



Summary of research on the ease of use of domestic digital television equipment

Publication date: **8 March 2006**

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Section 1

Introduction and background

- 1.1 Digital switchover provides the consumer electronics industry with the opportunity to supply new digital television receivers that will bring consumers a wider choice of channels and new interactive services. To help ensure that all consumers, including those currently relying on analogue only television reception, embrace and fully utilise the new digital services it is important that the receiver equipment is easy and convenient to use.
- 1.2 Ofcom has a duty under Section 10 the 2003 Communications Act to promote the development and availability of easy to use consumer equipment, and this report provides a summary of the research conducted by the ITC and Ofcom over the last three years on digital television receiver equipment usability. The intention of this report is provide background information on equipment usability for stakeholders involved in the practical management and implementation of digital switchover, including Digital UK, equipment manufacturers, and broadcasters. Ofcom does not plan to conduct further research in this area but it is willing to provide additional information and insights gained from the research if required.
- 1.3 This report describes recent user and expert evaluations of available digital television products and services which has informed the development of two prototype checklists for:
 - 1.3.1 the design of easy to use digital television receiver equipment including on-screen guides and remote controls; and
 - 1.3.2 the provision of easy to use installation and set-up instructions for digital terrestrial television receivers.
- 1.4 The objective of these checklists, which are reproduced in full in sections 3 and 4 of this report, is to provide an informed starting point for equipment manufacturers to develop and refine their own good practice design guidelines for digital television receiver products and services. Whilst these checklists have been developed on a technology neutral basis, and are potentially applicable to all digital television platforms, they are expected to be of most use for the Digital Terrestrial Television (DTT) platform where there is greater scope for variability between the user interfaces and equipment usability provided by different equipment manufacturers. These reasons for the greater receiver equipment variability on the DTT platform compared with satellite, cable and broadband IPTV services are described below:
 - 1.4.1 Free-to-view and/or subscription digital television services are available in the UK via satellite, cable, terrestrial and broadband. Currently, there is a single television platform operator in respect of digital satellite, each cable network and each IPTV broadband network. As a consequence, these operators control the design and supply of the equipment used to receive the service, the installation of the equipment, and the look and feel of technical services, such as electronic programme guides, provided to end-users.

- 1.4.2 In contrast, no single entity controls the digital terrestrial television (DTT) platform. (“Freeview” is an umbrella brand used to market existing DTT services.) Consumers have a range of receiver devices which they can choose to purchase and install themselves in order to receive DTT broadcasts. As a result, there is substantially more variation in the look and feel of the user interface (including the layout of the on-screen display and remote control) within the DTT market.
- 1.4.3 Operators which control their own platforms can more easily incorporate well designed user interfaces, because they control the whole system design. They are also more likely to reap the benefits of good usability - an improved experience for the consumer leads to more happy customers, and to reduced support and help-line costs. Such operators supply only a few different types of remote control handset and few, if any, variations of on-screen user interface. This means that it is easy for installers to give well rehearsed tuition to new users, and that help-lines can quickly identify solutions to caller queries because they do not have to spend time finding out what type of handset is being used.
- 1.4.4 Platform operators such as Sky, ntl, Telewest, KiT and HomeChoice have put considerable effort into well-designed user interfaces. In some cases this has extended to easy access to subtitles and audio description, and to recording using hard-disk based recorders. The Sky+ personal video recorder is a case in point; it was reported to be very popular with users for its ease of use in the Go Digital trial, a project that took place in the West Midlands in 2002 that focused on consumer experience of digital television.

Figure 1: Sky+ Personal Video Recorder (source: BSkyB)



- 1.4.5 As the operators of single-operator platforms have full control over the end-user experience on those platforms, the emphasis of the research reported here was largely directed towards DTT receiver equipment. Of course, many of the themes identified can apply to the optimisation of non-DTT digital television products and services.
- 1.5 Earlier research conducted between 2001 and 2003 by the Independent Television Commission identified that improvements to the ease of use of domestic digital television equipment could make digital television services more attractive to a much wider range of viewers. The interested reader is referred to two research reports describing this early work.

