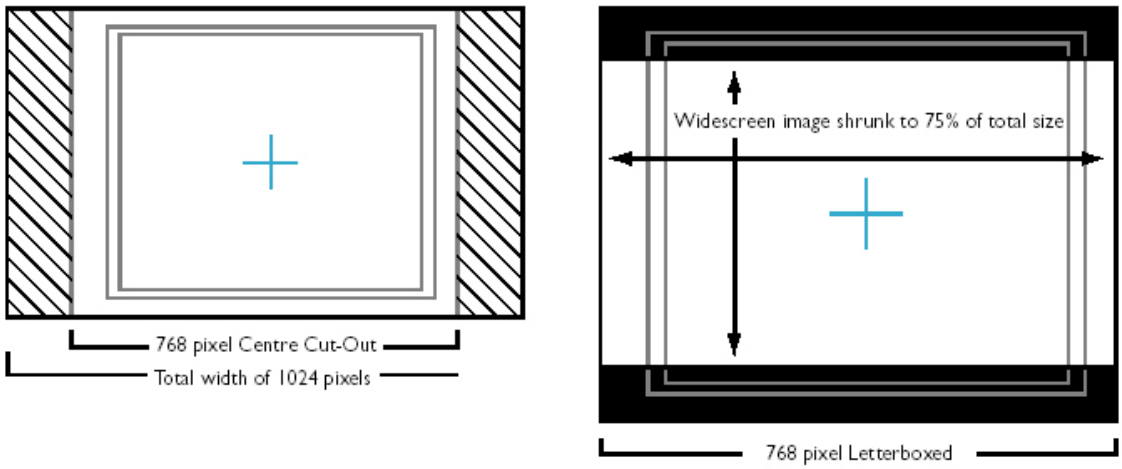


Figure 4.4 Center Cut-Out and Letterboxing

The BBC recommends that it is best to design for 4:3 because it will always display on both standard and widescreen TV sets (2002). However, since the 16:9 aspect ratio is the preferred format for the new HDTV standard, and since ownership of widescreen TVs is increasing, it makes increasing sense to design interfaces for the latest generation of televisions as well.

4.2.2 Safe Areas

Most televisions, especially older models, cut off the outer edges of the video screen. Therefore, any media that falls outside of the "action safe" area of the screen may be cut off. The safe areas for standard television are 10% graphics-safe and 5% action-safe around the entire perimeter (Baker, 1999). Figures 4.5 and 4.6 illustrate the action-

and graphics-safe areas for designing for the 16:9 HDTV standards, as well for optimizing output for the standard 4:3 ratio.

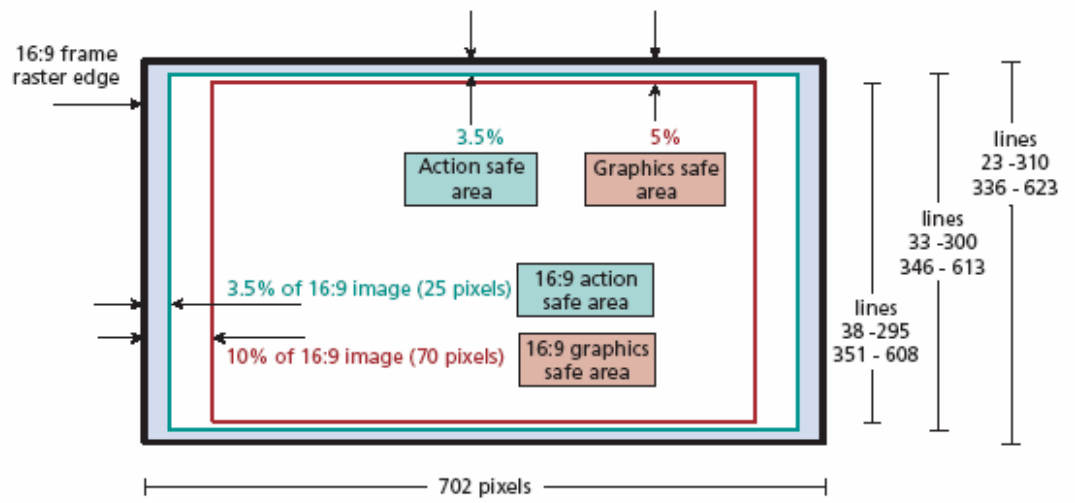


Figure 4.5 16:9 Full Image, Defining the Action- and Graphics-Safe Areas

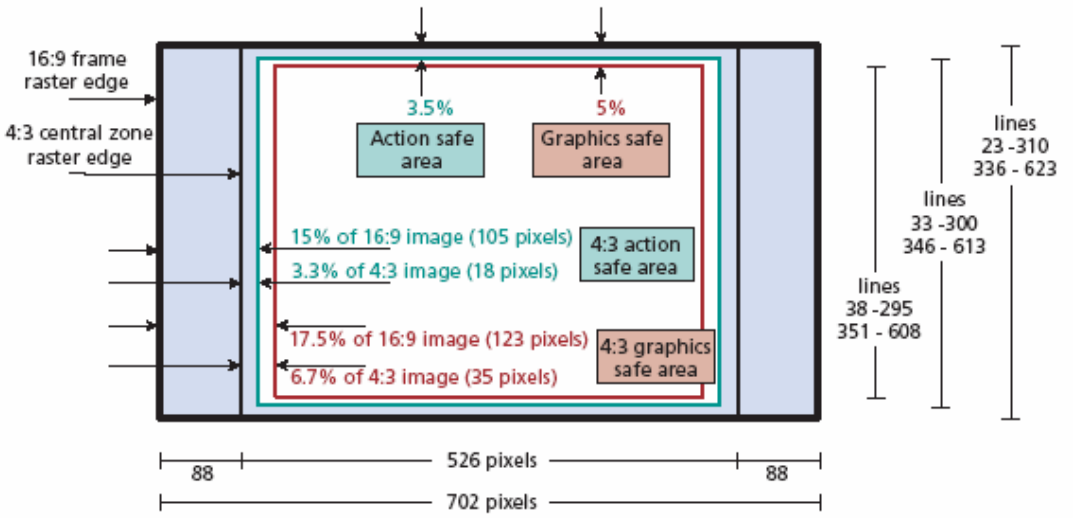


Figure 4.6 16:9 Shoot to Protect 4:3, Defining the Action- and Graphics-Safe Areas

Two main design considerations are important to keep in mind when designing for the 16:9 aspect ratio. Both the left- and right-hand edges of the screen will be cut off

on any television set where the image is cropped to 4:3. Therefore, these areas should contain only background information. All navigation and relevant iTV components must be kept in the center cut-out safe zone. Also, the entire application may be shrunk to 75% of its original size to fit in a letterbox format on a 4:3 set. In this case, any text on the screen must be large enough to remain legible (Baker, 1999).

4.2.3 Resolution

The maximum resolution of NTSC television sets is 720 x 486 pixels (compared with computer monitors, which are 800 x 600 pixels or better). HDTV, on the other hand, can have a resolution of up to 1920 x 1080 pixels. In addition, whereas the NTSC format uses rectangular pixels, the HDTV format is composed of smaller, square pixels, resulting in a noticeably crisper image. Figure 4.7 illustrates that a single pixel on a NTSC TV is about four and half times larger than a pixel on HDTV (Cringely, 1998).

Figure 4.7 Comparison of NTSC vs. HDTV Pixels

More importantly, because most computer monitors also use square pixels, HDTV is more compatible with computers in terms of design and image distortion.

To compensate for the distortion that occurs when the same image appears horizontally stretched on an NTSC compared to a television screen due to the difference in pixel size, design work on a computer should be done on a file that is 768 x 576 pixels. This dimension is optically correct for a 4:3 aspect ratio (British Broadcasting Corporation, 2002).

4.2.4 Line Width

The image on a television screen is composed of interlaced odd and even scanlines. The NTSC's 525 line, 30 frames per second system is used in the United States. NTSC interlaced video draws alternating top and bottom lines for each frame of video. To reduce interlace flicker, designs for TV-safe graphics should be no less than 2 or 3 pixels wide ("Television Guidelines," 2004). Also, it is best to avoid detail, since images with fine details will blur and television viewers won't be able to see them properly.

4.2.5 Color

In general, television screens have a more limited overall gamut and a much higher gamma value than computer monitors, resulting in displays that are higher in both contrast and saturation. When designing applications on a computer to be displayed on a television screen, the BBC recommends that images be toned down and desaturated. Large, clearly defined regions of cool, desaturated colors work best for television (2002).

To avoid color-associated distortion effects such as blooming, tearing, chroma-crawl, bleeding, interlace flicker, smearing of colors, and moiré patterns, NTSC graphics must not be too bright, too dark, or too saturated; the maximum saturation brightness in the color palette should be 85% ("Television Guidelines," 2004).

NTSC video supports a luma range of 16 to 235. Bright, saturated reds and yellows will bleed on NTSC monitors, and sharp color transitions will create unwanted artifacts at the boundaries where they meet. One way to avoid most potential problems is to keep all RGB values between 16 and 235. Additionally, some graphics programs such as Adobe Photoshop contain NTSC safe settings (Buehler, 2003)

Tom Buehler provides a helpful tutorial on making computer graphics NTSC compliant, and addresses issues related to luma values, color values, lines and edges, as well as safe zones (2003).

4.2.6 Typography

Text poses difficult challenges on television screens, as viewers are not accustomed to reading static blocks of text on screen. Other contributing factors include poor display quality of still images, the difficulty of rendering detail at low screen resolutions, color bleeding, and interlacing flicker. At the same time, the relatively large text size required for legibility on a television screen makes it difficult for designers to create effective screen layouts.

As a general rule, fonts must be used with care. Very light weights or fonts with very narrow and broad strokes should be avoided. It is a good idea to use simply constructed sans-serif fonts and use anti-aliasing to increase readability (Quesenbery & Reichart, 1996). Anti-aliasing, also known as smoothing, is a technique of blending bitmap-based images and text to reduce the jagged appearance of aliased text. The process of anti-aliasing blends the edge pixels in areas of transition to give the text a smoother looking appearance.

BBC interactive television services use Tiresias, a typeface specifically developed for television in conjunction with the Royal National Institute of the Blind, and adopted as a standard by the UK Digital Television Group as the resident font for interactive television (http://www.tiresias.org/fonts/design_report_sf.htm). This alphabet displays well at small sizes, and functions when stretched or squashed by televisions attempting to compensate for 4:3 or 16:9 ratios. Careful attention has also been paid to character

shapes, to make similar letters distinctive and to help with the characters most commonly misread by the visually impaired (British Broadcasting Corporation, 2002).

The following helpful guidelines for typography are from the BBCi Style Guide:

- Body text should not generally be smaller than 24 point
- No text should ever be smaller than 18 point in any circumstance
- Light text on a dark background is slightly easier to read on screen
- Text on screen needs looser leading (greater line spacing) than in print
- When technically possible, tracking should be increased by up to 30%
- A full screen of text should contain a rough maximum of 90 words
- Text should be broken into small chunks that can be read almost instantaneously
- Minimum text sizes still apply to graphical text. 24 point should be the general standard; 18 point the absolute minimum
- No more than two typefaces should ever be used at once on screen.

4.2.7 Digital Television

Making digital television a reality requires the cooperation of a variety of industries and companies, along with the development of many new technical and production standards. A wide variety of international organizations have contributed to the standardization of digital TV. Most standards organizations create formal standards by using specific processes: organizing ideas, discussing the approach, developing draft standards, voting on all or certain aspects of the standards, and then formally releasing the completed standard to the general public (O'Driscoll, 5). Some of the best-known international organizations that are contributing to the standardization of digital television include:

Advanced Television Systems Committee [ATSC] (http://www.atsc.org/)

Digital Video Broadcasting Project [DVB] (http://www.dvb.org)

CableLabs (http://www.cablelabs.com)

World Wide Web Consortium [W3C] (http://www.w3.org)

Federal Communications Commission [FCC] (http://www.fcc.gov)

Digital Audio Visual Council [DAVIC] (http://www.davic.org)

European Cable Communications Association [ECCA] (http://www.ecca.be)

European Telecommunications Standards Institute [ETSI] (http://www.etsi.org)

Additional information about the work that each of these organizations have carried out in this arena is available from their respective Web sites.

4.2.8 ATVEF and OCAP

The two primary organizations shaping iTV technological standards in the U.S. are the Advanced Television Enhancement Forum (ATVEF) and CableLabs' OpenCable project. ATVEF is a non-profit coalition of broadcast, cable, PC, and consumer electronics companies formed to promote interactive television standards and deployment. ATVEF defines the standards used to create content that can be delivered over analog and digital television broadcasts, and a variety of networks, including terrestrial broadcast, cable, and satellite. The ATVEF 1.0 Content Specification requires support for HTML 4.0, JavaScript 1.1, Cascading Style Sheets (CSS 1), and MIME extensions. Possible directions for future content levels include Dynamic HTML, synchronized multimedia, 3-D rendering, tuning, XML, Java, and higher-quality audio (Pignetti & Capria, 2001; ETV Cookbook, 2003a).

CableLabs' OpenCable project is an interoperability initiative supported by more than 400 cable television companies, software technology companies, and hardware manufacturers. The OpenCable Applications Platform (OCAP) is CableLabs' middleware

specification. OCAP is intended to enable the developers of iTV services and applications to design products so that they will run successfully on any cable television system in North America, independent of set-top or television receiver hardware or operating system software choices. The OCAP 1.0 specification was released in December 2001, and OCAP 2.0 in April 2002. Both are available from the CableLabs Web site (http://www.opencable.com/specifications/).

4.2.9 Additional Resources

The information presented here on television design standards represents an overview only. Additional resources can be found with the following resources:

NTSC (http://www.ntsc-tv.com)

Worldwide TV Standards - A Web Guide

(http://www.ee.surrey.ac.uk/Contrib/WorldTV)

World Television Standards and DTV/HDTV

(http://www.cybercollege.com/tvp009.htm)

TV and HDTV Glossary (http://www.crutchfieldadvisor.com/ISEO-rgbtcspd/learningcenter/home/tv_glossary.html)

4.3 DESIGNING FOR THE WEB

A wealth of resources exist for interface design for the Web. The second edition of the Web Style Guide, available in print or online (http://www.webstyleguide.com), provides a thorough guide to design issues within this medium. In this section I will summarize some of the most important factors specific to the Web to keep in mind, from both a design and usability perspective, and provide some resources for additional information.

4.3.1 HTML

Hypertext Markup Language (HTML) is the standard page-description language used on the World Wide Web. As previously mentioned, the ATVEF 1.0 Content Specification currently requires support for HTML 4.0, in addition to other Web elements including JavaScript 1.1, Cascading Style Sheets (CSS 1), and MIME extensions. Some resources on HTML include:

HyperText Markup Language (HTML) Home Page
(http://www.w3.org/MarkUp/)

HTML 4.01 Specification (http://www.w3.org/TR/REC-html40)

A Beginner's Guide to HTML
(http://archive.ncsa.uiuc.edu/General/Internet/WWW/HTMLPrimerAll.html)

4.3.2 Resolution

As previously mentioned, computer monitors typically have a display resolution of 800 x 600 pixels better (whereas the maximum resolution of NTSC television sets is 720 x 486 pixels, and HDTV 1920 x 1080 pixels).

Most computer monitors display about 72 to 80 pixels per inch (ppi) of the screen. Images created for the Web are always limited by the resolution of the monitor. For example, a square GIF graphic of 72 x 72 pixels will be approximately one inch square on a 72ppi display monitor. When creating graphics for the Web, designers should always use the 1:1 display ratio, where one pixel in the image equals one pixel on the screen (Lynch & Horton, 2002).

4.3.3 Graphic Safe Areas

The safe area for Web page graphics is determined by two factors: the minimum screen size in common use (800 x 600 pixels) and the width of paper used to print Web

pages. Web applications that exceed 800 pixels will inconvenience and frustrate many users: "It's bad enough to have to scroll in one (vertical) direction; having to scroll in two directions is intolerable" (Lynch & Horton, 2002).

The graphic safe area dimensions for applications designed for an 800 x 600 screen is 760 x 410 pixels, in order to ensure visibility without scrolling. The graphic safe area dimensions for Web applications designed to print well are 560 x 410 pixels. Figure 4.8 illustrates the graphic safe areas for Web applications.

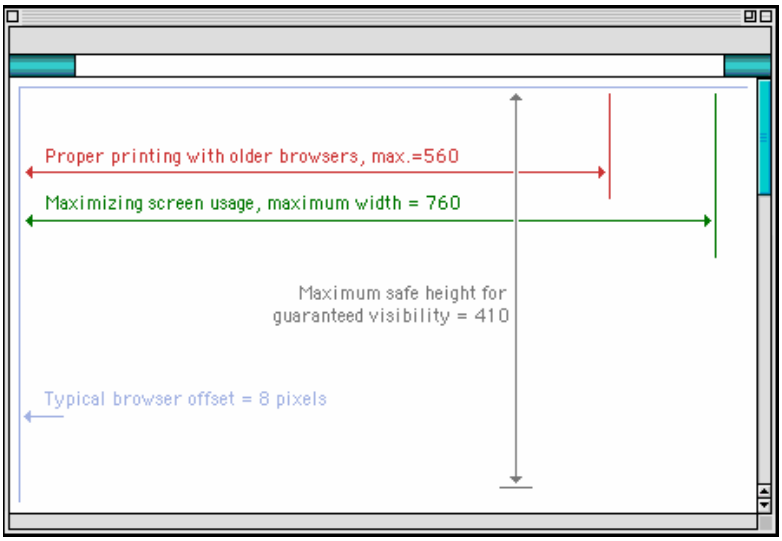


Figure 4.8 Graphic Safe Areas for Web Applications

4.3.4 Color

As we discussed earlier, colors appear less vividly on computer monitors than they do on television screens. When designing iTV applications that will be output onto a computer monitor, it is best to use Web-safe colors. The color management system currently used by Web browsers is based on an 8-bit, 216-color palette, which is identical in both the Macintosh and Windows system palettes (Lynch & Horton, 2002).

Most graphics programs such as Photoshop have Web-safe color palettes built in, which ensure cross-platform consistency. Additional guidelines for designing for the Web include: make the ratio between text and background on a Web page high in contrast; keep backgrounds low contrast and simple to reduce visual noise; do not use pure red or blue text on white backgrounds to avoid chromatic aberration; do not use highly saturated colors together; and finally, for accessibility reasons, make sure that the message can still be clearly transmitted without color at all (Human Factors International, 2001).

4.3.5 Typography

Typography does not pose as much of a design issues for Web-based applications as it does for television, since users are used to reading and scrolling through text on the computer. The "lean forward," or two-foot interface, also makes this activity easier. Human Factors International provides the following typography design guidelines for ensuring maximum legibility and accessibility in Web-based environments:

- Use 10 point or larger for all text
- Black text on white background is most legible
- Don't over-emphasize. Make bold or larger text size, not both
- Avoid italics
- Set leading 3-4 points larger than type size
- Align left, rag right. The eye anchors on the vertical line of the left margin, makes reading easier
- Avoid all capital letters for running text. It slows reading 14-20%
- Use ALT tags
- Anti-alias large type, but not small

Source: Human Factors International, 2001.

4.3.6 Video

The ability to deliver video over the Web is a key component to iTV experiences based on a PC platform such as the Microsoft Media Center. However, video is the most challenging content to deliver via the Web, as one second of uncompressed NTSC requires approximately 27 megabytes of disk storage space (Lynch & Horton, 2002).

The Moving Pictures Expert Group [MPEG] (http://www.chiariglione.org/mpeg) has defined a range of different video compression standards for different purposes. The MPEG standards are all about interoperability. In particular, MPEG4 is a standard designed especially for Internet streaming and synchronized multimedia. According to Bouthillier, MPEG4 is a "container for all kinds of media objects (images, text, video, animation, interactive elements like buttons and imagemaps, etc) and a way to choreograph them into a synchronized, interactive presentation" (2004). Therefore, MPEG4 is particularly useful for iTV applications that provide synchronous content such as timed overlays and on-screen prompts.

