

The Accessibility of Interactive Digital Television

John Gill

john.gill@rnib.org.uk

Sylvie Perera

sylvie.perera@rnib.org.uk

*RNIB Scientific Research Unit,
Falcon Park, Neasden Lane,
London NW10 1RN, UK*

Keywords: Usability, Inclusive design, Customisation, Standards

Abstract

Interactive digital television [iTV] is a potential revolution in home infotainment which, if accessible, can improve the access to information for people with disabilities. Unfortunately a digital divide has arisen between those who have access to digital technology and those that do not - the latter are mainly elderly people. As people age they can suffer from decreasing sensory, mental and physical abilities e.g. increasing visual impairment. Applying inclusive design by adopting a user-centred approach to iTV could make it accessible and bridge this gap. Smart cards provide a viable means of configuring the system to the user's specification. What do people want and require? How should these features be designed? Where do the parameters lie? This paper describes research to identify user needs for access to iTV and discusses methods for implementing inclusive design in this area.

The potential of the television system is unlimited but what if people cannot access this developing form of technology; they will be denied a fundamental element of our culture. Beyond entertainment, iTV could become a lifeline for some people by maintaining their independence and subsequently empowering them. To decrease the digital divide - between those that have access to digital technology and those that do not - the concerns of those not up-taking digital television i.e. the elderly, need to be addressed [Consumers' Association, 2001]. A by-product of decreasing the digital divide would be a lessening of the burden on society. Some visual impairments such as presbyopia, macular degeneration and cataracts are age related. There is a high positive correlation between the prevalence of visual impairment and age, so designing for visually impaired people will benefit the increasing ageing population.

Radios and televisions differ sufficiently for some visually impaired people to prefer the company of their television to a purely auditory output. Although it may be surprising that 94% of visually impaired people watch television, it is not so implausible when presented with the fact that only 7% of visually impaired people are totally blind with no light perception [Bruce, McKennel, & Walker, 1991]. From this we can infer a high proportion of visually impaired people have some useful vision although this may vary in its manifestation e.g. some people may have only peripheral vision whereas others have patchy vision covering their entire visual field. "Already some people, most notably the partially-sighted, have heard of interactive television's convenience, sought to use it - but found services inaccessible" [Kay, 2000]. Used as a communication device or information point nestled in the heart of the home, for many elderly and visually impaired

people iTV could improve their quality of life, if it is accessible. Presbyopia occurs around middle age to most of the population and causes a decrease in the ability of the eye to focus at different distances. People may require longer to view information on the screen as their visual accommodation adjusts. Some people have to move closer to the screen to view textual information but they are reluctant to do this. They may also have to put their glasses on and off as they focus on the remote control and screen in quick succession as is necessary with interactive functions. The poor design of some systems make them difficult to use and at worse inaccessible so research was deemed necessary to counteract this. Good design for people with impairments is frequently good design for everyone.

Inclusive Design

It is very difficult to determine the numbers of people that are excluded from accessing digital television as data is sparse. A subset of those who cannot access iTV, includes people who have digital television, but are restricted in their access because the usability of the system does not correspond to their needs so only some of the features are accessible. For example a totally blind person whose children coerced them to purchase an iTV but they themselves cannot read the electronic programme guide.

For seamless functionality, usability based on a thorough understanding of users' needs should be a primary concern. As people age they can suffer from a decrease in their sensory, mental and physical abilities. Additionally, the effects of multiple impairments are significantly more than the sum for the separate impairments. The wide range of television users' needs and requirements may differ considerably so it is not surprising that they may conflict. For example if a visually impaired person wants audio description – when the gaps in the dialogue are used to aurally describe visual information do not want could prove annoying to other people who while simultaneously watching, do not want this feature; headphones or another solution would have to be adopted.

Usability

Higham [2001] thought there was a need to persuade designers to think harder about usability i.e. to identify and understand users' expectations, characteristics, limitations, needs, as well as the task functionality and environment. Many people learn to use the service by trial and error [Counterpoint, 2001], finding services by accident or remaining unaware that they had interactive options available. These reactions illustrate uninitiated design. Guidelines need to be determined - based on scientific principles and specifically for television - that will enable designers to create designs according to the needs of the people that will utilise the systems.

By adopting a user-centred approach and finding out what people want from this media, industry's mission can be complemented. For example, making an iTV application accessible would enable an old lady (without a computer) to buy her groceries though her television and she may then purchase things she doesn't usually buy e.g. because they are too heavy to carry. Instead of a trip to the video shop, 'Video-on-demand' can supply films at any time to people who find shops inaccessible. An untapped potential market is lying dormant. Being able to shop from home will not only aid mobility impaired people

but those who may have other impairments whether temporary or permanent e.g. people who have had an accident.

Customisation and Smart Cards

iTV multimedia must be multimodal [e.g. with audio and visual cues] to account for different needs, with the option to dis/enable specific features. Over-specified functionality with numerous options, decreases the ease of use of a system, customisation could alleviate this. Customisation is the ability for the user to specify their own configuration. This would allow the configuration of the presentation – layout, contrast etc. - and functionality of the system – simplifying any interaction. An option to display a system specifically to suit any user's needs could be useful to everyone. Elderly people or those with impairments would also benefit.

Smart cards could provide a viable method of customising iTV and other systems. The user's preferences are stored on the smart card so when it is inserted into the system, it will reconfigure the display appropriately according to the coding on the card. On iTV, smart cards could be used to control: text size; content layout; speech output; colour combinations; subtitles; audio description; signing; timeouts; reminders and alerts; mode changing capabilities according to level of expertise etc. [Gill, 2002]. In the future one card may suffice for use on many devices: a multi service pre-payment card [Gill, 1994].

The facility to store a user's preferred interface on a smart card was studied by the EU Saturn project [Gill, 1996]. This resulted in the European standard EN 1332-4 which is now being incorporated in a range of systems. Current work is proceeding to extend the standard to cover facilities needed by disabled users in a range of new systems and services.

Usability Evaluation Research

There is no previous scientific research to indicate how elderly people or those with impairments use iTV or how information should be provided to them. So the initial work was undertaken with visually impaired viewers to determine how they interact with a generic HTML simulated iTV system and how they regard presentation of information on iTV. There were ten subjects who had a range of visual impairments. They were set three tasks to prompt them to comment on the design and interactions: to change the contrast; to change the text size; and to change the colour combination.

The results showed a wide range of different requirements for user interfaces which the user would like to select for themselves. It also indicated the majority of visually impaired people tended to use numerical keys to navigate through the menu system and in terms of preference a significant difference was found for numerical buttons over arrow and OK buttons, $X^2(2) = 6, p < 0.05$. This implies that it is important for menu options to be numbered so for some people especially the totally blind, number sequences can be used to navigate to an option. Numerical buttons can also require less button presses.