- 1.5.1 The first described a study conducted to benchmark public perceptions of the ease of use of different domestic products and services, including digital television¹.
 - 1.5.2 The second described research that identified the consumer groups most likely to benefit from easier to use digital television equipment and services, and the equipment design changes most likely to provide greatest improvements in its ease of use².
 - 1.5.3 These two research phases were led by the Independent Television Commission, in a joint initiative named 'Easy TV' in collaboration with the Consumers' Association (Which?) and the Design Council.
- 1.6 Section 2 of this report describes the follow-on research used to develop good practice design checklists for easy to use and easy to set-up domestic digital television equipment. These research activities were conducted in close collaboration with industry, in particular the UK Digital Television Project's Technical Equipment Group, and its DTT converter sub-group TEG-C, the Digital Television Group (DTG) Domestic Systems Group, and the manufacturers' representative body Intellect, to ensure that the focus of the research was of most relevance and use to industry.
- 1.7 In summary, the research described in this report has resulted in identification of two prototype design checklists, one for digital receiver equipment user interface design and one for receiver equipment installation and set-up instructions. The purpose of these checklists is to provide an informed starting point for equipment manufacturers to refine and develop their own good practice guidelines. Whilst the research was conducted on a technology neutral basis these checklists (provided in full in section 3 and 4 of this report) are expected to be of most use for the DTT platform where there is currently a wide variability in consumer equipment user interfaces and set-up instructions provided by different equipment manufacturers.

¹ ITC-UsE - Ease of use and knowledge of digital and interactive television: Results (Easy TV 2001 Research Report) ITC (December, 2001; research conducted by i2 media research). Available online: http://www.ofcom.org.uk/static/archive/itc/uploads/UsE_report.pdf

² Easy TV 2002 Research Report (ITC-MaTE): ITC, Consumers' Association, Design Council (7 January, 2003; research conducted i2 media research and ITS Research and Testing Centre). Easy TV 2002 Research Report (ITC-MaTE). Available online from: <http://www.which.net/campaigns/other/communications/0301easytv.pdf>

Section 2

Detailed summary of research used to identify prototype good practice design guides for easy to use domestic digital television equipment

Introduction

2.1 The research described here utilised carefully piloted multi-method research approaches, providing efficient, cost-effective and reliable results focussed on two main themes:

2.1.1 the development of prototype checklists identifying good design practice for easy to use domestic digital television equipment which included:

- the identification of intuitive, easy to understand remote control button labels for a range of functions available with digital terrestrial television³, and
- the identification of good practice in self-installation and connection instructions for digital terrestrial television

2.1.2 an evaluation of the ease of use of early DTT personal video recorders

2.2 This work was conducted in close cooperation with industry, in particular the Digital Television Action Plan, the Digital Television Project's Technical Equipment Group, and its DTT converter sub-group TEG-C, the Digital Television Group (DTG) Domestic Systems Group, and the manufacturers' representative body Intellect.

Development of Design Checklist

2.3 Having identified through earlier research conducted by the ITC a range of key design elements for easy to use domestic digital television equipment, a literature review was conducted to understand the range of abilities and key human factors characteristics of the UK population. The literature review helped to identify how many people might benefit from optimisation of the design elements identified in earlier research, and how good design practice had the capacity to improve the ease of use of digital television equipment. The main output of this work was a prototype design checklist for easy to use domestic digital television equipment, first published by the ITC in 2003. The checklist was designed as a living document. As such, it has been reviewed within both academic and industrial contexts on a regular basis since its initial development, in the light of published research results.

³ As described in Section 1, because they are provided by operators which control their own platforms, giving full installation and customer support, digital satellite and cable services were not included in this research activity.

Identification of intuitive, easy to understand remote control button labels

Objectives, methods and samples

- 2.4 The objective of this activity was to identify for DTT equipment design and development teams the terms most readily understood by a range of typical viewers for common functions available on DTT. The nine functions investigated within the research were specified by ITC in association with the Digital Television Project's Technology and Equipment Group – Converters Subgroup (DTP TEG-C). The functions were: Subtitles, Text, Exit Text, TV Guide, Now and Next, Return to Programme (Go to Sound and Vision), Back to Previous Screen, System Menu. A team of broadcast engineering experts defined the functions for which labels were sought.
- 2.5 A four stage process was designed and executed to meet the research objective. The first stage involved brainstorming by groups from the general public to find suggestions for labels for remote control buttons. A total of five discussion groups were run with five to six people per group. In total, 27 people participated in the discussion groups, with an average age of 51 years. The output of this stage was a list of suggested labels for each remote control function considered.
- 2.6 Next, the list of labels generated was screened by an expert team of broadcast engineers. The screening was conducted to remove labels suggested in the brainstorms that were inappropriate, for example because of potential for ambiguity. The output of this stage was a revision of the lists generated by the brainstorm participants.
- 2.7 The third stage of the study involved distribution of a postal questionnaire to 500 members of the public, asking them to rank the suggested labels for each of the DTT functions in their order of preference. The output was analysis of the responses, summarising respondents' expressed preferences for labels for each function. There were clear subjective label preferences for most of the functions tested.
- 2.8 In a fourth stage, a laboratory experiment was conducted with 54 non-expert participants who were asked to locate and press buttons for different functions on a virtual remote control. The virtual remote control, shown in Figure 1, was presented on a touch-screen. Accuracy and time taken to complete the task were measured. The results of this experiment were used to evaluate the extent to which performance was better with labels that were most preferred by respondents to the postal survey relative to less preferred labels. For the three functions tested in the experiment, there was close agreement between the results of the postal survey, with participants finding preferred labels faster and more accurately. The results of the remote control button labelling research and conclusions relating to the best labels for specific functions were included in the DTG D-Book (an industry standard specification for UK DTT set top boxes). In addition to this output, various aspects of the research have been presented at and published in academic and industry forums^{4 5}.