The MPEG4 standard is designed to work well across a range of bandwidths. MPEG4 also defines standard ways to represent virtually any unit of sound, video, or multimedia content – called "media objects" – which can be recorded with a camera or created by a computer. These objects can then be manipulated in a variety of ways by the broadcaster or the viewer (Gawlinski, 2003).

4.3.7 World Wide Web Consortium (W3C)

The W3C (http://www.w3.org) is a consortium that produces standards for the World Wide Web. The W3C develops interoperable technologies (specifications, guidelines, software, and tools) with the goal of leading the Web to its full potential.

4.3.8 Additional Resources

The information presented here on interface design standards for the Web represents an overview only. Additional information can be found with the following resources:

Web Style Guide (http://www.webstyleguide.com)

Apple Software Design Guidelines (http://developer.apple.com/documentation/MacOSX/Conceptual/AppleSWDesign/Introduction/chapter_1_section_1.html)

Macintosh Human Interface Guidelines, by Inc. Apple Computer

Microsoft Windows User Experience, by Microsoft Corporation

4.4 DIFFERENT MEDIA, DIFFERENT STRENGTHS

In this section I have surveyed many of the technical design issues for both television and Web. Table 4.1 outlines usability expert Jakob Nielsen's comparison of the user experience between television and the computers along a number of dimensions.

Nielsen's assessments speak to a number of key differences between the two mediums, such as the "lean forward" model of using a computer versus the "lean back" model of watching television. However, these and other boundaries are beginning to blur. For example, people no longer limit televisions to living areas and computers to work areas. Not only do people have computers in the same room as televisions, they are actively using them at the same time. As we have seen, two-screen synchronized applications such as TNT Interactive have attempted to take advantage of this growing trend. Moreover, the fact that more and more computers are networked means that

working on a computer is not a solitary activity, but one that is capable of convening an active community around an iTV program.

Table 4.1 Televisions versus Computers

	Television	**Computers**
Screen resolution (amount of information displayed)	Relatively poor	Varies from medium-sized screens to potentially very large screens
Input devices	Remote control and optional wireless keyboard that are best for small amounts of input and user actions	Mouse and keyboard sitting on desk in fixed positions leading to fast homing time for hands
Viewing distance	Many feet	A few inches
User posture	Relaxed, reclined	Upright, straight
Room	Living room, bedroom (ambiance and tradition implies relaxation)	Home office (paperwork, tax returns, etc., close by; ambiance implies work)
Integration opportunities with other things on the same device	Various broadcast shows	Productivity applications, user's personal data, user's work data
Number of users	Social: Many people can see screen (often, several people will be in the room when the TV is on)	Solitary: Few people can see the screen (user is usually alone while computing)
User engagement	Passive: The viewer receives whatever the network executives decide to put on	Active: User issues commands and the computer obeys

More importantly, with increasing exposure to interactive programming, and with increasingly access to PVRs and VOD systems, television viewers are slowly moving away from the passive model of watching whatever the network executives decide to air into a more active model where they are able to exert a great deal of control over what they watch and when they watch it.

Of course, the convergence of television and the Web, each with its established set of design guidelines, brings with it a host of new and complex design issues. As Janet Murray writes, "Format and genre conventions are a changing, open-ended system," and within such systems it will always be problematic to identify guidelines for action:

> The convergence of multiple forms of representation in the single digital medium means the collision of formats and genres. A web page with a box of digital video pasted into it is both page and screen, displayed upon a larger screen. The page is one kind of format, the screen another. The movie screen is different in aspect ratio from the television screen, and both are different from the computer. The page of a magazine is different from the page of a book or a newspaper… Each of these sets of conventions has their own paradigms, and when all of them are brought together we have an increase of potentially expressive elements but a conflict of conventions (forthcoming).

The activity of accessing the Web from a television set is a very different type of interaction from access via a computer. On the other hand, the experience of watching and interacting with video content on a computer monitor is also very different from that of viewing on a television set. A comparison between MSN TV and Microsoft Media Center is an effective way to highlight some of these design challenges.

4.5 CASE STUDY: MSN TV VS. MICROSOFT MEDIA CENTER

Microsoft has experimented with both sides of the TV / Web convergence. A number of lessons about incorporating television and Web functionalities into one platform can be gleaned from studying the different ways in which MSN TV and the Media Center PC are successful and the ways in which they are not.

4.5.1 MSN TV

Microsoft bought WebTV in 1997 for $425 million and re-branded it MSN TV (http://www.webtv.com/pc). MSN TV's developer site (http://developer.msntv.com/) includes standards on using HTML, CSS, Javascript, iTV, color, Flash, and streaming

media, among others. Figure 4.9 provides examples of iTV applications on the Web TV and MSN TV 2 platforms.

Figure 4.9 Examples of Web TV and MSN TV2 (a), (b), (c), (d), (e), and (f)

Usability expert Jakob Nielsen offers a very thorough review of WebTV from a usability standpoint (1997). Although Microsoft has since upgraded to MSN TV 2, many of the problems from Nielsen's 1997 analysis persist. I summarize here a few of the key design issues that Nielsen points out:

- *Remote control:* The need for a simple remote control ultimately dooms WebTV as a highly usable Web experience. No matter how well designed, it is simply too awkward to use cursor keys to move around the screen instead of using a mouse or other direct pointing device.
- *Wireless keyboard:* Supposed to be an optional device, but the system is almost useless without it. There is an on-screen keyboard that can be operated by the remote control, but it is extremely painful to tap out even short URLs by moving cursor keys up-right-left-down.
- *Screen size:* WebTV has a small screen that shows a very limited amount of information compared with a traditional computer screen. This is particularly true given the need for WebTV to use large fonts because of the poor display quality of NTSC televisions and the typical viewing distance between the TV set and the user's couch. In addition, WebTV's small screen size creates problems with excessive scrolling, users getting lost within a single page, and difficulties scrolling back to the top of the page.

Ultimately, however, Nielsen concludes that "WebTV achieves a very high level of usability given its design constraints. Unfortunately, the constraints are so severe that even this great design ultimately fails to provide an optimal Web user experience" (1997).

MSN TV 2, which Microsoft rolled out in late 2004, features high-speed Internet connections and home networking and messaging capabilities in addition to functioning as a basic TV-based Web and email terminal. Matthew Fordahl, an Associated Press technology writer, notes that the onscreen display is well designed. The general interface, as well as the email and instant messaging components, are all user-friendly and easy to use from a distance. However, the Web browsing aspect of MSN TV 2 is still a hit-or-miss experience. Awkward scrolling, as noted by Nielsen in 1997, remains an issue to this day, as is difficulty in navigating through the application using the remote (Fordahl notes that a touchpad, trackball, or other mouse-like device would have made it easier). Finally, due to the relatively poor resolution on NTSC screens, video quality on external Web sites and within the MSN TV 2 service was acceptable only when the clips didn't show a lot of action (Fordahl, 2004).

4.5.2 Microsoft Media Center

The Microsoft Media Center system is meant to serve consumers as a cataloging and access system for all home media, including television, home videos, pictures, and music. The newest version, MCE 2005, has full DVR capabilities; the system allows users to watch and record TV on a personal PC as well as to share digital media files such as photographs, music, and video with the other screens and TVs in the household. According to Windows eHome Division General Manager Joe Belfiore, while almost 50% of all Media Center buyers are using the machines in their dens, studies, or home offices, 27% are using the machines in their living rooms, and 23% are using them in bedrooms (Thurrott, 2004). These numbers are striking and truly speak to consumers' growing acceptance of converging entertainment technologies. Figure 4.10 provides examples of iTV functionalities on the MCE 2005.

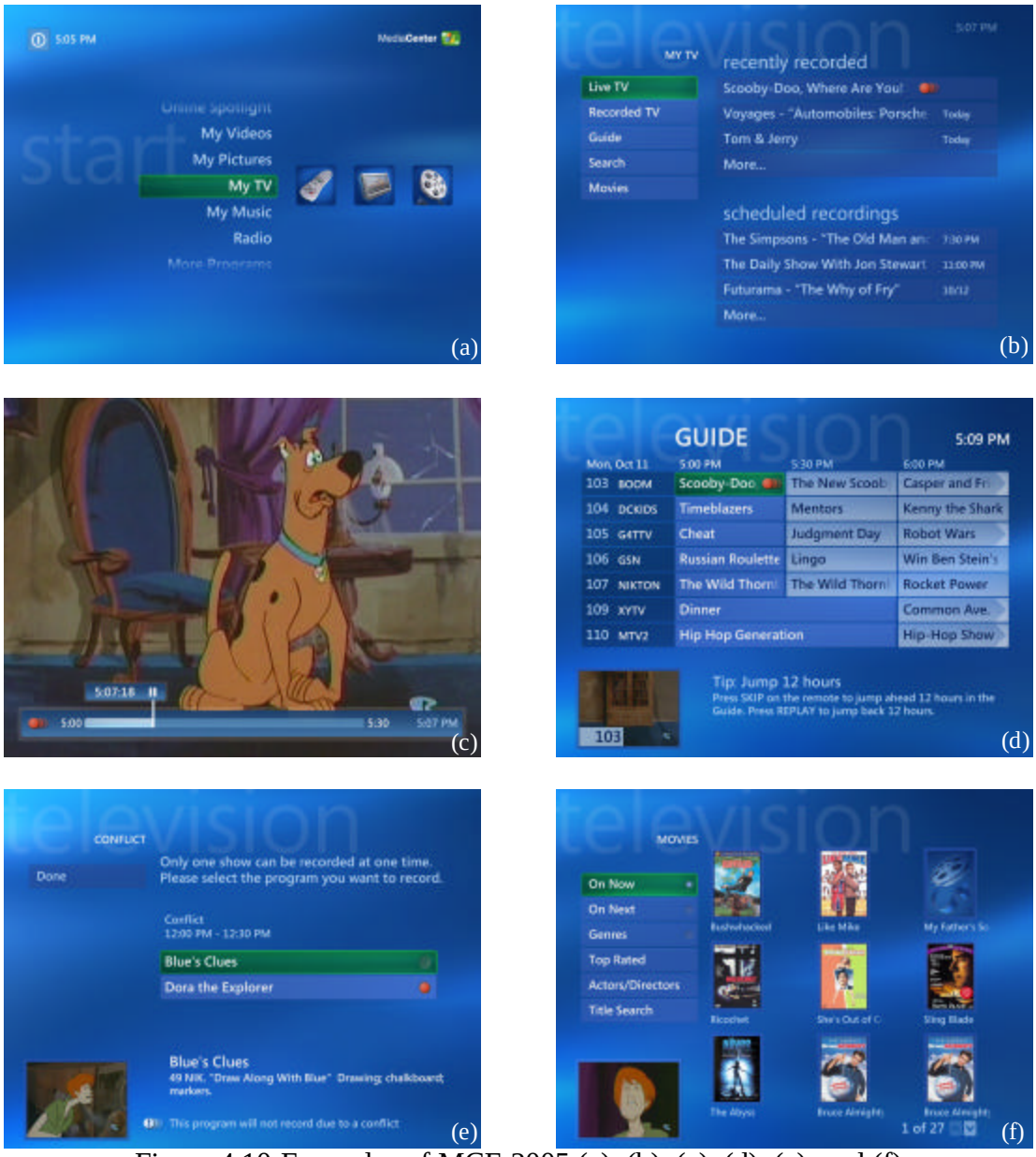


Figure 4.10 Examples of MCE 2005 (a), (b), (c), (d), (e), and (f)

In the newest version of MCE, Microsoft has put the most significant effort into improving the TV and DVR experiences. Belfiore noted that "As far as we're concerned, TV watching is the new mission critical application for Windows" (quoted in Thurrott, 2004). In fact, MCE 2005 refines what Microsoft calls the "10-foot interface," with large fonts and easy to read on-screen menus hooked up to a television that can be navigated

with a handheld remote control from across the room. This contrasts with the traditional "2-foot interface," where the user sits at a desk in front of a monitor and keyboard. Users can use a wireless keyboard and mouse, but generally don't have to, except to surf the Web from the couch or to clear the occasional error message.

The "My TV" button will display an inset displaying the current channel the user is watching, plus buttons for selecting an EPG, a program search function, and a list of the last three shows recorded. If a TV is the primary or only display, the user can select a high-contrast background. Many users find this useful because the default blue-on-blue text of the first MCE interface was difficult to read on TV sets (Thurrott, 2004).

The EPG (which, unlike subscription-based DVR services like TiVo and RePlay, is free) allows users to filter the cable guide to show just sports or movies, for example. Similarly, a listing of separate recorded episodes of the same program can be collapsed into a single listing, which can greatly help to reduce scrolling. In addition, users can search movies based on genres, rating, actors and directors, or by title, allowing for a sense of control over the viewing experience. Multiple tuner support allows users to watch a live TV show while recording another program simultaneously (Thurrott, 2004).

One of the ongoing concerns about watching television on the computer had been picture quality. Belfiore admits that "the display hardware and the drivers have to be of high quality… the truth is, no one was really connecting PCs to TVs in high volume until we released Media Center" (quoted in Thurrott, 2004). MCE, however, starting with the 2004 edition, features a display calibration wizard, a series of videos that users can watch while setting aspects such as screen centering and sizing, aspect ratio, contrast, brightness, and color balance. However, Matthew Elliott, a reviewer from CNET, says

that while "MCE 2005 is second to none as a desktop DVR app… poor image quality on large screens stops us from recommending that you ditch your TiVo" (2004).

Dale Herigstad, who designed the *Queer Eye for the Straight Guy* prototype for the 2004 AFI eTV Workshop on this platform, says that he particularly enjoys designing for the Media Center because "it allows the same data, pictures, movies and other things you'd find on a Web site to be reconfigured and presented in a more TV-like experience. So it's almost like a new medium that's not the Web but that uses elements of the Web" (quoted in Swedlow, 2004b).

4.6 CONVERGENT DESIGN CONSIDERATIONS FOR ITV

As television and the Web continues to converge, Bolter and Grusin observe that "Convergence is remediation under another name, and the remediation is mutual: the Internet refashions television even as television refashions the Internet" (1999). However, the process of remediation exposes the need for new design considerations in this realm. A service that has been designed for one medium then transferred directly to another, particularly between two platforms that offer such different affordances, is not likely to be very successful.

The conflict of conventions encountered during this convergence has social and psychological roots, as well, as people have different responses to different communication technologies: "the mere labeling of a technology as a 'computer' or a 'television' can have very strong effects on users' perceptions of content, equipment, as well as their own feelings and memory for content" (Kernal, 1999).

Table 4.2 outlines some of the different user experience issues, based on cultural practices and social conventions, that emerge for iTV applications when they are deployed on a television versus on a computer system.

Table 4.2 ITV on Televisions versus Computers

iTV on the Television	**iTV on the Computer**
10 foot interface	2 foot interface
Battles the passive, "lean back" stereotype	Active, "lean forward" – users are already used to being active on this platform
Attention not fixed – people like to do other activities while watching TV	Fixed attention
Social activity – even more so with networked set-top boxes	Traditionally solitary activity, but increasingly with networked computers
Used in the living room, bedroom	Used increasingly in living areas, especially with laptops
Navigation is difficult with remote control	Navigation is easy with mouse
Text input is difficult with remote control; awkward with wireless keyboard	Text input is easy with keyboard
Scrolling is difficult and annoying to users	Users are used to the scrolling convention
Legibility is an issue with text and details in graphics	2 foot interface allows for easy reading and more detailed interfaces
TV viewers are not used to Web-like elements on this platform	Web users are used to video elements on the computer

The key barrier to successful adoption of iTV on the television platform seems to be that people are not used to browsing the Web, or navigating Web-like functionalities, on the computer; moreover, the remote control device and often poorly design navigational structures in iTV applications make this process difficult and frustrating for users. It is a difficult design issue because the remote control does not afford the free-ranging movement of the mouse. Likewise, navigating to and selecting hotlinks is easier

with a mouse than with a remote control, where users must often click through numerous elements before reaching the desired link. As we have seen from the case study, the primary usability concern for MSN TV 2 remains the difficulty of Web browsing, including legibility issues and excessive scrolling, a convention that users are used to on the computer but find annoying on television. According to Mark Gawlinski, the solution for layout and readability problems with the Internet on television is to ask Web site operators to design alternate, television-friendly versions of their sites (2003). Of course, most companies today are not yet prepared to spend the time or money to go through this effort.

As evidenced by Table 4.2, there appear to be fewer issues with the adoption of iTV on the computer platform. This platform seems to be more conducive to successful iTV adoption because users are already accustomed to the active, "lean forward" model of interaction. Navigational concerns are negligible because the mouse affords relative ease of movement. More importantly, while television must struggle with the adoption of Web-like elements, the majority of Internet users are already accustomed to accessing video content on the Web. Streaming video has been available on the Web for a long time, and this model is not an alien one to most users. From the case study, it does appear that the MCE 2005 is more user-friendly, and more readily adopted by consumers, than the MSN TV 2 service.

4.7 CONCLUSIONS

In this chapter I have surveyed the existing standards for designing for the television and for the Web, and explored some of the challenges arising from convergent iTV design. In general, for iTV applications that are targeted at TV output, interaction

should be designed with the television experience in mind, while applications targeted at computer output should be designed with the Web experience in mind.

Summarizing the analysis from this chapter, some key points and design recommendations include:

- TVs and computers have many display differences. When designing for either medium, pay attention to canvas size, aspect ratio, action or graphic safe areas, resolution, cropping, pixel shape, and scan rate.
- The NTSC TV display is different from standard computer VGA, requiring different color palettes and use of different fonts.
- Avoid highly saturated and very bright colors. In a graphics program, use NTSC safe settings and Web-safe palettes.
- Large, clearly defined regions of cool, desaturated colors work best for television.
- Choose appropriate fonts and type sizes for television and the Web. For example, on the television, avoid light weights or fonts with very narrow and broad strokes. Use simply constructed sans-serif fonts and use anti-aliasing to increase readability. If an application may be shrunk from a 16:9 ratio to fit a 4:3 ratio, use text that is still large enough to be legible after shrinking.
- Use design elements such as color, typography, and layout to guide users' attention and script their interactions appropriately.
- To compensate for the distortion that occurs when the same image appears horizontally stretched on an NTSC compared to a computer screen due to the difference in pixel size, design work on a computer should be done on a file that is 768 x 576 pixels.

- Avoid detail when designing for an NTSC screen.
- When designing content on a computer that will be displayed on a television screen, test work on a variety of television screens.

Because difficulty of navigation is a key issue for iTV applications to be used on the television platform, it deserves some special attention. As we discussed, the use of a remote control restricts the navigational model to a single dimension at a time (up-down or left-right), in contrast to the free-ranging navigation control afforded by a mouse: "Instead of being a single action, pointing turns into a sequence of actions that have to be planned and monitored with a much larger degree of cognitive load than when using a mouse" (Nielsen, 1997). In addition, computer screens usually have a cursor to visually indicate the user's location on the screen; on TVs, cursors are difficult to locate due to poor resolution, so a different model may be necessary. As a result, iTV interfaces for the television should be designed to be as simple to navigate as possible. Mark Gawlinski offers several helpful recommendations for designing for navigation on a television screen:

- Make on-screen selectors prominent
- Use short text instructions on the screen explaining what viewers need to do (do not put this in the help section)
- Important parts of the on-screen navigation should be logically positioned
- Avoid abstract icons
- Navigating using number keys can work well
- Minimize the number of key presses required
- Anticipate the viewer's next selection when they are navigating between pages and pre-set the selector box or highlighter in that position for them

- Pages that appear in series, one after the other, are likely to be more familiar to viewers than scrolling pages
- Avoid PC or internet navigation devices like drop-down menus
- Avoid having too many planes of navigation

Source: Gawlinski, 2003.

4.7.1 Future Design Challenges

In the next generation of iTV design, convergence – both in terms of functionality and actual devices – will be the key trend. For example, MCE 2005 already combines many of the platform functionalities I describe in chapter two into a single platform. In the near future, there will likely be three primary screens on which iTV applications will reside: HDTV television screens, computer monitors, and mobile devices. Moreover, in order to reach the as many users as possible, each application will most likely have a version that is accessible on all three platforms. Many of the most recent prototypes at the AFI eTV Workshop, produced for entertainment, reality, and even documentary genres, have incorporated mobile enhancements into their designs. ITV interaction will need to be designed so that they offer a consistent experience but translate well to all three platforms. This means, at the outset, designing for a 16:9 ratio, a 4:3 ratio, and a host of miscellaneous ratios depending on the target mobile devices.

To date, there are no design specifications in place for mobile platforms. Mobile devices such as 3G cellular phones and the Sony PSP have very different affordances from the television and the Web, and have a different model of interaction altogether. For example, instead of a ten foot or even two foot interface, mobile devices have a one foot interface. More importantly, the portability of these devices will enable users to access iTV content away from their homes or any other stationary places. Wireless networking

will allow these users to share files, communicate with one another, and to form communities surrounding iTV programs and events. What are the ways in which iTV applications can deliver compelling content to users who are away from home, on the road, whose interactions will most likely take place in short sporadic intervals? These new possibilities and questions point to the necessity of thinking about interactivity in a different framework. Interactivity will become a key component to the design of iTV programs from the conception stage, not as an afterthought or as a retrofitted application. More than ever, it means that producers and designers must view the converging mediums as a means to transform the experience of watching television.

CHAPTER 5

PRINCIPLES OF INTERACTION DESIGN FOR ITV: SYNTHESIZING THE INVESTIGATION

5.1 INTRODUCTION

Having completed a survey of the interactive television arena, including platforms, programming for persistent television genres, and some existing design guidelines and challenges, we now turn to the formulation of interaction design principles for iTV. The survey conducted thus far has already touched upon many relevant interaction design issues; I will be drawing upon them in part to inform the principles presented in this chapter.

5.1.1 Inventing the Medium

The study of interaction design for converging digital media is tackling new ground. Janet Murray notes in *Inventing the Medium: A Principled Approach to Interactive Design* that "digital designers may come from traditions that approach design as a remaking of familiar artifacts; but digital design is often more like invention than adaptation. Digital design is often a process of inventing the equivalent of the world's first toaster, of looking at bread and fire and being the first to imagine the possibilities of toast" (forthcoming). Consumers are no longer limited to the experience of watching analog television from the sofa or surfing Web sites in front of a computer; successful iTV design and programming will transform and "remediate" the very ways we watch television and will generate new possibilities of interaction and community building between networks and worldwide audiences (Bolter & Grusin, 1999).

As we have seen, current guidelines that inform design in this new arena are specific to analog television and Web applications. The expressive digital medium,

however, is a new medium "in its own right" (Murray, forthcoming). How do we create guidelines for future platforms and compelling iTV programming that motivate viewers to "lean forward"? To do so, we must take a step back and invent the medium itself. What exactly are the affordances of this new medium, what potential does it hold for television programming, and what new possibilities for viewers? Taking a look at the medium in abstract will be useful prior to defining design principles in greater specificity.

5.1.2 Defining Properties of the Digital Medium

Janet Murray, in *Hamlet on the Holodeck* (1997), identifies four essential properties of digital environments. I briefly summarize each of these properties, and discuss how they relate to iTV, respectively:

- *Procedural.* The procedural property refers to patterns of rule-based behavior. The digital medium is intrinsically procedural: computers are designed "not to carry static information but to embody complex, contingent behaviors." This property has been used very little so far in the iTV realm.
- *Participatory.* The participatory property refers to patterns of participation. "Procedural environments are appealing to us not just because they exhibit rule-generated behavior but because we can induce the behavior." This property has been taken advantage of mostly in game shows and in applications that allow viewers to select and customize their viewing experiences. As we have seen, participatory activities can also lead to the convocation of a viewing community.
- *Spatial.* The spatial property refers to patterns of navigation and boundary definition. "The new digital environments are characterized by their power to represent navigable space. Linear media such as book and films can portray space… but only digital environments can present space that we can move

through… The computer's spatial quality is created by the interactive process of navigation." The spatial property has been experimented with in projects such as the *Battlestar Galactica* and Sony Surf Space prototypes, where navigation literally occurs in a 3-dimensional space. However, the ability to navigate through an iTV space by allowing viewers to select from multiple points of view on the same event (e.g., multistream sports), can also be considered a spatial property.

- *Encyclopedic.* The encyclopedic property refers to patterns of segmentation, categorization, and agglomeration. Information storage and retrieval capabilities are ever increasing, and "just as important as this huge capacity of electronic media is the encyclopedic expectation they induce." The encyclopedic property is highly relevant to iTV. It has been exploited by DVRs and in iTV applications that take advantage of the depth of information inherent to programs such as sports, educational, and documentary programs in order to offer viewers the ability to customize their viewing experiences.

According to Murray, interactivity is best achieved by maximizing the procedural and participatory properties. In turn, experiences of immersion are successfully achieved by maximizing the encyclopedic and spatial aspects of the digital medium. I will be referring to these properties of digital environments as they pertain to iTV interaction design throughout my analysis.

5.1.3 Functional Affordances of Digital Television

The digital technologies that propel iTV offer many new functional affordances that increase participation and possibilities that were impossible in the days of analog television. I present here an overview of some of these general properties. It will be

useful for iTV designers and producers to fully leverage these attributes when creating new interactive experiences for the viewer.

- *Multiple streams of audio / video* – Viewers are able to choose and shift between multiple camera views or audio commentaries. For example, this is frequently utilized by the BBC for major sporting or concert events.
- *Time shifting* – Viewers can watch and record video and audio streams, pause live television, record to play back later, and skip through commercials.
- *Navigation within a program* – Viewers can jump back and forth to pre-determined spots within a program.
- *Multiple access paths* – Information can be accessed in more than one way.
- *Two-way networking* – Viewers are able to interface with and send information back to the networks. For example, poll results can be instantaneously tallied and displayed on screen. Networking also allows members of the viewing community itself to be in touch with one another.
- *Nonlinearity* – Broadcasts are no longer limited to delivery in a linear manner, as with analog television.
- *Customizability* – Viewers have more control than ever over their viewing experience.

The affordances outlined here serve as a general framework for thinking about the potentials of the digital medium and how they might be utilized to promote successful iTV programming.

5.1.4 New Conventions Emerge

It is clear that new conventions will need to be established for interaction design for interactive television to fully take advantage of the functional affordances of the new

medium. The current state of this emergent medium reflects the period of experimentation that each new medium of expressive communication must go through:

> In 1455, Gutenberg invented the printing press – but not the book as we know it. Books printed before 1501 are called incunabula; the word is derived from the Latin for swaddling clothes and is used to indicate that these books are the work of a technology still in its infancy. It took fifty years of experimentation and more to establish such conventions as legible typefaces and proof sheet corrections; page number and paragraphing; and title pages, prefaces, and chapter divisions, which together made the published book a coherent means of communication (Murray, 1997).

Similarly, interactive television is still a medium in its infancy. It will take a period of experimentation before we develop conventions familiar to us all. These new conventions will develop to encode the affordances of the digital medium and will make the ways in which we interact with our television programming more meaningful, engaging, and compelling.

5.1.5 Interaction Design for ITV

Today, the study of interaction design is emerging from the foundations of human-computer interaction (HCI) and industrial design – with a dedicated focus on user-centered design. Murray specifies that the design process "must simultaneously take into account how the human being is acting, how the computer is acting, and how the actions of one are made readable to the other" (forthcoming). In other words, the actions of the viewer and the machine are closely linked; designers must take into account that components relevant to the interaction process such as content, navigation, and the user's understanding of his/her actions cannot exist independently of one another.

Designing effective interactive television experiences is a challenge for interaction designers. In order to effectively approach the design challenges, I use a combination of visual culture and usability methodologies. The visual culture aspect addresses the experience of watching television as a cultural one, and is primarily

pertinent to the interface design of a system. The usability perspective is concerned with the navigation of the system. Theory will be based on well-known texts in the two fields. From visual culture, I will be referencing primarily Kevin Mullet & Darrell Sano's *Designing Visual Interfaces: Communication Oriented Techniques* (1994). From the usability perspective, I will be drawing from the works of renowned usability specialists Donald Norman and Jakob Nielsen. Finally, I will also incorporate relevant techniques from existing Web and television design standards.

I have separated interaction design concerns for interactive television into three areas to be explored in greater detail – interaction model, interface, and navigation – and will address common design concerns in each case respectively.

- *Interaction Model.* What is the basic model of interaction behind the iTV program or application? For example, how is the interactivity conceived? What type of interaction does it allow? How does the interaction change the audience's viewing experience? The interaction model must take into account the content of the television program, its genre, and the context in which the interactivity is being conceived. The interaction model is derived from the TV genre and platform affordances; the principles that apply here transcend any show in particular.
- *Interface.* Interface refers to the visual look of the design on the television, computer screen, or mobile device. A visual culture approach is the best way to examine this area. For example, are the elements on the screen too cluttered? Do the colors work well together? How approachable is the design for unfamiliar users?
- *Navigation.* Navigation refers to the way users actually move through an iTV application. Is it with a remote, a mouse, or both? How easy is it to navigate

through the different elements offered, or to follow along a specified path? How easy is it for users to exit the program? As interface is explored from a visual culture perspective, navigation will be explored from a usability perspective. Within environments of increased functionality, maintaining usability should be a key design goal for interaction designers.

The principles presented in this chapter are necessarily generalized because they must be robust enough to apply across a range of design situations. They are not strict rules or guidelines, but are rather observations gleaned from examining existing designs in abstraction, "the process by which the essential qualities of the thing being represented are separated from the actual physical object or event. By removing superficial or idiosyncratic details, the designer helps the viewer see the formal qualities that tie the representation to its object" (Mullet & Sano, 1994). Whenever possible, I will also identify some common pitfalls and suggest techniques for maximizing the effectiveness of the design.

5.1.6 The Designer's Challenge

The greatest challenge for iTV interaction designers is to design easy to use, engaging, and satisfying experiences for viewers while maximizing the affordances of the digital medium. While designers have a responsibility to keep up with evolving technology platforms, it is worthwhile to keep in mind that in the long run, "interaction is governed by our biology, psychology, society and culture… As each new technology matures, customers are no longer happy with the flashy promises of the technology but instead demand understandable and workable designs… Technology may change rapidly, but people change slowly" (Norman, 2002). The key to good iTV interaction design is to motivate the viewers and not to disappoint them when they do act: present users with an

approachable and aesthetically pleasing interface, effective navigational structure, and a compelling interactive experience that highlights the program or transforms the viewing experience in some meaningful way. The design principles presented in this chapter will be applicable for many years to come because they are not technology specific, but speak to maximizing the interaction experience itself.

Finally, simplicity is perhaps the key element to keep in mind when designing an iTV interaction across all models: "All successful iTV content to date has shown that viewers demand content that is marked by both the simplicity of its concept and the simplicity of the interface and interactive functionality" (Lamont, 2003a).

5.2 INTERACTION MODEL

The interaction model addresses the basic conceptual model behind an interactive television program. For example, how is the interactivity conceived? What type of interaction does it allow? What media platforms will the audience participate through? How does the interaction change the audience's viewing experience? Most importantly, what motivates a viewer to interact with the iTV program at hand? In other words, the benefits of interactivity should be obvious to the viewers.

At this stage in the process, the interaction model must also take into account the content of the show, its genre, and the context in which the interactivity is being conceived. Keep in mind that sustainable interactivity will happen only if the program content is compelling to begin with, as interactivity will not save a poor program (Cunningham, 2003; Feinleib, 1999). Is there a good reason to interact? Whether the interaction allows a viewer to answer a question, express an opinion, or even to play a role in affecting the outcome of a program, the value of interaction is ultimately created

by the wider context of the program as a whole: "What makes the experience exciting, expressive, and empowering is the quality of the content itself and the relationship of the interaction to it" (Lamont, 2003a). In chapter three I surveyed many persisting television genres and analyzed the reasons why each type of programming is inherently conducive to interactivity. The interaction design and content of an iTV program are intimately connected because the content of the show shapes its form. The interaction model is derived from the television genre and platform affordances; the principles outlined here transcend any show in particular.

Principle: Interactivity should be integrated into the program at its conception

This principle may seem obvious, but it is worth stating, particularly because it is not yet in common practice in the United States. Emma Somerville, BBC's Head of iTV Programming, presented this guideline as a vital piece of advice during her keynote address at the 2004 AFI enhanced TV Workshop. Today, networks often tack interactivity as a "bonus" onto shows that have already proven to be successful in the ratings. ITV is so new that even at the AFI workshop, the majority of proposed programs for the team to work with are established shows such as *Queer Eye for the Straight Guy* and *The Daily Show*. It is not yet within the working model of these networks to conceive of original programming with elements of interactivity built into the program structure itself. However, to maximize the compelling experience of an interactive program, iTV programming should be designed from the beginning to be a convergent experience. According to Scott Gronmark, "currently, almost all interactivity is an afterthought" (quoted in Gawlinski, 2003).

It is difficult to force compelling interactivity onto existing programs when the original content was intended for linear broadcast, or a "lean back" experience. Any attempts to convert the viewing experience to a "lean forward" one is still very much constrained by the existing footage. As a result, the majority of retrofitted iTV applications are nothing more than a vehicle for the delivery of trivia or factoids. This approach is neither an absorbing experience for the viewer nor does it take advantage of the affordances of the medium.

History IQ, a broadcast and online game show developed by The History Channel and Spiderdance, makes good use of the synchronous framework to deliver a challenging, participatory experience. It was conceived from the beginning to be an interactive, two-screen synchronized experience, engaging the users at home in competition against both the broadcast contestants and other online players at the same time. As illustrated by Figure 5.1, because the same graphic designers created the interface for both the broadcast and online versions, they were able to ensure visual and game-playing consistency between the two platforms (Curran, 2003).

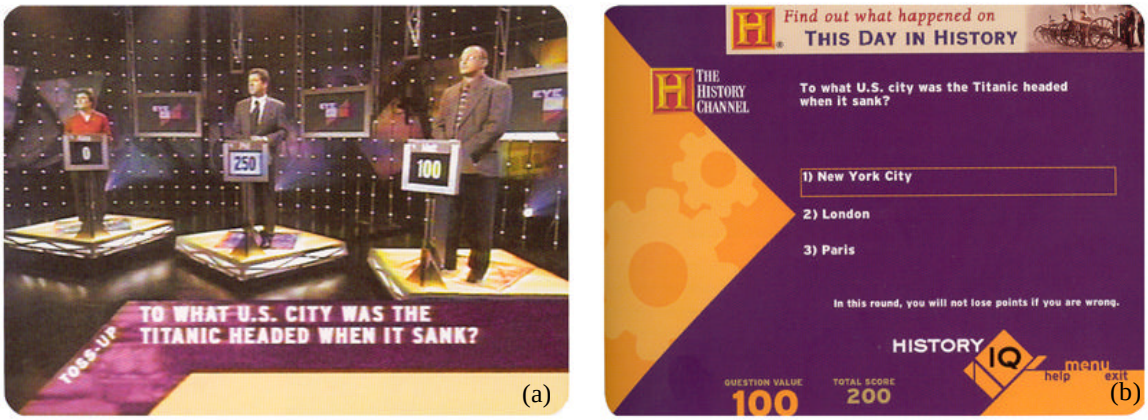


Figure 5.1 History IQ Visual and Game-Playing Consistency (a) and (b)

History IQ focused on keeping the interactive contest fair with accurate synchronization between the TV and the PC. In the timeline round shown in Figure 5.2, players at home and in the studio try to answer together within the allotted time, which is kept by synchronizing the clocks for both versions (Curran, 2003).

Figure 5.2 History IQ Synchronized Timeline Round (a) and (b)

In the timeline round shown in Figure 5.3, contestants in the studio and at home "drag and drop" ten historical headlines to match the appropriate years: "This technique involves online users in the same tension-filled, bonus-round event that is happening on TV" (Curran, 2003).

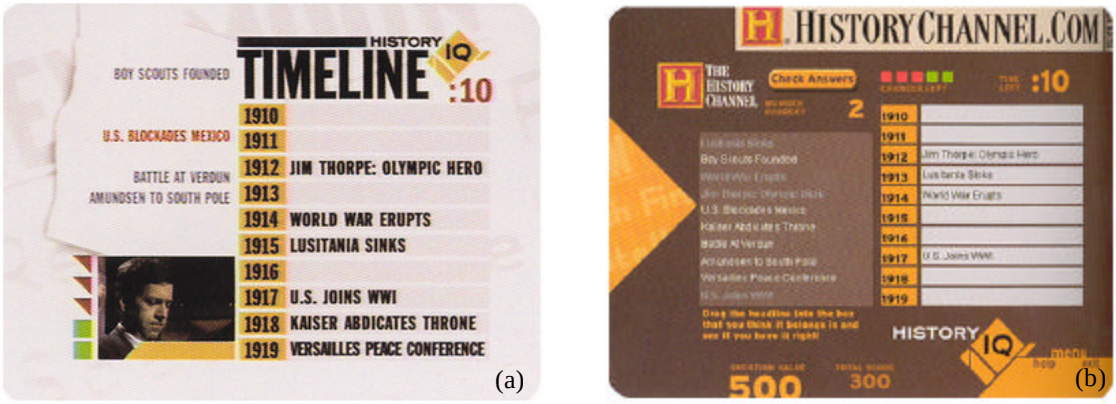


Figure 5.3 History IQ Drag and Drop Timeline Round (a) and (b)

HistoryIQ is a good example of the meaningful gaming experience that can be achieved when interactivity is integrated into the game show from the very beginning. The experience is a highly participatory one, made more challenging by the synchronization between player at home and the same time constraints faced by the broadcast contestants. The networked platform allows users to compete against a real viewing community who are all interacting at the same time.

It is difficult to force non-linear content onto a linear platform; conceiving of the experience as a convergent one from the beginning helped to make *History IQ* a compelling experience for the users playing along at home.

As a noted exception to this principle, however, retrofitted iTV applications have worked well for educational programs and documentaries. Such programs have such depth of information that hundreds of hours of footage is often cut due to time constraints; however, the viewing demographic is often eager to learn more about the topic at hand. Here, iTV applications can and do take advantage of the encyclopedic property of the medium. Retrofitted applications such as the digital enhancements to the Ken Burns documentary *Frank Lloyd Wright* (PBS, 2000) or the interactive documentary prototype *Woodrow Wilson* (KCET/CPB, 2001) were designed especially well for this purpose. In fact, PBS won one of the interactive world's most prestigious awards – the Milia d'Or – for the *Frank Lloyd Wright* application in 2000. Likewise, the *Woodrow Wilson* DVD, designed by Dale Herigstad, was awarded the prestigious Communication Arts Interactive Design award and a BDA Gold award for DVD Design.

In most cases, however, retrofitting interactivity – particularly utilizing iTV as a platform to deliver trivia – does not maximize the affordances of the medium. In recent years, a few of the prototypes that have been developed at the AFI eTV Workshop have

been programs that were still in development, allowing us to see that integrating interactivity into a show at its conception can pave the way for much innovation. This approach works particularly well for experimental modes of iTV, such as the convergence of games and television. *Dinosaur Highway* from the 2004 workshop, as illustrated by Figure 5.4, provides an excellent example.

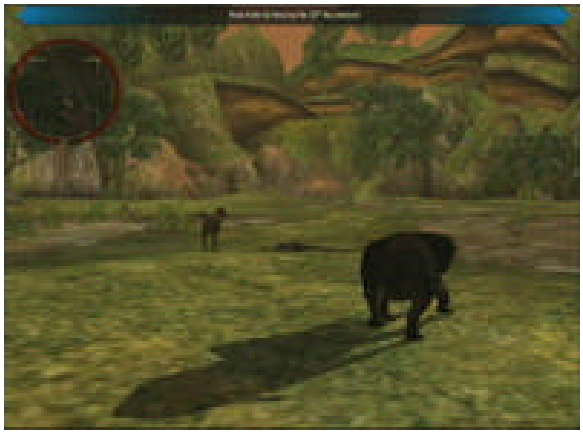


Figure 5.4 Dinosaur Highway Prototype

Dinosaur Highway proposes a new programming concept where an MMORPG (massively multiplayer online role-playing game) merges with television, where weekly activities in the game world would influence the world of the television show, and vice versa.

In the prototype for *Dinosaur Highway*, developed to be a PC-based game experience that runs on Microsoft's Windows XP Media Center Edition, players control a pack of dinosaurs in a virtual 3-D interactive environment and try to ensure the survival of the pack in the face of various environmental and evolutionary challenges. Players earn a ranking for their dinosaur pack based on the lifespan and composition of the pack. The game would require a base of players with Internet connectivity as well as a

centralized server that could generate real-time images of the gaming world. Each week, the game environment and the content of the television program would change dynamically to reflect events that occurred in each respective world (AFI, 2004).

Although the prototype was not deployed, the conception of this convergent gaming / viewing model was possible precisely because the Science Channel was willing to discuss how interactivity could be integrated into a new show in order to achieve a completely new programming concept.

We will undoubtedly see more experimental cases such as *Dinosaur Highway* in the future as networks and producers become more willing to produce programs tailored for interactivity. Ideally, in the future, interactive television experiences will be written into programs at their conception. In fact, Gronmark predicts that by 2007 there will be programs that "exist because of interactivity. There will still be linear forms equivalents that can be enjoyed without interactivity, but full enjoyment of the programs will require access to interactive functionality" (quoted in Gawlinski, 2003). Movement into this model of interactivity can encourage innovation and is more likely to maximize the affordances of the medium. Of course, meaningful interaction must be tailored to the particular genre and content of the program in order to deepen the viewing experience for users.

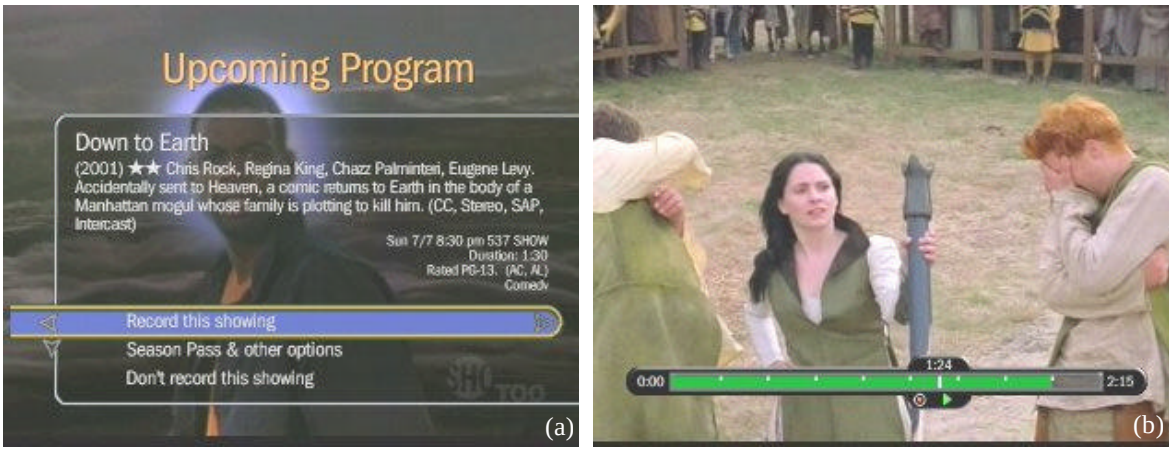
Finally, in thinking about how best to integrate the interaction model, keep in mind that the best time is not necessarily during the show itself. During her keynote address at the 2004 AFI eTV Workshop, Emma Somerville advised iTV producers to consider the "golden ten-minute window" immediately after a program airs, when the content is still fresh in the viewer's mind. According to Somerville, this time frame is similar to how viewers utilize DVDs (e.g, users are more likely to use the interactive

features of a DVD immediately after watching it than at any other time). For example, FOX's *American Idol,* which millions of people interact with each week, allows viewers to vote for up to one hour after the end of the program.

Principle: Give users increased control over their viewing experiences

A key human-computer interaction principle is to give users increased control in any system. As we have seen from examples in chapters two and three, viewers greatly enjoy and are beginning to demand increased control over their viewing experiences. DVRs, in particular, allow viewers to watch television at their own convenience instead of waiting for their favorite programs to air according to the network's schedule. Similarly, EPGs allow viewers to actively search for desired programs by a favorite genre, actor, or director, for example, instead of the traditional passive model of watching and waiting for scrolling programming guides that don't allow any user control.

TiVo is an iTV platform that is exemplary in giving users this sense of control over the system. As we discussed in chapter two, TiVo allows viewer to search for, record, and watch television programs at their leisure. Options such as the season pass allow viewers to record multiple episodes of a program automatically (Figure 5.5 (a)). TiVo also allows viewers to time-shift media, with the ability to pause, rewind, and fast forward through live television (see Figure 5.5 (b)). These powerful single-actions, effective over many instances, leverage the procedural programmability of the processor. In addition to taking advantage of time-shifting capabilities, one of the key functional affordances of the digital medium, TiVo takes advantage of the encyclopedic by storing hundreds of hours of video programming for viewers to watch at their leisure.



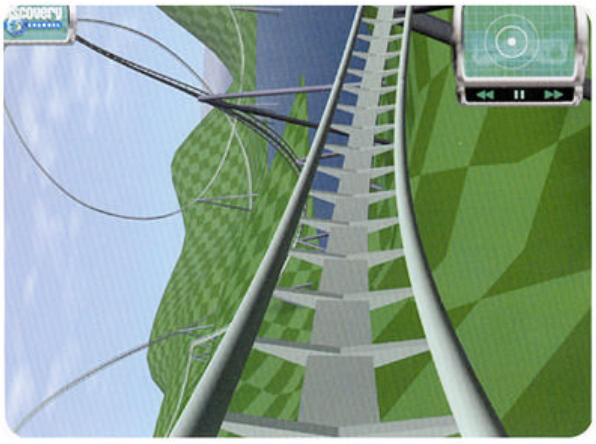
5.5 TiVo User Control Functionalities (a) and (b)

Principle: Maximize agency

Along with giving users increased control, the digital medium allows users to gain increasing agency, or "the satisfying power to take meaningful action and see the results of our decisions and choices," over their television viewing experiences (Murray, 1997). Another approach to agency, a concept that relates well to the participatory property of the digital medium, is the model of the viewer as an active player within the program or activity. The Discovery Channel's *Extreme Rides* application, as seen in Figure 5.6, has a "build-your-own-coaster" feature, where roller coaster fans select segments of other coasters to make their own thrill rides.

After users create their own roller coasters, the selections are compiled into a Quicktime movie that lets them experience the virtual thrill of the ride. This interactive application is particularly effective because it takes on a constructionist approach to agency, or the notion that people learn best when they are actively engaged in creating artifacts that are personally meaningful to them: "this happens especially felicitously in a

context where the learner is consciously engaged in constructing a public entity, whether it's a sand castle on the beach or a theory of the universe" (Papert & Harel, 1991).



5.6 Extreme Rides "Build Your Own Roller Coaster"

However, providing viewers with an increased sense of agency should not occur at the expense of disrupting the program. Showtime's enhanced *The L Word*, a prototype from the 2004 AFI eTV workshop, provides an example of bad design. The enhanced version of *The L Word* attempts to personalize the viewing experience for viewers by allowing them to answer questions about their own romantic habits and preferences. The viewer's answers unlock additional scenes, and ultimately provide the viewer with an analysis of the characters (or personality types) they most resemble. At the conclusion of the episode, each viewer is presented with a message from their "Sister" in a personal video vignette (American Film Institute, 2004).

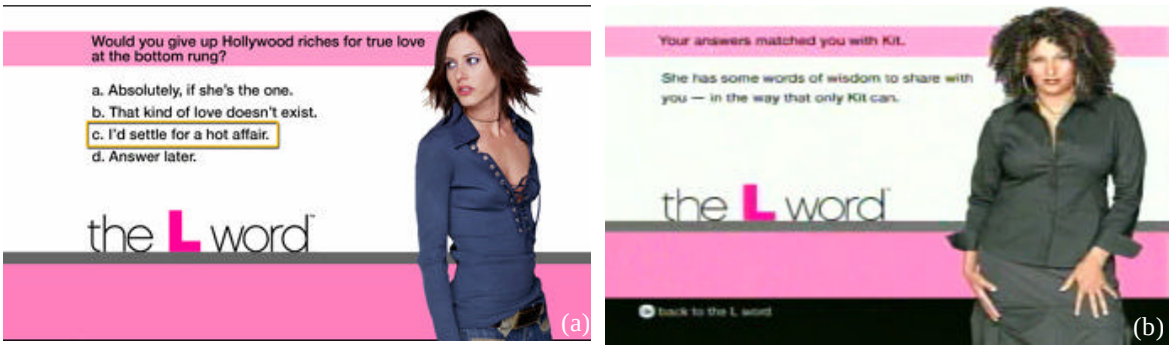


Figure 5.7 The L Word (a) and (b)

As the broadcast of *The L Word* progresses, the enhanced application pauses automatically at several points to present viewers with multiple-choice questions. As we can see in Figure 5.7 (a), however, the application takes the viewer away from the primary screen of the video, disrupting the dramatic flow of the show. This model of interaction is too interruptive and intrusive, interjecting interaction at the expense of removing viewers from the primary world of the program.

The procedural aspect of digital television (the processing of program data) and the participatory aspect (allowing users control over what and how they watch television) combine to give viewers an increased sense of agency (Murray, 1997). In the case of the *Extreme Rides* example, the system enables viewers not only to participate, but also to become active creators of original, personalized content. In the design of iTV programming, interactivity should be conceived in order to give viewers a satisfying sense of agency.

Principle: Allow viewers to customize their viewing experiences

Customizability is one of the core functional affordances of the digital medium. With increased control and agency comes the ability to allow viewers to customize their

viewing experiences so that each viewer can have access to only the most personally relevant and interesting content. The digital medium is encyclopedic, that is, it stores vast amounts of information that the viewer is then able to access and manipulate. In order to allow viewers to customize their own viewing experiences, iTV interaction designers should provide multiple access paths, or multiple ways of sorting and presenting information. For example, as illustrated by Figure 5.8, BBCi multistream sports broadcasting allows viewers to customize their viewing experiences by choosing from multiple camera angles or audio streams.

Figure 5.8 BBCi Multistream Sports

NASCAR's TrackPass with PitCommand application also provides a good example of customizability. As illustrated by Figure 5.9, the interactive application, featuring a live streaming GPS telemetry system, has the ability to track the position of all 43 NASCAR Winston Cup Series cars' on track in real-time. It also allows users to access information about each car's speed, RPMs, throttle and braking, and be privy to live in-car audio communication between the drivers and their teams during the race. PitCommand allowed viewer at home to follow along with their favorite NASCAR

drivers as though they were in the race car itself. In 2003, PitCommand won an Emmy Award for Outstanding Achievement in Advanced Media Technology for the Enhancement of Original Television Content.

Figure 5.9 NASCAR TrackPass with PitCommand

The TiVo WishList provides another good example of allowing users to customize their viewing experiences. As illustrated by Figure 5.10 (a), the WishList feature allows viewers to search for and automatically record every movie, biography, or interview with their favorite actor, director, category, keyword, or title. In Figure 5.10 (b), for example, the viewer has chosen to record all shows starring the actress Jessica Alba, as well to record as every episode of *Law & Order* that airs.

The TiVo WishList leverages the metadata information that is already associated with the programs (actors, director, etc.) and allows users to have greater control over finding and accessing programming of interest. Allowing users to customize their viewing habits in this way provides them with a satisfying experience.

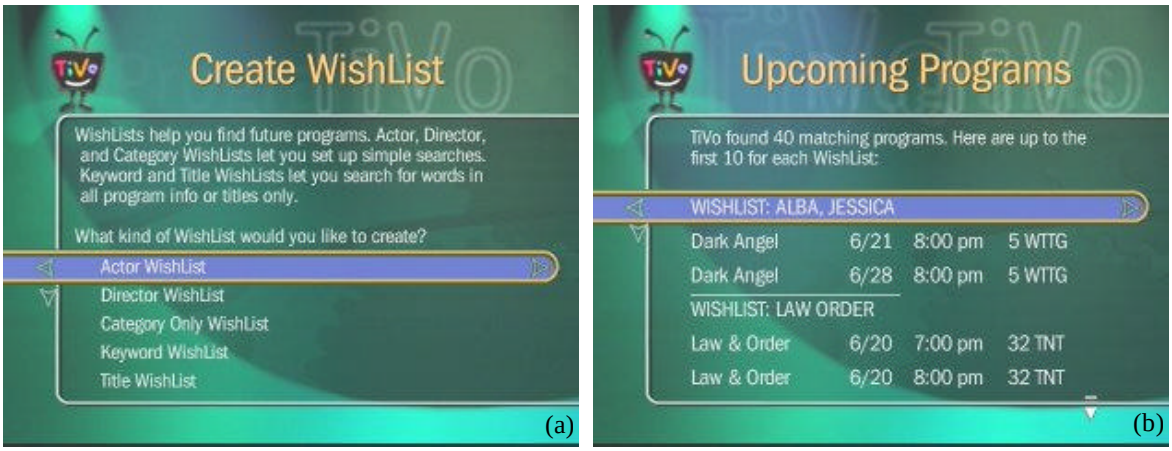


Figure 5.10 TiVo WishList (a) and (b)

Principle: Enhancements must be intimately tied to content

Enhanced content within iTV programming should intimately support the content and theme of the program. To be most effective, they should not be merely factoids or trivia that only divert the viewer's attention. Instead, iTV enhancements work to their full potential and advantage when they serve to deepen the viewer's relationship with the world of the program.

Information appearing in the enhanced area should be tightly coupled to the screen, or the action occurring within the fictional world. It should be relevant to the moment and pique the curiosity of the viewer, motivating them to act. Skelly, et al, observe that "Producers of film and television programming have had many years to refine techniques for engaging the human brain's attention-fixing mechanisms. Unfortunately, studies indicate that passive viewing alone does not provide the emotional rewards found in more actively engaging activities such as sports, hobbies, or video games. In order to engage viewers enough to simply press a button, it may be necessary to challenge them, but at a level appropriate to their abilities and desires – starting simply, perhaps, with curiosity" (1994).

C.S.I. Interactive, developed by CBS and H Design, provides an excellent example of using enhancements to pull the viewers deeper into the world of the story. *C.S.I.*, a popular drama which follows a team of forensic scientists, features many forensic science methodologies and specialized procedures foreign to the average viewer. The interactive component takes advantage of the dramatic structure of the program by reinforcing what the viewer is already curious about. Figure 5.11 demonstrates the ways that the enhancement area is used to provide relevant content which, unlike trivia, works to draw the viewer deeper into the world of crime scene investigators. In addition, the design and color scheme of the entire iTV application are seamlessly integrated into the mood of the program, making the enhanced area a natural extension of the screen.

Figure 5.11 C.S.I. Interactive Enhanced Content (a) and (b)

The next two examples, from PBS' *Life 360* and CBS' *Survivor*, also serve as good examples of enhancements that are intimately tied to the content of the program. The enhancement in Figure 5.12 provides relevant information to orient the viewer geographically to the action happening on screen. Enhancements in Figure 5.13 provide relevant information about Jessie, a contestant on the reality show, who may or may not

be voted off the island. In both cases, the enhanced content of the iTV component – both in terms of information provided as well as design and color scheme – are seamlessly integrated into the program.

Figure 5.12 Life 360 Enhanced Content

Figure 5.13 Survivor Interactive Enhanced Content

A common violation of this principle is the use of iTV as a delivery vehicle for trivia or factoids, which often have little or nothing to do with the actual content of the program. Figure 5.14, an example from TNT Interactive's application for *Sleepless in Seattle*, is typical of the factoids that pop up in synchronization with the broadcast. The application is hosted on a two-screen platform, forcing the viewer to look away from the

television in order to access the enhanced information. However, the experience is not a compelling one for the effort: the content has nothing more than a superficial relationship to the movie, is distracting, and does nothing to pull the viewer deeper into the fictional world of the film itself.

Figure 5.14 TNT Interactive Trivia Content

Simply put, iTV experiences must be entertaining or engrossing for viewers; if it is unsuccessful in this respect, the product will fail regardless of how powerful or capable the application may be (Mountford, et al, 1992).

Principle: Convening an Audience

The experience of watching television is moving away from one of relative isolation. Networks are increasingly using call-in voting, polls, and trivia to leverage the power of networked two-way communication and instantaneous feedback to create a dynamic sense of community surrounding a television program. Murray calls this phenomenon "convening an audience" (forthcoming). As we have seen from chapter three, many television genres already have this inherent participatory property that makes

them so conducive to iTV programming. Barry Schuler, President of AOL's Interactive Services, notes that "applications like e-mail, instant messaging and other ways people can be with each other can help tie a home experience with a community experience. That's what will make TV explode into an active medium from a passive medium over the next decade" (quoted in Swann, 2000).

Phillip Swann argues that television has always been conducive to creating community: "One of the great myths of watching television is that it's often a solitary experience… But after watching a particularly good show, the TV viewer is eager to share his thoughts with others. It's part of the experience. By talking with another person, the viewer can relive the positive emotions he or she felt during the show… most times, people have come together to simply chat about a funny moment in a favorite sitcom or perhaps some silly remark made by a network anchor during the evening news. Because we saw it on television, we saw it together" (Swann, 2000). Today, that process can occur in real time with the networked, participatory affordances of the digital medium.

The process of convening an audience through voting, typically through mobile platforms or via the Web, works well particularly when the user's action is reinforced through near-instant feedback. Questions, however, must reinforce the moment onscreen. For example, as illustrated by Figure 5.15, ABC's *The View His & Her Body Test* allowed their viewers to partake in a live health quiz relevant to the viewer's knowledge about male and female health issues.

Figure 5.15 The View His & Her Body Test (a) and (b)

The poll in Figure 5.16, from *C.S.I. Interactive*, asks viewers: "Do you believe Dominic Kretzker is telling the truth?" The question, which is synchronized with the broadcast, is relevant to the story occurring at the moment and works to draw its audience deeper into the tension of the plot. The real-time feedback (85% Yes vs. 15% No) is extremely satisfying for the viewers and creates an instantaneous community surrounding the suspenseful premise of the program.

Figure 5.16 C.S.I. Interactive Poll

The "Create your own roller coaster" function from Discovery's *Extreme Rides* application, which gives users a great sense of agency, also allows users to rate each other's creations (see Figure 5.17). The more iTV applications allow users to create their

own content in ways similar to this, the more dynamic communities will evolve around these activities: “The tools and the opportunity for artistic creation have long existed, but are not used as often as they could be. The missing ingredient that the net contributes is *audience*... Having an audience motivates creation” (Bruckman, 1995).

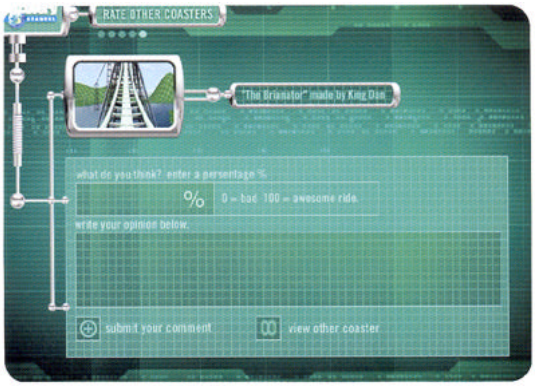


Figure 5.17 Extreme Rides Rating System

As we discussed in chapter three, reality programming works extremely well for convening an audience due to the contest and game-like aspects of the genre. In the example from *Celebrity Mole: Yucatan* illustrated by Figure 5.18, viewers at home can vote on which celebrity they think the mole is via the Mole-O-Meter and compare their perceptiveness with hundreds or thousands of other viewers around the country instantly.

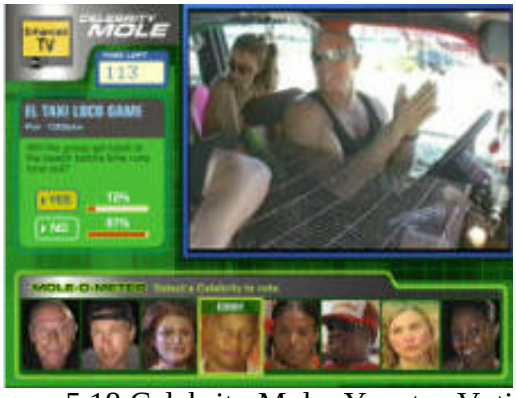


Figure 5.18 Celebrity Mole: Yucatan Voting

A common pitfall in utilizing polling functions is to ask questions that trivialize the content in the program or that distract the viewers instead of bringing them deeper into the world of the show. Figure 5.19 provides an example of a poll question that trivializes the content of the program at hand.

Figure 5.19 Life 360 Poll

With two-way communication and the ability to tabulate data in order to provide nearly instantaneous feedback, viewers at home are feeling more connected to other viewers than ever. In addition, users are also becoming creators of content. Successful iTV programming can leverage these new possibilities of expressive communication to convene larger, more loyal viewing communities than ever before.

Principle: Promote iTV

In the U.K., where interactive television programming has enjoyed the most success, the BBC and Sky run numerous promotional campaigns to make users aware of iTV services. For example, Sky's creative agency developed the "Lil' Red Button Man" character to embody the "Red Button" that activates interactivity on remote controls:

> In the first of a series of on-air executions Lil' Red struts around to music composed by Goldbug, who had chart topping hits in the early nineties. Wearing a 'Touch Me' t-shirt, Lil' Red incites Sky digital viewers to press the red button on their remote control, when watching a Sky channel - demonstrating that interactive TV is a fun and easy to use addition to the viewing experience (Broadband Bananas).

Sky's "Lil' Red Button Man" was promoted across Sky's channels during advertising breaks to get viewers to use the interactive services on the Sky platform. Figure 5.20 depicts a promotion for Sky's Customer Channel interactive service.

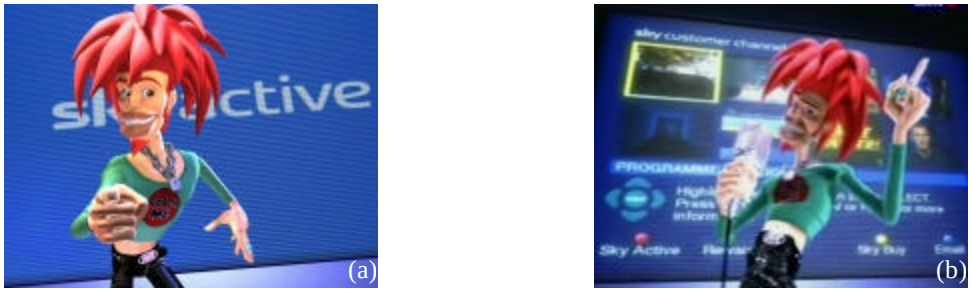


Figure 5.20 Lil' Red Button Man (a) and (b)

Likewise, the BBC provides viewers with promotions and instructions on utilizing interactive features, often utilizing program hosts familiar to viewers to explain how to act. In the example illustrated by Figure 5.21, the BBC's Wimbledon 2002 promotion was shown across the BBC channels, highlighting the interactive services available during Wimbledon 2002 to all digital homes in the U.K.

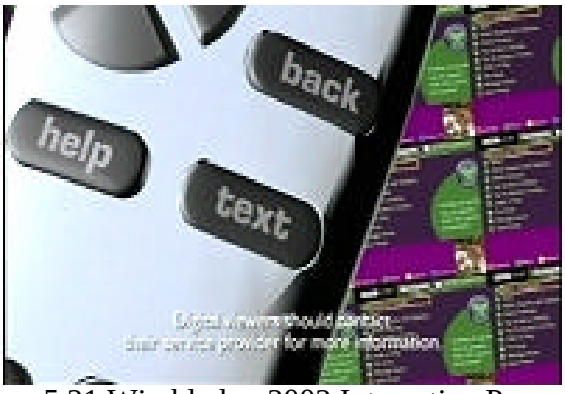


Figure 5.21 Wimbledon 2002 Interactive Promotion

Because iTV is still a relatively new concept in the U.S., networks should not assume that viewers will know how to interact no matter how simple the interaction model is. To engage with an engaging and compelling experience, users must be motivated, challenged, or have their interests piqued – but more importantly, they must know that the interactive options exist and they must feel comfortable in knowing how to use it. In fact, the BBC attributes the success of many iTV programs such as *Test the Nation* and The Chelsea Flower Show foremost to effective promotion: "When presenters invite viewers to press the red key, the results are startling" (BBC Web site).

5.3 INTERFACE

The interface of an iTV application is the visual look of the design on the television screen, computer monitor, or mobile device. The interface is the first and last part of the application that the viewer observes. Graphic and interface design is critical because it is about "creating meaning beyond the basic functionality… A great graphic design helps make a service emotionally engaging and aesthetically pleasing, helps signal how an application should be used, and helps boosts viewers' enjoyment" (Gawlinski, 2003).

Jakob Nielsen notes that users are increasingly making rapid choices when faced with new interfaces: "they will immediately discard any interface that looks boring, obsolete, or too confusing. Think of home users flipping through 500 channels of cable TV and then multiply by a factor of several thousands to match the smorgasbord of options on the Internet, commercial subscription services, and major corporate nets… Each of these applications would at best have a minute or two in which to seduce the customer" (1995). Referring to their research on the dynamics of seductive interfaces, Skelly, et al, note that "Seductive interfaces encourage temporary mental disengagement from the 'real world' by presenting the mind with alternate, engaging activity. What conditions are necessary to produce this mental state? The first of these is a clear cut goal. The next condition is closure, or feedback – abundant, fast and easy to discern – that lets the participant know whether they are attaining those goals. Finally participants must feel challenged but also feel that their skills are equal to the challenge being presented (1994). In the previous section we discussed how *C.S.I. Interactive* allowed viewers to dive deeper into an alternate, engaging activity through the iTV application; the application would not have been as successful, however, had the interface design of the application not been so seamlessly and accurately crafted to reflect the world and mood of the show.

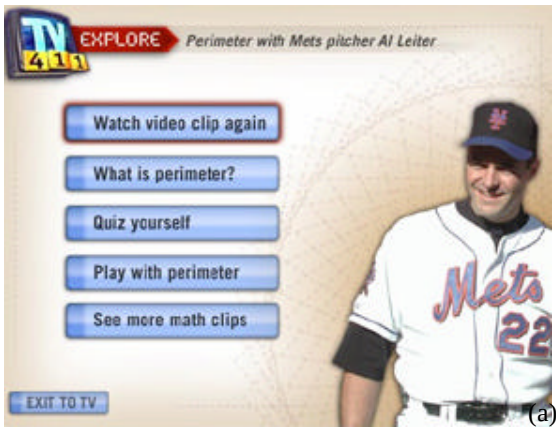
Regardless of the platform, basic graphic design guidelines apply when we are talking about designing effective interfaces. If a design is too cluttered, for example, viewers are less likely to approach it with interest. In chapter four, I provided a comprehensive survey of information on layout grids, colors, grouping patterns, viewing patterns, and other important factors to keep in mind while designing the interface of an iTV application.

Principle: Simplicity

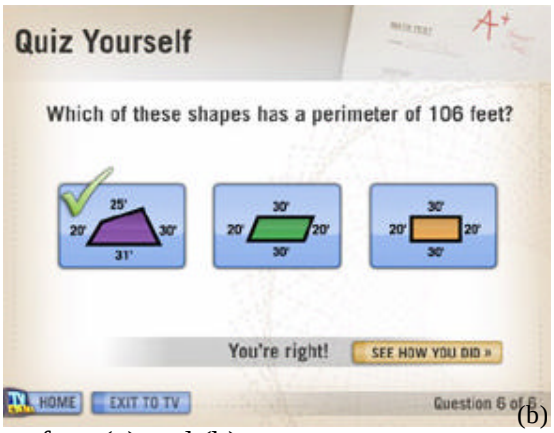
An iTV interface design must be easy to understand, regardless of the user's experience, knowledge, or current concentration level. Consumers tend to ignore designs that have too many bells and whistles. Mullet and Sano argue that the benefits of simplicity are functional as well as aesthetic in nature (1994):

- *Approachability.* Simple designs can be rapidly apprehended and understood well enough to support immediate use or invite further exploration.
- *Recognizability.* Simple designs can be recognized more easily than their more elaborate counterparts… they present less visual information to the viewer, and are more easily assimilated, understood, and remembered.
- *Immediacy*. Simple designs have a greater impact than complex designs, precisely because they can be immediately recognized and understood with a minimum of conscious effort.
- *Usability.* Improving the approachability and memorability of a product… [eliminating] unnecessary variation or detail make the variation that remains more prominent and informative.

Achieving a simple design, which always works better for a broad audience, often means reducing a design to its essence (Herigstad & Wichansky, 1998). Figure 5.22, from the TV411 prototype developed at the 2004 AFI eTV workshop, presents good examples of a simple interface that is easily understood at a glance.



(a)



(b)

Figure 5.22 TV411 Interface (a) and (b)

Common pitfalls in this category include designs that are too full of clutter and visual noise, excessive detail and embellishment, or elements that are not of interest to viewers such as excessive advertising content. Be aware of overly designed designs for the amount of information given. Earlier examples from MSN TV (Figure 5.23) and Gemstar-TV Guide's GUIDE Plus+ (Figure 5.24) are examples of poorly designed interfaces that may intimidate users or make them more hesitant to approach the application.

Figure 5.23 MSN TV 2 Interface Design

Figure 5.24 Gemstar-TV Guide's GUIDE Plus+ Interface Design

Principle: Enhancements should not compete with the main content

Enhanced elements should not compete with the primary elements on the screen, which should be viewed as a whole. The purpose of enhanced content is not to dominate the interaction process, but rather to present a thematic and visual framework that the user can understand in order to integrate the additional information.

Textual enhancements and stills should not compete with the moving image in the primary portion of the video screen. Figure 5.25, an example from PBS' *Life 360*, illustrates the visual confusion that arises when competing elements appear on the screen. The enhancement layer on the left featuring the solider in the background directly competes with the image of the solider in the main video display. Because our eyes move across the screen from left to right, our attention focuses first on the figure in the enhancement rather than the main character in the program. In cases such as this, it is difficult for users to know which area to direct attention to.

Figure 5.25 Life 360 Competing Elements

A common pitfall in this category is the use of overlays on top of primary video content, particularly overlays that cover up a large area of the screen. Overlays are graphical elements that intrinsically compete with the main content on a screen. In Figure 5.26, an example from the BBC's *Walking with Beasts*, the overlay is not obstructing any important visual information in this particular shot; however, since it covers up close to 50% of the screen, it very well could prove to be annoying to many viewers. The example in Figure 5.27, on the other hand, covers up more than 50% of the screen, making it nearly impossible for viewers to know what to pay attention to. It is difficult and annoying for viewers to strain to look through the overlay for the primary content underneath.

Figure 5.26 Walking with Beasts Overlay

Figure 5.27 TCM Movie Mogul Overlay

Enhanced content appearing on the same screen as the primary information should not compete, but rather should seamlessly reinforce the user's engagement within the world of the program.

Principle: Interfaces should have a consistent theme

An iTV application will typically have many screens of content. In each of these instances, the interface design or conceptual model should remain visually consistent. Maintaining good visual continuity will keep users engaged as well as let them know what to expect from the application. Figure 5.28, from the *Frank Lloyd Wright* interactive application from Intel/PBS, embodies this principle well. The application employs an architectural theme throughout, in keeping with the subject matter. It also makes consistent usage of color scheme and typography. Strong visual elements, particularly in Figures 5.28 (c) and (d), direct the viewer's eye movements across the screen.

Figure 5.28 Examples of "Frank Lloyd Wright" Interface (a), (b), (c), and (d)

In the U.K., the BBC has created a brand for its interactive TV service, BBCi, with a consistent logo and navigational elements that are not only present throughout a single enhanced program but across all of their interactive programming. This consistency is achieved in part through the usage of a single font, Tiresias, developed specifically for television and adopted by the UK Digital Television Group as the resident font for iTV. The visual consistency established by the BBC, along with predictable navigational elements throughout a wide array of iTV applications, builds a familiar expectation with its viewers. Figure 5.29 illustrates examples of this visual branding.

Figure 5.29 Examples of BBCi Branding (a) and (b)

As evidenced by Figure 5.30, the text on the consistent navigational bars used by the BBC can be adapted for each program as appropriate, but the colors are mandatory and are purposefully color coded: red is meant to provide a relevant link to whatever content is on screen; green is thought of as providing customization or access to communication tools; yellow can be flexible and fills in for controls that are difficult for the viewer to access; and blue is meant to provide access to fixed textual information or to sections of a service (British Broadcasting Corporation, 2002).

Figure 5.30 BBCi Navigation Bar Color Scheme

In early 2005, the BBC updated the look of BBCi and its brand logo. User-centered design is clearly the driving force behind this evolution. As evidenced by Figure 5.31, "Gone is the chunky white i block of the original logo and in comes a little red i dot,

representative of the red button that digital viewers are encouraged to press in order to go interactive" (quoted in May, 2005).

Figure 5.31 New BBCi logo

Accordingly, the BBCi service itself has also been re-designed to reflect the same black, red, and white colors of the new logo. According to Rahul Chakkara, BBC Controller of BBCi 24/7 interactive television services, BBCi's new look is "the second stage of our continuing journey to make the interactive experience easier for BBC viewers... We also wanted to create a visual identity for our interactive TV services that would help raise awareness amongst those people who have not yet pressed red" (quoted in May, 2005).

While we do not have a comparable system in place to standardize iTV interfaces in the U.S, it is nevertheless a good idea for networks to build a visual identity that is consistent so that over time, users become familiar with the model of interactivity and come to know what to expect.

Principle: Create an effective screen structure

In chapter four, I discussed the importance of leveraging grids, colors, and grouping principles such as the Gestalt Laws in order to create effective layouts that direct a viewer's visual attention and help to script the interaction. Thissen provides additional detail about how this process operates:

> When we direct our attention to a picture, initially our eyes skim the picture and scan it superficially for prominent features. In this manner, the rain gets an orientation to the total context. In a second step, we view the prominent features more exactly and more intensively. The details do not follow until afterward. The more structure the screen composition establishes, the simpler the comprehension. The more unstructured the screen is, the more the eye must seek, the more energy the brain must expend to define a structure, and the more unwilling the user becomes to work with the picture" (2004).

Many iTV applications require an additional space in which to present enhanced content. The most appropriate way to configure this iTV space, however, is a challenge for designers. In recent years, two different layout conventions – overlays and the embedded "L" or split-screen design, have emerged in the realm of iTV interface design. Table 5.1 compares the advantages and disadvantages of each approach (Lamont, 2003a).

Table 5.1 Comparison of Overlay vs. Embedded Layouts

Design	Advantages	Disadvantages
Overlay	• Size of TV window is the same as regular TV • Content feels more integrated into the show • Close proximity of TV and content may facilitate divided attention • Close proximity of TV and content may enhance memory for show	• Distracting because content on top of TV • Users try to look through content to see TV • Close proximity of TV and content may inhibit focused attention
Embedded	• Easy to separate TV and content when viewing • Easy to focus on content or watch show • Separation of content and TV may facilitate memory • Separation of content from TV may facilitate divided attention	• Size of TV window reduced • Viewer can more easily multi-task and direct attention in 2 locations • Importance may be given to content when not necessary • Separated elements make focused attention difficult

Lamont brings up compelling advantages and disadvantages to each approach to ITV design. However, as we have seen earlier in this chapter, overlays tend to inherently compete with the main video content by obstructing 50% or more of the screen, and viewers can become frustrated by trying to look through the enhancement to the primary content. ITV interaction designers might take into consideration the fact that on the Web, users assume that accented entities such as overlays may be clickable, leading to additional information. While this convention is not yet popular on the television platform, it may become increasingly transferred to iTV in the future.

When graphic content must be combined with the video screen, typically the video portion is reduced in size and surrounded by graphics on three sides. This commonly used format has become known among iTV designers as the "L design." The L design, which operates on a simple grid system, works very well provided that the content in the enhanced area is intimately tied to the primary content of the program. Figure 5.32 provides examples of the L design from four different applications that work effectively to deepen the viewing experience. Each design is successful in keeping with the colors and themes of the respective program. The enhanced content must also remain simple and uncluttered; for example, lengthy text next to video content will be ignored by viewers (British Broadcasting Corporation, 2002).

Common pitfalls to effective layout design include random window sizes and arbitrary component dimensions and positioning. Figure 5.33 provides examples of these violations. Due to the lack of a good grid system, it is difficult for viewers to know how to focus their attention. In addition, the use of red in Figure 5.33 (b), which is difficult to see against a black background, violates good color design guidelines for television.

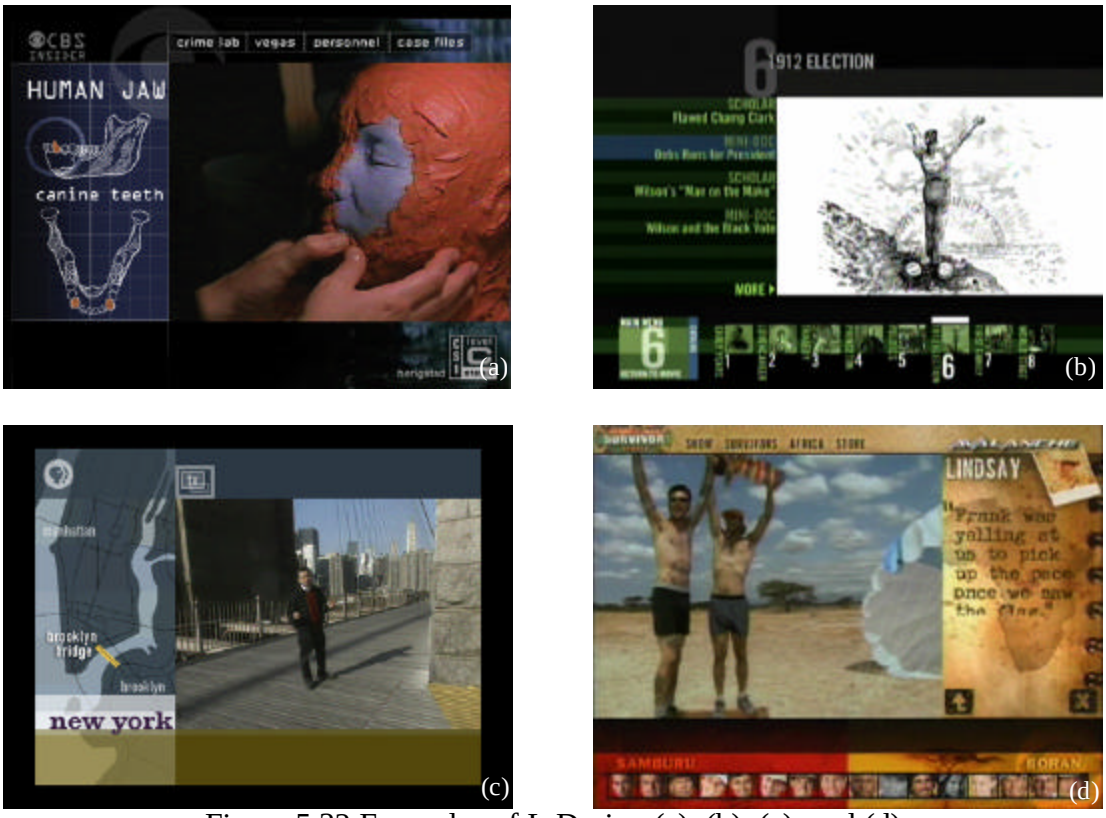


Figure 5.32 Examples of L Design (a), (b), (c), and (d)

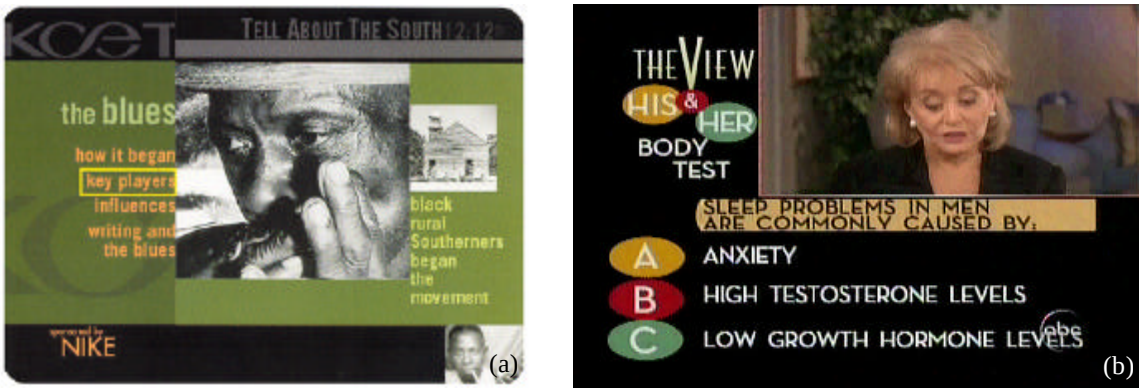


Figure 5.33 Examples of Ineffective Layout (a) and (b)

Finally, good screen design must take into account how viewers scan television screens visually. In chapter four, I provided a brief overview of how interface design can influence viewers' viewing patterns and thus script interaction. Because viewers tend to scan screens from the upper left-hand corner down to the lower right, the upper left and

lower right-hand areas are privileged spaces; these areas are perfect for titles and logos. Conversely, the upper left and lower left-hand areas are dead spaces, and elements placed in these areas are unlikely to be noticed. In addition, video and text content will be perceived separately, and lengthy text next to video will most likely be ignored (British Broadcasting Corporation, 2002).

An application that will be deployed primarily on the television should keep text elements to a minimum. In addition, text that is broken up into chunks is easier to read from a distance. The same rules are looser if the application is designed to be accessed from a computer, because users are closer to the monitor and accustomed to reading text on screen. Figure 5.34 illustrates some design recommendations from the BBC for effective page layout for the standard L shape design.

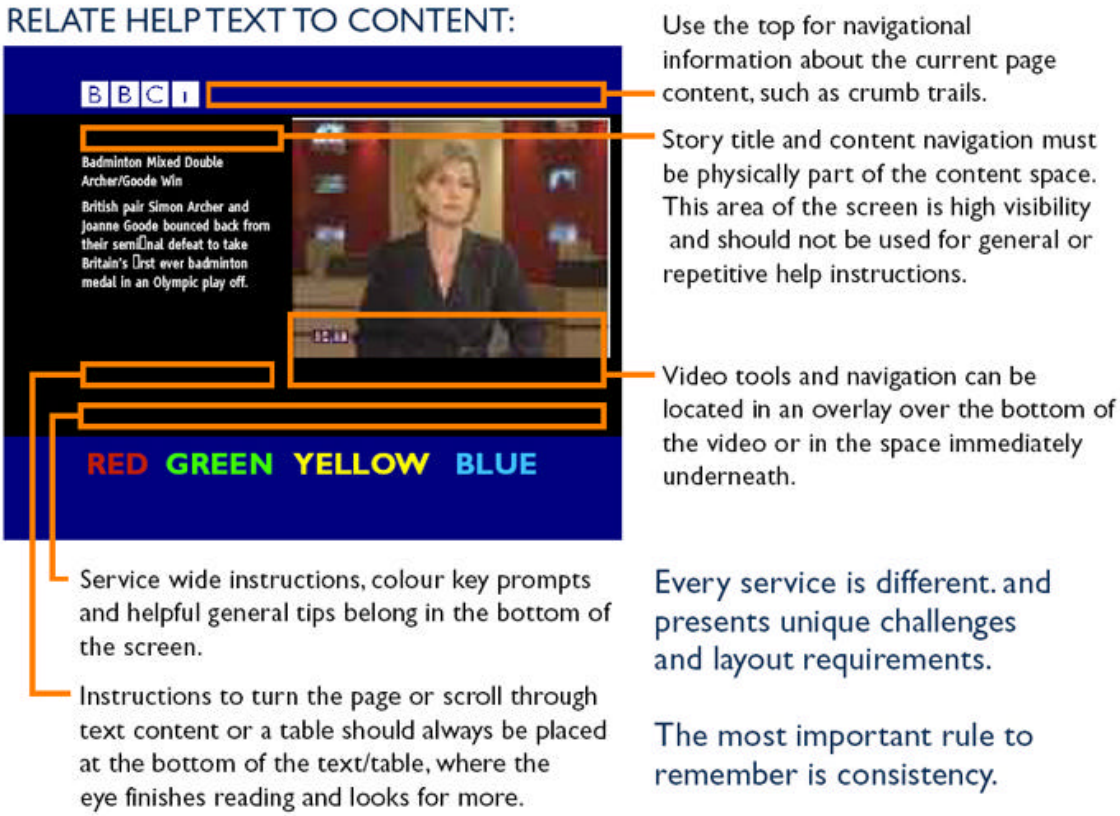


Figure 5.34 BBCi Page Layout Recommendation

Screens may change in the future as technologies become more advanced and viewing habits change. For example, the advent of HDTV may mean that a greater level of detail can be incorporated into the enhanced areas due to increased resolution. As well, people may become accustomed to reading text next to video. As of now, however, the L design seems to be the most graceful design for enhanced programming on the TV and the Web.

Principle: Pay attention to existing standards

In chapter four, I surveyed the array of existing standards for designing for television (including aspect ratio, safe areas, resolution, scan lines, color, typography, etc.) and for the Web (including video, graphic safe area, resolution, color, typography, etc.). As a general rule, when designing an iTV application that will be viewed primarily on a television monitor, design for the television experience, and pay attention to TV appropriate colors and fonts. The same holds true when designing applications that will be primarily used on a computer monitor.

Mullet and Sano caution against the dangers of unwarranted innovation in interface design: "Constraints free the designer to focus their resources on those portions of the problem where innovation is most likely to lead to a successful product. The very essence of the GUI lies in a desire to eliminate the need to re-invent common components in every application. This not only makes the designer's job easier; it also lowers the barriers that slow user acceptance of the environment" (1994). In order to help facilitate widespread acceptance of iTV programming in the United States, designers should pay careful attention to existing standards in favor of widely innovative designs that raise the barriers to user acceptance.

5.4 NAVIGATION

Navigation pertains to the way users interact and move their way through a system and how they know how to act. From the onset, the navigational design of an iTV application should be immediately clear. Good navigation should script the interactor, that is, it should signal to the viewers what they can and cannot do at any given moment. A clear, user-friendly navigational structure is how a participatory system explains itself and encourages action by the users.

Currently, navigational tools available to users are the directional buttons on the remote control (up-down or left-right), with which users can skip from choice to choice and make selections, a keyboard for typing in commands, and a mouse for making selections. Tracy Swedlow points out that "in the United Kingdom and in Europe, remote controls and wireless keyboards aggressively exploit primary-colored buttons (red, green, yellow, blue) called 'Fast Keys.' These simple buttons provide consistent navigational infrastructure – something U.S. manufacturers have yet to exploit" (2000).

In addition to "fast keys" and the "red button," the BBC, in an effort to improve the usability of BBCi services, also introduced page numbers to its digital text and video services November 2004. The system used the same page numbers as CEEFAX, which many viewers grew up with and are familiar with as a method of navigation. According to the BBC, with this system, most viewers know their favorite page numbers off the top of their head. Rahul Chakkara, BBC Controller of BBCi 24/7 interactive television services, said: "This latest development is really about making BBCi more efficient for the viewer… One of the biggest challenges has been to make this diversity of content easily accessible for everyone… Research with our users has shown that page numbers are the most effective and simple way to enable people to navigate through our content…

This will improve both the speed and usability of BBCi." (BBC Press Release, March 11, 2004).

In chapter four I outlined many of the navigational challenges related to the functional affordances and constraints of remote controls versus the mouse and keyboard, noting that navigation poses a primary concern for widespread iTV adoption on the television platform. Mark Gawlinski offers some helpful practical design recommendations to improve this experience, which I also outlined in chapter four (2003).

Despite the lack of a consistent navigational infrastructure in the U.S., and also taking into design consideration the necessity for multiple-device distribution, there are some basic principles we can apply to ensure good navigational design for iTV. Many of the principles presented in this section echo well-established usability principles for good user interface and interaction design within any effective information system.

Principle: Orient the viewer

A good navigational system provides the viewer with cues about where they are, how they got there, and where they can go next at any time. The user should never have to ask the question "Where am I now?" on any screen. Users should also be able to easily understand "What can I do now?" at any given time in the interaction process. In addition, users should understand the extent of the navigable iTV space and understand where he/she is in relation to that space.

As illustrated by Figure 5.35, in this example from *New Americans* from Kartemquin Films, the overlay alerts viewers that *New Americans* is an iTV experience, and provides very simple instructions for accessing the iTV menu for additional options.

Figure 5.35 New Americans Orientation

The consistent brown overlay present throughout the program (see Figure 5.36) uses both words and universal symbols to let users know at a glance what options are available to them. At any given time, users know that they can access the menu, choose subtitles, or adjust the audio. In addition, users have the option to bookmark certain segments. At any time, the viewer can also opt to turn the iTV function off and watch the program with no enhancements. This reversibility is important in giving users a degree of control over their viewing experience.

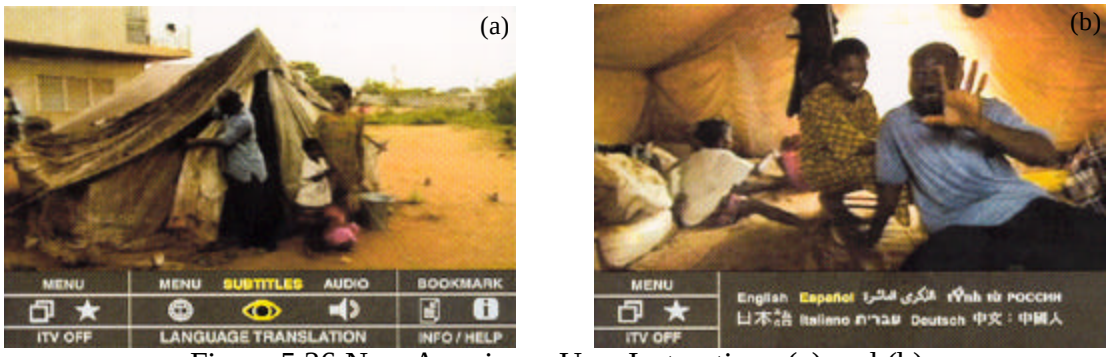


Figure 5.36 New Americans User Instructions (a) and (b)

The simplicity of the overlay elements, and the fact that they are always present, ensures that the viewer is never lost within the iTV space. Viewers always know the answer to the question "What can I do?" throughout the duration of the program.

Principle: Teach viewers how to interact

Swann predicts that in the near future, companies invested in iTV will need to launch massive marketing and public relation campaigns to educate the public about how to use iTV: "The campaigns will be designed to convince consumers that ITV features will make their lives more convenient and more fun. The marketing effort will be pivotal to persuading Americans – most of whom still have trouble even setting the clock on their VCRs – to give new products and services a try. Companies that fail to understand the need for this education campaign will come up short and become high-tech dinosaurs" (2000). In order for users to participate in a compelling experience, it is important to teach them how to act.

Earlier in this chapter, I discussed the importance of promoting and marketing the availability of iTV services to consumers. The better a program is promoted, the more chance people will interact. At this point, however, viewers must know what to do within a realm that is still relatively unfamiliar to many. In addition to airing promotions during commercial slots, clear instructions teaching viewers how to act should also be prominent throughout the program. In the example illustrated by Figure 5.37, the overlay from the *Test the Nation* game show in the U.K. provides succinct but clear instructions on the interaction model and how to obtain more detailed instructions if necessary.

Figure 5.37 Test the Nation User Instructions

In the U.S., interactive programs are increasingly incorporating clear instructions teaching viewers how to interact, as well as motivating viewers to do so with teasers. In this example from *The L Word* prototype for Showtime, teasers like "Do you have a type L personality? Go interactive to find out" entices users to utilize the interaction functions in order to reveal some aspect of their personality as it relates to the show. In Figure 5.38, the screen tells the user "Thanks! Watch for questions and keep your remote handy." This feedback helps to keep the users engaged with the program and encourages them to remain in the "lean forward" model of viewing, with remotes in hand ready for the next round of interaction.

Figure 5.38 The L Word User Instructions

Likewise, the following two examples, from TLC's *Trading Spaces: Home Free* (Figure 5.39) and the 2004 Olympics on NBC (Figure 5.40), both provide viewers with clear instructions on how to vote by SMS via a mobile device.

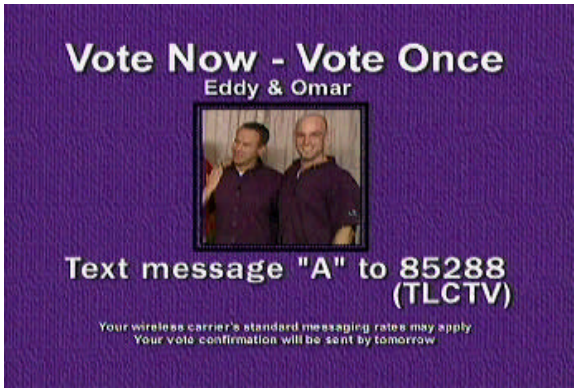


Figure 5.39 Trading Spaces: Home Free User Instructions

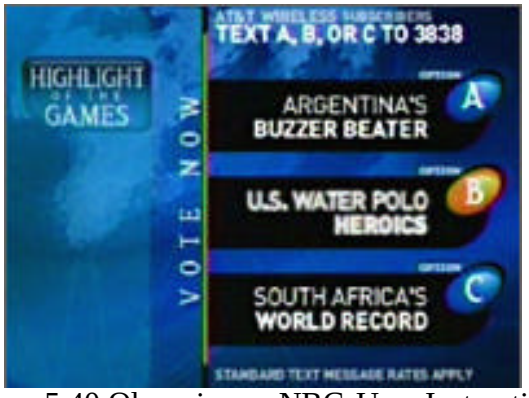


Figure 5.40 Olympics on NBC User Instructions

Principle: Minimize clicking / distance from primary screen

The activity of clicking excessively is one that is conventionally annoying to users both on the television and the computer. In particular, using a remote control for selection can be a reasonably strenuous activity relative to using a mouse. Therefore, with

applications based on the television, iTV applications must be navigable using only a remote control, with the four directional arrow keys and a select key. With the navigation limited in this way, designers must take special care in the arrangement of navigable and selectable objects on the screen. For example, it may be a good idea to group functional buttons into one column and navigational buttons into another. Thus, moving from one group to the other requires only one click to the left or right. The BBC is a bit more constrictive and actually recommends that designers limit navigation to only one axis – either forward/back or up/down (British Broadcasting Corporation, 2002).

In general, iTV designers should minimize the number of clicks that the user must press in order to navigate through the application. As well, these activities should not take the user too far away from the primary screen. According to research conducted by See & Woestendiek, environments with a depth greater than four often become disorienting and confusing to the user (1987). Taking users too far away from the primary screen increases the chances that they will become distracted or frustrated with the application.

Dale Herigstad, who designed the interaction for the *Queer Eye for the Straight Guy* prototype at the 2004 AFI workshop, explains that his design purposefully attempted to move away from "the 'page model.' As illustrated by Figure 5.41, instead of clicking from page to page, the design keeps you in one kind of space, but one that is fluid, so that you click one thing and it generates something else. The design is all about transition" (quoted in Swedlow, 2004b). In another one of his designs, *Woodrow Wilson*, the timeline-based navigational structure that persists along the bottom edge of the application ensures that users never navigate outside of the iTV space or away from a familiar point (see Figure 5.42). Yet a third tactic may be to employ the picture-in-picture

convention when users are interacting with a program, so that they never feel removed from the primary content itself.

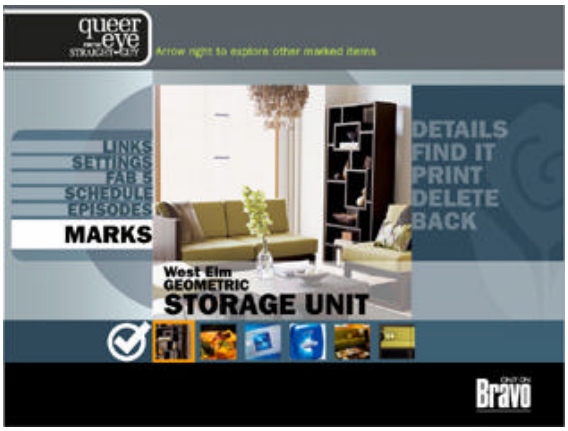


Figure 5.41 Queer Eye for the Straight Guy Navigation Model

Figure 5.42 Woodrow Wilson Navigation Model

Some evidence exists that the “less clicking, more watching” interactive model may work better for cultural applications than entertainment or game-like genres. For example, research shows that for some cultural entertainment experiences on the Web, a more passive experience results in higher levels of perceived entertainment and engagement (Karat, Pinhanez, Karat, Arora, & Vergo, 2001). According to the

researchers, "In many ways, the participants in our research seemed to lean toward defining an entertaining Web experience as something closer to traditional TV, but enriched by the opportunity to explore and find related information" (2001).

In general, however, the depth of an interface can adversely hamper a user's navigating through it. Limiting the number of clicks and movement away from the primary content increases the pace of interaction, keeps the user's level of attention, and provides a more satisfying interactive experience overall.

Principle: Always offer an exit option

For iTV applications in which the interactive component covers up part of the screen or reduces the video screen size, the screen should always offer a way of letting the viewer exit, even though they opted in to the interactive component to begin with. In many cases, this means that the enhanced elements will disappear, allowing viewers to watch the program at full screen. Applications without this option are likely to annoy viewers who do not wish to interact. Similarly, on mobile platforms, users should always have an option to opt out. In Figure 5.43 (a), the "Full screen" button on the bottom left-hand corner of the screen allows users to opt out of the enhanced version of the program at any time. Likewise, in Figure 5.43 (b), the "Exit to TV" button on the bottom left-hand corner of the screen allows users to return to the television full screen, exiting the interactive component.

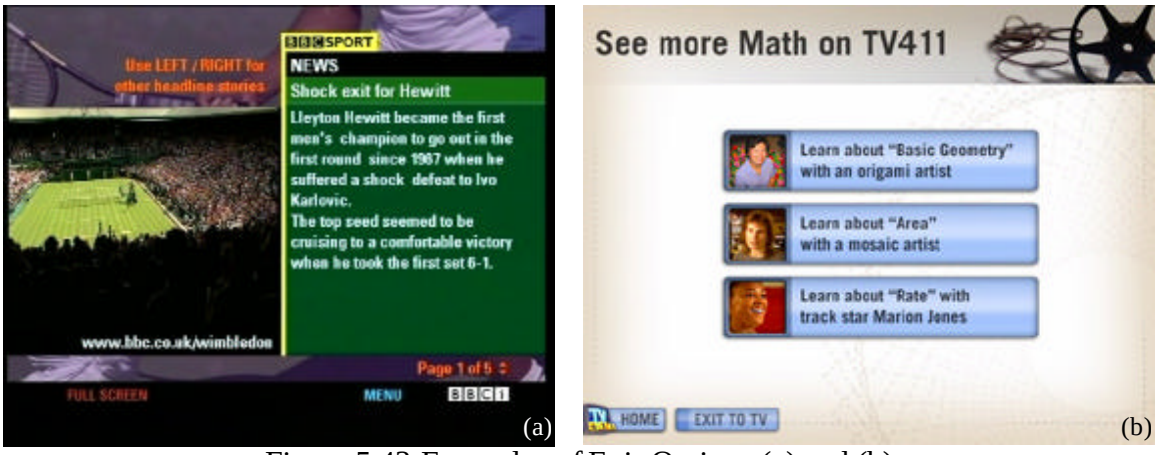


Figure 5.43 Examples of Exit Options (a) and (b)

Interaction designers should always provide an escape route in the event that viewers become lost, bored, or press the wrong button. One button push should take them back to a space they are familiar with. By knowing that there is an exit option available, users will feel more comfortable exploring the application if they know they can always return to a familiar point. This model refers to what Herigstad and Wichansky call the "comfort of home" (1998).

Principle: Reinforce engagement through immediate and consistent feedback

For each action of the user, a reaction of the system should follow. The system should always make the result of every action clear; if nothing happens, the user is likely to think that the system has crashed or that they have acted incorrectly. While interacting with a program, the user should never have to ask "What just happened?" According to the BBC, basic navigation should always involve sub-second response times. If the viewer is left without a response to a command for more than eight seconds, they are extremely likely to switch over (British Broadcasting Corporation, 2002).

In Robert Miller's classic user research test, where he looked at the effects of different response times with computer systems on users, he found that, on average:

- Less than 0.1 second response time for people to feel that the system is reacting instantaneously and to feel that they are directly manipulating events
- Less than 1 second response time, for users' thought processes to remain uninterrupted
- Less than about a ten-second response time for users to keep their attention

Source: Gawlinski, 2003.

Furthermore, the navigational elements and the feedback from the system should be consistent and predictable. This means that all selectable elements should react in the same manner and that the acoustic feedback (if any) should be consistent, as well. EPGs generally provide a good example for consistent feedback. Users know that if they select a program listing, for example, they will be able to access more detailed information about the selected program including a brief synopsis, show times, an option to record, etc.

In Figure 5.44, an example from *History IQ*, users must drag-and-drop the headline from the box on the left into the corresponding year that they think it belongs to. In this interface, color cues indicate whether the events are matched with the right or wrong years. Once it has been dragged into a time slot, the content turns red or green to indicate right or wrong, using a cultural model that we are familiar with and providing users with instantaneous feedback on whether they have acted correctly.

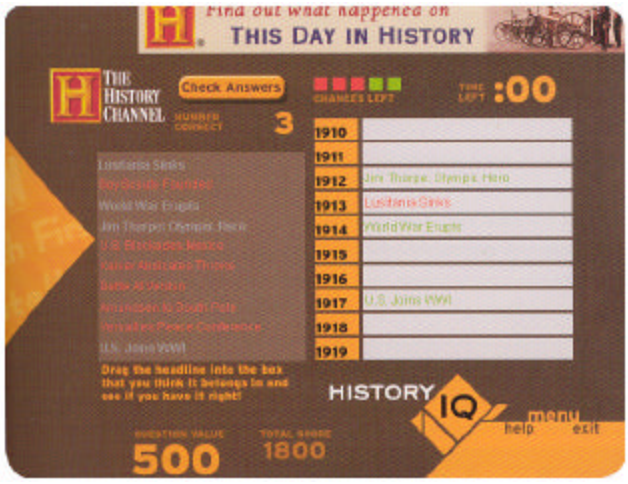


Figure 5.44 History IQ System Feedback

Finally, consistent audio feedback, if available, is important to user interaction as well. TiVo's trademark series of sounds, designed by a sound engineer using wood blocks and other percussion instruments, sets a good example. "You hear the bloop-bloop-bloop; it's kind of friendly. It's cute. It makes it very intuitive. You know what's going on without watching," says one TiVo fan. Another fan relates, "When I do a lot of my TiVo maneuvering, I don't even look at the remote, I listen." The importance of good audio feedback is underscored by Donald Norman: "Sounds are critical… You have to spend the same type of attention to designing sound as visual appearance. Companies these days always hire graphic artists. They need to hire sound artists" (quoted in Fernandez, 2004).

Principle: Use appropriate cultural mental models and metaphors

A metaphor transfers something well known and familiar from the every day world of the user to the organization of data displayed on the screen. An example of a metaphor utilized in a graphical user interface is the trashcan of the Mac OS, or the

recycling bin from Windows, that stands for the deletion of files. Human-computer interaction experts agree that metaphors can both be helpful and harmful. For example, metaphors that are too literal can be too constraining to the design; on the other hand, metaphors that are too abstract can fail to do its job. Metaphors, therefore, should be used appropriately and with caution.

Figure 5.45 illustrate PBS' *Cisco's Journal* application, which uses the journal / scrapbook metaphor to tell the story of Cisco and his family. The application is successful in keeping the metaphor consistent throughout the application. In addition, the metaphor is integrated into the television component of the show, where each week viewers actually watch Cisco – an electronic artist – sit down at his desk and work on his online "journal."

Figure 5.45 Pages from Cisco's Journal (a), (b), (c), and (d)

Thissen outlines the characteristics of suitable metaphors (2004):

- The metaphor should fit the topic and the content of the product
- The metaphor should be simple but, at the same time, not have a boring or trivial effect
- The metaphor should be familiar to the users. They should not have to put forth a lot of effort to work the metaphor initially
- The more realistic the representation of the metaphor, the greater the acceptance by the user
- The visual representation of the metaphor should not dominate the actual contents; rather, it should transport them
- The metaphor should be multifaceted enough to be used in various situations
- The metaphor should be used uniformly and consistently in the product. Mixing of several metaphors causes confusion and destroys their effect

An effective metaphor can serve to orient the user and script the interaction, to a great degree. Metaphors that are either too literal or too abstract, however, can actually be detrimental to the usability of the application and detract from the depth and meaning of the interactive experience.

5.5 CONCLUSIONS

The interaction design principles I have presented here suggest directions but do not provide hard-and-fast recipes. Technological opportunities continue to evolve, and the set of options available to designers continue to evolve as well. Design principles should provide more stable guidelines than platform-specific design practice (see chapter two). Of course, the respective genre and content of each individual program is also of

importance (see chapter three). In this chapter, I have deliberately discussed design implications at a level that will require designers and others to choose how they apply the principles according to the different settings, technologies, and needs that characterize each design challenge.

5.5.1 Function versus Aesthetics

Usability and graphic design have a symbiotic relationship to one another: "An iTV application designed purely for usability may allow viewers to perform tasks, but risks leaving them feeling disconnected, uninvolved and without a sense of allegiance. On the other hand, an application built only with graphic design in mind may look fantastic but may be difficult and frustrating to use" (Gawlinski, 2003).

Nielsen speaks to the relationship between graphic design and usability in the overall design process:

> Graphic design in the user interface business is not just a matter of aesthetics. There is much more at stake than simply pretty pictures, and good graphic design can significantly improve the communicative value of the interface, leading to increased usability. System usability has many components, including ease of learning, efficiency of use, memorability, reduced number of user errors, and subjective satisfaction. Good graphic design can improve all these quality attributes, though of course graphic design is only one element of overall user interface design (Nielsen, 1995).

However, Norman emphasizes that there is no need to sacrifice beauty for usability or vice versa: "It is possible to create things that are both creative and usable, both pleasurable and completely workable. Art and beauty play essential roles in our lives. Good designs will have it all – aesthetic pleasure, art, creativity – and at the same time be usable, workable, and enjoyable" (2002).

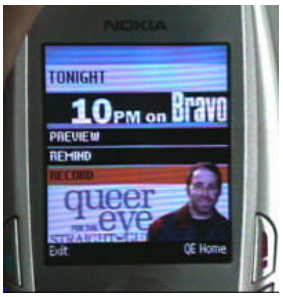
Effective iTV designs should integrate function and aesthetics to leverage and maximize the affordances of the digital medium in order to provide users with compelling and engaging interactive experiences.

5.5.2 New Technologies

For relatively new technological entrants into the iTV realm such as mobile devices, very little has been done to study effective interface design on these platforms, where new design issues arise. The screen on most cellular phones and PDAs, for example, is relatively square compared to that of a television screen or computer monitor, comprising of a different aspect ratio to design for. Screen resolution is also relatively poor, and very few words can be displayed on the screen at once. Because of this, excessive scrolling is perhaps even more irritating on a mobile device than it is on a television monitor. Finally, mobile devices do not yet have ubiquitous support for applications developed in Java or Flash, for example, and platforms in which content can be developed for mobile devices are still very limited. Together, these factors make it difficult for designers to effectively repackage iTV materials for mobile technologies.

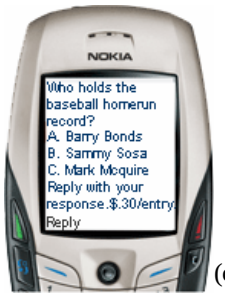
Donald Norman notes that "Each time a new technology comes along, new designers make the same horrible mistakes as their predecessors. Technologists are not noted for learning from the errors of the past. They look forward, not behind, so they repeat the same problems over and over again. Today's wireless devices are appalling" (2002). The array of mobile interfaces in Figure 5.46 demonstrates that there are many ways to design for this medium.

A key challenge to designing for the relatively small screens of mobile devices is the display of Web content and text legibility. Human-computer interaction specialists are currently working on zooming techniques to address this problem. Patrick Baudisch, an HCI research scientist at the Visualization and Interaction Research Group at Microsoft Research, has been working on two of these projects.



(a)

(b)



(c)


(d)

(e)

Figure 5.46 Examples of Mobile Interfaces (a), (b), (c), (d), and (e)

"Summary thumbnails" is a mobile browser that renders pages as thumbnails, but keeps the text large enough to read using text truncation. Another solution, "collapse-to-zoom," allows users to use a stylus to draw lines across areas on a thumbnail display of a Web page to either zoom into desired content or collapse unwanted content. Frauenfelder notes that if such techniques become standard in mobile browsers, designers will come to rely on these when they create mobile content in the future (2005).

Another research team, Robertson, et al, whose team prototyped a PDA-ITV application, offers the following guidelines for designing for use in multiple-device situations:

- Distribute information across the appropriate devices
- Combine devices so that the ensemble provides more than each independent device
- Information content strongly determines display format, which should be mapped to the appropriate device(s)

- User tasks influence which device is appropriate fro particular types of information
- Device coordination is critical. Be sure that the information on different devices is coordinated, consistent, and up to date
- Combine the coordinated information guideline with the appropriate device guideline. Information about the same thing can be presented in more than one way. For example, information about a room can be conveyed in a picture, a text description, or a floorplan graphic. Navigation through a house video is controlled on a schematic floorplan displayed on a PDA

  Source: Robertson, S., Wharton, C., Ashworth, C., & Franzke, M., 1996.

There is little doubt that new technologies will continue to change the ways we navigate through iTV systems: "in the future, we may also see voice commands via one's remote control or cell phone, speaker-driven commands for sound-sensitive TVs, touch screens on consumer televisions, lab devices for more complex interaction, and more" (Swedlow, 2000). As this occurs, design standards must continually be formed and redefined.

ITV represents a new medium and a new space for expressive communication, one that is distinct from the viewing and computing platforms that have existed to date. The TV itself has fundamentally different display characteristics from conventional PC monitors, which are still different from mobile devices. As a result, good convergent design practices will be essential in order to create meaningful, compelling, and interesting interactive experiences. The principles presented in this chapter are a starting point. They serve to orient interaction designers and producers of iTV to a set of issues that any specific design may need to explore in greater detail.

CHAPTER 6

CONCLUSIONS AND FUTURE DIRECTIONS

My goal in this document has been to formulate interaction design principles for interactive television programming in the United States. While gaining momentum, iTV has not yet enjoyed widespread success within the U.S. to date. The lack of standards across both the design and technical realms of iTV production, as well as between the two, is a crucial part of what makes successful iTV deployment a challenge: "This cross-media expertise requires the integration of good design principles with knowledge of the technical and database implications. The exclusivity of the platform designs of recent technologies and the current lack of a standardized data format have created for today's designers many challenges in integrating the multiple distribution channels with the disparate databases, software programs, and applications" (Curran, 2003). I have attempted to contribute to the effort toward establishing principles for designing effective and compelling iTV experiences.

Figure 6.1 illustrates the most popular user preferences for iTV applications. Not surprisingly, these popular user preferences speak to a number of the principles discussed in chapter five, such as giving users greater control, agency, and customizability over their viewing experiences (Pause, Rewind Live Shows, Additional Information in Shows, Additional Information on Ads, EPG), and convening an audience (Vote on Issues, Games, Interact with Other People).

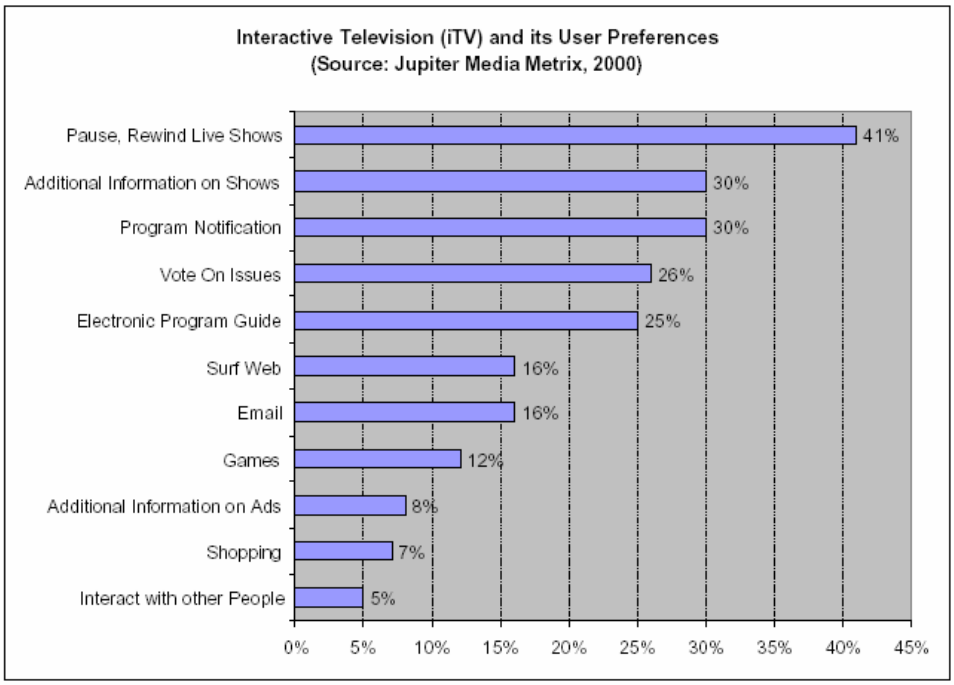


Figure 6.1 iTV and User Preferences

These desired functionalities also relate well to the three inherent properties of television programming that make them conducive to iTV: depth of information (Additional Information on Shows, EPG, Additional Information on Ads), contest (Vote on Issues, Games, Interact with Other People), and participation (Vote on Issues, Email, Games, Shopping, Interact with Other People). It is worthwhile to note that the user preferences listed are all very active activities; more than ever, iTV is helping to transform the traditional "lean back" experience of watching television into a "lean forward" one.

6.1 CONVERGENCE

Figure 6.2 illustrates the ways many modes of entertainment, communication, and computing are converging to create the new emergent medium of interactive television.

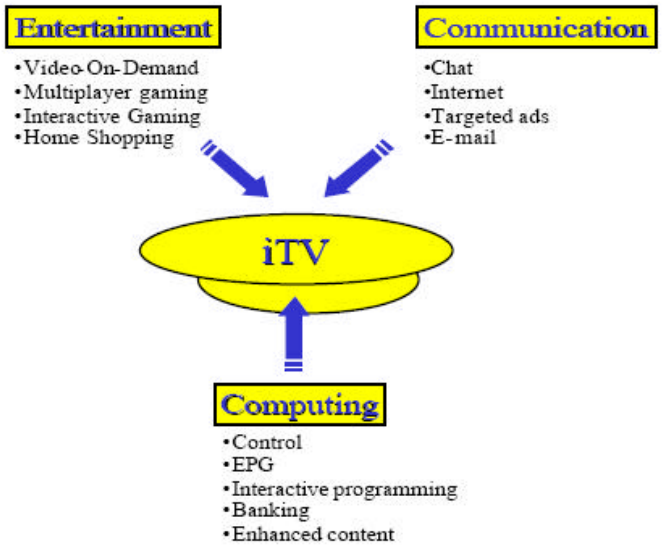


Figure 6.2 Convergence of Entertainment, Communication, and Computing

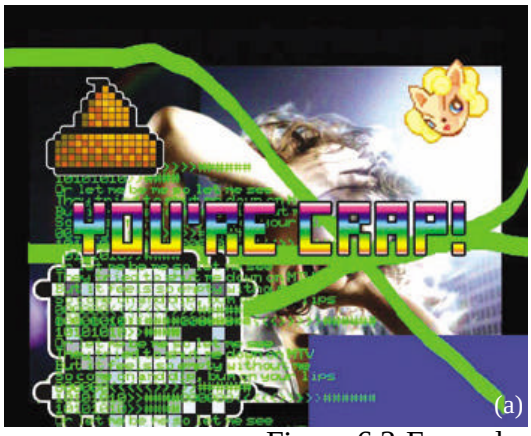
The convergence of various entertainment and iTV-enabling technologies seems to be the key theme as we move toward platforms and technologies of the future. In addition to the merging of television and the Web, we are also witnessing the addition of game consoles and mobile devices to this equation. The Sony PSP, as we have seen, is an amalgamation of all of these devices. Future devices, incorporating the best functionalities from across all platforms, will not only allow users to access content on demand and to exercise a great deal of agency, but will free users from the constraints of consuming video and iTV content from a stationary device. Users will not only be able to time-shift but also place-shift their media.

More importantly, interactive television goes beyond the convergence of devices; rather, enabled by these technologies, iTV is going to satisfy growing consumer demands for a myriad of easily accessible services, all available on one platform: "As the ways in which content for television is produced, delivered, and consumed are transforming, content must become 'scalable' so that it can be used in different environments and

delivered via different network infrastructures… Convergence is not just about technology. It is about services and about new ways of doing business and of interacting with society" (Molyneux, 1999). The trend of technological convergence goes hand in hand with the consumer demand for unprecedented control over their television viewing experiences.

6.2 EXAMPLES OF NEXT GENERATION ITV

Many of the prototypes from the American Film Institute's eTV Workshop provide excellent examples of next generation iTV programs and applications. As exemplified by examples such as *Battlestar Galactica* and *Dinosaur Highway*, networks are experimenting with the convergence of gaming and television more than ever. In the 2004 workshop, MTV Networks teamed with the AFI to prototype *Hijack*, an application that allows viewers to play games on top of music videos. *Hijack* offers a series of ten mini-games running over music video programming on a 24/7 basis. Most of the games are variations of a "shoot-'em-up" game. One game in particular, "Pixel Boi," allows viewers to use their remote controls to make a character break dance over a video to the beat of the music. Weekly *Hijack* culminates with a one-hour show that pulls competitive highlights together in the weekly "Game Zone," and allows players compete against each other for prizes (American Film Institute, 2004; Swedlow, 2004b).



(a)

(b)

Figure 6.3 Examples of MTV Hijack (a) and (b)

As evidenced by Figure 6.3, *Hijack* may not look like any interfaces that we are used to today, but such ideas will most likely be prevalent in the future. The concept for *Hijack* works especially well for MTV by addressing the problem that viewers tend not to stay tuned to music video programming for very long. Taking advantage of the fact that viewers don't need to pay close attention to the visual information of music videos, which are broadcast repeatedly, MTV has incorporated gameplay as a way to retain viewership, create contest, and convene a community surrounding the traditionally passive genre of music videos.

Also at the 2004 AFI eTV Workshop, for the first time, a prototype was designed to be produced only to air on broadband and not on a television. *Living for the Weekend*, on Scripps Networks, was prototyped to air exclusively on MSN Video Service as a video platform and soon via IPTV. This application uses Windows Media Player and the MSN Video Service, and its metapane and accompanying dynamic advertising facility:

> Scripps Networks' Living for the Weekend is composed of hosted wraps, stand-alone segments, sponsored interstitials and a special interactive, short-form lifestyle feature for an emerging "broadband primetime" viewing audience. The content in this prototype is co-branded with CoverGirl, and includes eight, two-minute segments like Molly Beeson's "2 Minutes of Style," Kathy Smith's "Secrets to Healthy Living" and Sebastian Siegel's "21st Century Man." The show

can be viewed in its linear form, or deconstructed for on-demand viewing of selected segments (American Film Institute, 2004).

Figure 6.4 shows examples from the *Living for the Weekend* prototype.

Figure 6.4 Examples from Living for the Weekend (a) and (b)

With programming produced only to air online, the Web could very well become another medium to access interactive television content on demand. Neither the *Hijack* nor *Living for the Weekend* prototypes from the 2004 workshop were deployed following the workshop. However, they illustrate some new creative directions that iTV will venture into in the near future.

6.3 BUILDING COMMUNITY

One of the most exciting aspects about iTV is its potential for convening large audiences, either by connecting existing communities around programs that traditionally enjoy a loyal following, or by creating new communities around programs and events through compelling interactivity. Tracy Swedlow forecasts that:

> Those producing ITV shows and applications, eventually, will soon discover that not one, but hundreds, thousands, or even millions of viewer interest groups will form around the context of shows – each with a different perspective, agenda, and style of communications. Ultimately, this will encourage and eventually require

> television producers to create shows that consider the shared group communications dynamic experience (possibly for many related groups independently at once) and not the individual or the mass audience solely as a viewer unit. Community or public television in other words will, potentially, – at last – emerge when ITV technologies make video and data content a platform for discussion and participation (2000).

As we discussed in chapter three, participation is one of the key elements inherent to television genres such as sports, dramas, and reality programs, where viewers are always eager to participate and weigh in with their opinions. And as we have seen in chapter five with examples such as CBS' *C.S.I. Interactive*, and ABC's *Celebrity Mole: Yucatan*, compelling interactive content can do a great deal in convening an audience around a television program.

Ben Cunningham concurs with Swedlow regarding iTV's potential to turn television into programs targeted at large special interest groups; this model of large-scale, conversation making, high-rating TV is what he calls "Event TV" (2003). According to Cunningham, "Interactive TV technology allows us to turn TV shows into events, because the public can now participate easier than ever before. Event TV is a great platform driving Interactive TV usage as it allows greater levels of participation, and gets the nation talking" (2003). In addition, this model of television broadcasting is well suited to multi-platform applications using the Web, TV, mobile and gaming devices. Michael Grade, the former chief executive of the U.K.'s Channel 4 Television, said that interactive television may be something to "make the event more eventful" (quoted in Gawlinski, 2003).

While iTV convenes communities, it also promises to provide users with richer, more personalized entertainment. It will evolve toward new levels of social interaction, both through the network and in the future, directly with each other. Another model of community that may evolve in the realm of iTV is that of a peer-to-peer one. We have

already seen the power of peer-to-peer networks with file sharing on the Internet. Now, with music sharing, wireless gaming, and mobile telephony, our media devices will expand what we can share and play with our peers. Set-top boxes that are connected to the network will allow users to forward content to one another the way the Internet affords. Other user-generated content might evolve to the point where groups have their own backyard TV channels. Adams, Anand & Fox predict that iTV will evolve into what they call the network model of iTV: "Intelligence and content will be distributed to the network, iTV will become increasingly mobile, and multiple technologies and media will converge on one device or be built into many different single devices. No longer will iTV be device-centric, as it is today, but it will become network-centric and will become an increasingly inseparable part of our lives" (2001).

More interestingly, we may be beginning to see that the movement toward Event TV is coinciding with the passing of our need for channels. For example, viewers are increasingly recording and watching programs on DVRs, which allow viewers to select what they want to watch by program, actor, or director, among other parameters. This model of on demand viewing eliminates a viewer's dependency on channels and network scheduling.

6.4 THE IMPORTANCE OF USER-CENTERED DESIGN

In this document I proposed interaction design principles for interactive television from the visual culture and usability perspectives. However, a critical component that has been missing so far in the design process has been the importance of user-centered, or viewer-centered, design. The field of usability represents a design approach that puts the user, rather than the system, at the center of the design process: "This philosophy, called

user-centered design, incorporates user concerns and advocacy from the beginning of the design process and dictates that the needs of the user should be foremost in any design decisions" (Lamont, 2003b). As it is well known in the human-computer interaction field, the core of philosophy behind interaction design is to "put the user first, keep the user in the center and remember the user at the end" (Dix, Finlay, Abowd, & Beale, 2004).

In the realm of interactive television, understanding the users, or the viewing audience, will enable interaction designers to identify reasons why people watch certain television programs. This knowledge, in turn, will help designers to produce the most compelling and interesting interactive content for that particular program and its audience. Unfortunately, during the design of iTV applications, the user-centered approach is rarely practiced. Figure 6.5 outlines the ideal interaction design process as outlined by Dix, Finlay, Abowd, & Beale (2004).

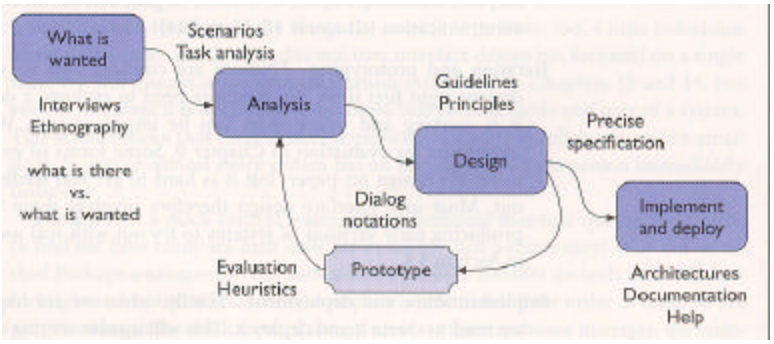


Figure 6.5 Interaction Design Process

Table 6.1 outlines some established examples of usability research tools and techniques from the field of human-computer interaction that can be effectively applied to testing the effectiveness of iTV prototypes (Gawlinski, 2003).

Table 6.1 Examples of Usability Research Tools and Techniques

Tool	**Explanation**
Card sorting	Can be used to help understand how viewers structure a topic or issue in their minds. Users categorize words or concepts written on cards. Results can be fed into the navigation design of a service and the requirements.
Paper prototyping	Quick and easy sketches of aspects of an application, aimed at helping clarify requirements and at highlighting issues.
Heuristic evaluation	Evaluating a service based on a specific set of principles (a technique known as expert evaluation is similar but more open-ended).
Walkthroughs	Predicting and testing the usability of a service by working through the experience of using it (asking what actions users would expect to take at various points, for example). It's very useful to watch videos of users doing walkthroughs.
Think aloud techniques	Users say what comes to mind during testing.
Journal studies	Asking users to keep journals of their daily experiences and use of a particular service.
Button hit records	Recording the number of button presses uses take to perform particular tasks.
User surveys and checklists	Questions or items on particular issues or aspects of the design and navigation.
Contextual research and ethnographic research	Observing user behavior in real-world contexts.
Eye tracking studies	Actually following how people's eyes move across the screen.
Scenario analysis	Examining how users perform different tasks in specific contexts and circumstances.

Sheri Lamont, who has practiced and written specifically about applying user-centered design processes to designing for interactive television, advocates using heuristics and walkthroughs as soon as storyboards or mock-ups of the initial design have been created. According to Lamont, heuristic evaluation (Nielsen, 1994) and the streamlined cognitive walkthrough (Spencer, 2000) are two types of usability evaluations that can be conducted very early in the design process, be done on low-fidelity prototypes, and do not require a lot of money and time for them to be completed (2003a).

Another established approach in HCI is the creation of "personas," or models of different types of viewers, which are imaginary persons who represent the core user group of an application. Personas, which are presented in vivid narrative descriptions, are constructed based on user goals, attitudes, and behaviors distilled from observation or interviews. For example, one persona might be a housewife with school-aged children who watch primarily daytime soap operas; another persona could be a college student with TiVo who watches crime dramas and movies late at night and on the weekends. It is useful to construct and study personas that represent a large percentage of viewers. Based on these, designers can consider how each persona might use their interface and design based upon these considerations (MIT Communications Forum, 2004).

The design principles I proposed in chapter five are represent only one component in the larger scheme of good interaction design practice. In order for an iTV experience to be as successful and compelling as possible, many parties must work together in the design process and they must follow the cycle depicted in Figure 6.5. User-centered design and iterative design practices should not be forsaken for the sake of convenience.

6.5 THE NEED FOR COLLABORATIVE DESIGN

ITV is a new medium in its own right; it is neither computation nor television but a medium that is better than both. In order to design effectively for this medium, there is a growing need for interdisciplinary design. To succeed, experts from many disciplines – graphic design, human-computer interaction, ethnography, and industrial design, to name a few – will all need to work together. This interdisciplinary approach is especially important taking into account the principle that interactivity must be conceived into the program at its conception, in close collaboration with producers and writers, in order to ensure the best overall interactive experience. As Bretan and Kroon put it, there is a necessity for "concurrent engineering" in interactive television design (1996). The need for collaborative design will drive the best interaction experiences for the future.

6.6 FUTURE DIRECTIONS

The interactive TV market is growing at a remarkable rate. In recognition of the increasing importance of interactive media and its role in enhancing and transforming the television viewing experience for consumers, the Academy of Television Arts & Sciences (ATAS) established the new Emmy Award category for Outstanding Achievement in Interactive Television Programming in 2002. According to the criteria, the original interactive content must engage the viewer synchronously, or in a manner that is integrally related to the content of a specific television program ("Television Academy," 2002).

According to Bryce Zabel, Chairman and CEO of ATAS, "The establishment of this award is a significant event in the history of television as it recognizes that interactivity is an important and growing part of the television viewing experience… This

recognition of outstanding achievement in ITV by the Academy will add even more credibility to the efforts of those currently working in the industry, and will encourage others to share their vision of what the medium can become in the years ahead" ("Television Academy," 2002).

In its inaugural year, HBO's *Band of Brothers* DVD set received the first Emmy for Outstanding Achievement in Interactive Television Programming. The interactive experience features both synchronous and asynchronous components. The synchronous element allows viewers to activate text overlays that deliver factoids and other significant details about the program throughout viewing. The enhanced component of the DVD, on the other hand, offers viewers asynchronous access to character biographies, a "chain of command" explaining various military ranks, a map, a detailed WWII timeline, and episode synopses (see Figure 6.6).

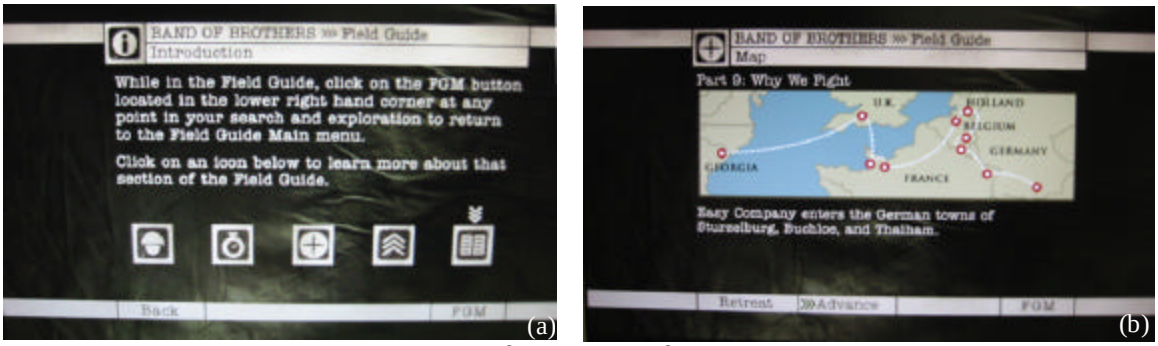


Figure 6.6 Examples from Band of Brothers (a) and (b)

In the U.S., another key player in the development of iTV, the American Film Institute, has also made recent changes in response to shifting market needs. The AFI announced in March, 2005 that its annual AFI enhanced TV Workshop will become the Digital Content Lab. The announcement for this change speaks to the convergence of technologies and forward thinking about the evolution of entertainment media:

> Our efforts over the last seven years to discover the digital, interactive future of television have extended to some previously unexpected places. As digital media became more prevalent and efficient, we found ourselves developing "TV" properties on cell phones, for game consoles and broadband, and anywhere else the bits and bites would take us. It no longer seems important that we confine ourselves to the traditional definition of television, but rather that we look instead to a future of entertaining and informing viewers wherever and whenever they want it. Hence our name change to the AFI Digital Content Lab (AFI DCL, 2005).

Unlike the eTV workshop, which was an annual production process beginning in July and ending in December, the AFI DCL will be in production year-round. In addition, the AFI DCL is more ambitious in its hopes to guide productions from prototype to deployment.

It is worthwhile to keep in mind that in the long run, "interaction is governed by our biology, psychology, society and culture… As each new technology matures, customers are no longer happy with the flashy promises of the technology but instead demand understandable and workable designs… Technology may change rapidly, but people change slowly" (Norman, 2002). As these mediums merge technically, it will be some time before the appropriate language and form of iTV develops fully.

The former tagline of the AFI's eTV Workshop read: "Someday we'll just call it television." Today, however, perhaps even the emerging vision of interactive television is giving way to a more dramatic transformation of entertainment media as a whole. If this is true, iTV will play a key role in the midst of this transformation. We are witnesses to the advent of a new medium, comparable to the inventions of the book, the photograph, and the moving image. The interaction design community needs to better understand the opportunities afforded by each medium in this equation, and thereby create successful bridges between them in order to give shape to an entirely new expressive medium.

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GLOSSARY

ADVANCED TELEVISION ENHANCEMENT FORUM (ATVEF)

A cross-industry alliance of companies representing the broadcast and cable networks, television transports, consumer electronics and PC industries. ATVEF has defined protocols for HTML-based enhanced television.

ANALOG

An analog signal is any continuously variable signal, unlike a digital signal which uses discrete values. Analog signals are susceptible to noise when copied or transmitted over long distances.

ANTI-ALIASING

Anti-aliasing, also known as smoothing, is a technique of blending bitmap-based images and text to reduce the jagged appearance of aliased text. The process of anti-aliasing blends the edge pixels in areas of transition to give the text a smoother looking appearance.

ASPECT RATIO

The width-to- height ratio of the screen or monitor. Two aspect ratios are in common use for television: 4:3 (standard) and 16:9 (widescreen).

BROADBAND

A network capable of delivering high bandwidth, used by Internet and cable television providers.

DIGITAL TELEVISION (DTV)

DTV, which will ultimately replace the analog NTSC signal in the U.S., uses digital modulation and compression to broadcast video, audio and data signals. DTV allows for more channels to be carried in the same amount of bandwidth, high definition programming, and a switchover to the 16:9 aspect ratio.

DIGITAL VIDEO RECORDER (DVR)

A DVR records television programming onto a hard disk in digital format, which enables users to time-shift through recorded media. Commercial examples include TiVo and ReplayTV.

ELECTRONIC PROGRAMMING GUIDE (EPG)

An EPG allows viewers to have interactive access to television broadcast schedules and additional information about programs. Additional functionalities and features, depending on the device and service, can include one-touch recording, program summaries, search by genre or channel, immediate access to the selected program, reminders, picture-in-picture, and parental control functions.

ENHANCED TELEVISION (ETV)

See Interactive Television

EXTENSIBLE MARKUP LANGUAGE (XML)

A general-purpose markup language for creating special-purpose markup languages. XML has been chosen as the standard for producing interactive applications because of its ability to be understood by both people and machines, its general acceptance as an open method for transferring data, and its compatibility with all of the major iTV platforms.

HIGH-DEFINITION TELEVISION (HDTV)

A digital broadcast television signal with a higher resolution than NTSC. An HDTV-compatible TV usually has a 16:9 aspect ratio.

INTERACTIVE PROGRAMMING GUIDE (IPG)

See Electronic Programming Guide

INTERACTIVE TELEVISION (iTV)

Any television or video programming that incorporates enhanced content or some style of user interactivity, for example, providing synchronized trivia content during a broadcast, allowing viewers to vote on the outcome of a show, or digitally recording video onto a hard drive so viewers can time-shift while watching a program. ITV is also used as an umbrella term to cover the convergence of television with digital media technologies such as computers, personal video recorders, game consoles, and mobile and wireless devices, enabling user interactivity.

MEDIA CENTER

Media centers, or PC TVs, are personal computers equipped with TV tuner cards. A commercial example is the Microsoft's Windows XP Media Center Edition PC.

MULTIPLE SYSTEM OPERATOR (MSO)

Cable operators that own a number of different networks and services.

NATIONAL TELEVISION STANDARDS COMMITTEE (NTSC)

The committee formed to determine the guidelines and technical standards for monochrome and color television. Also used to describe the analog television system in use in the United States and several other parts of the world.

PERSONAL VIDEO RECORDING (PVR)

See Digital Video Recorder

PIXEL

Pixel stands for **Pic**ture **El**ement. A pixel is the smallest individual unit in an image.

SET-TOP BOX (STB)

A device that connects to a television and some external source of signal, such as a telephone or cable line, DSL, or satellite dish, enabling content such as video, audio, interactive games, or an Internet connection, among others.

SHOPPING

Purchasing goods and services through the television. Also known as “tcommerce.”

TCOMMERCE

See Shopping

VIDEO ON DEMAND (VOD)

VOD systems allow viewers to select and watch video content on their television over a network. VOD systems are either streaming, in which viewing can start as the video streams over the network, or download, in which the program is downloaded in its entirety to a set-top box before viewing starts. Near Video on Demand (NVOD) systems are streaming systems in which viewers wanting to watch a program are batched up for the next start time, which occurs in staggered intervals.

WEB-BASED ASYNCHRONOUS

Web-based asynchronous iTV applications differ from Web-based synchronous ones in that the enhanced content does not need to be delivered or viewed by the user during the broadcast itself and is not time sensitive. Instead, users can browse the interactive or enhanced content on the Web at any time to learn more about the show and to interact with relevant content.

WEB-BASED SYNCRHONOUS

An iTV application is one in which interactivity is synchronized with the broadcast of the program itself. This type of programming takes advantage of a two-screen application in

which a television and a personal computer are in the same room and are simultaneously utilized by the viewer.

WEB TV

A television set especially designed (or connected using a set-top box) to allow an Internet connection. A commercial example is MSN TV (formerly WebTV).

XML

See Extensible Markup Language