⁴ Lessiter, J., Freeman, J., Davis, R. & Dumbreck, A. (2003). Helping viewers press the right buttons: Generating intuitive labels for digital terrestrial TV remote controls. *PsychNology*, Vol 1(4), 355-377.

Figure 1: 'virtual' remote control presented on touch-screen in laboratory experiment



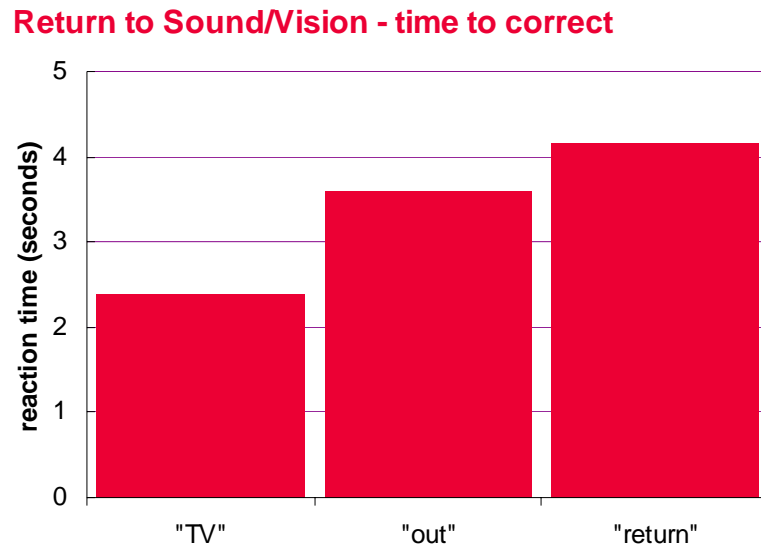
Results

- 2.9 Detailed results in relation to the identification of intuitive button labels for digital terrestrial television remote controls are available in the project reports. Here we present some key results.
- 2.9.1 Subtitles: The label 'subtitles' was preferred by 61% of respondents compared with 10% for 'subT' and 9% for the internationally recognised (standard) subtitles symbol. This result was borne out in the laboratory experiment where overall people performed well with the 'subtitles' label. 'subT' was found to be an acceptable abbreviated label, particularly for younger participants.
- 2.9.2 Back to Previous Screen (in any interactive application): For this function, 'back' was the clear winner in both preference (52% rated it as their favourite label) and performance. The label 'back up' is used on many existing remote controls. It was found to be relatively easy to learn albeit not as intuitive as 'back'.
- 2.9.3 Return to Sound and Vision (from any interactive application): 'Return' and 'TV' scored similarly in terms of preference, with 'return' slightly more

⁵ Lessiter, J., Freeman, J., Davis, R., & Dumbreck, A. (2004) Understanding DTT remote control button labelling: a multi-method approach. Second European Conference on Interactive Television (euroiTV 2004), University of Brighton, 31st March - 2nd April 2004 (oral presentation).

popular (31%) than 'TV' (26%). In terms of overall performance, participant's performance on the button identification task was better for the label 'TV' than for 'return'. As an illustration of the detailed data collected for this study, Figure 2 presents results of participants' response times to the different tested labels for the 'Return to Sound and Vision' function. 'TV' was easier than 'return' to learn, and was less easily confused with the 'Back to Previous Screen' function.

Figure 2: example graph, showing mean response times for the label options for the 'Return to Sound and Vision' function



2.9.4 Symbols versus text labels: Participants generally preferred text labels to symbols across the range of functions tested. In the laboratory experiment using the virtual remote control, the internationally recognised subtitles symbol was compared with 'subtitles' and 'subT' text labels. The symbol was found to be less intuitive and less easily learned. Symbolic labels may be helpful for some users, such as people for whom text labels are difficult to read or understand. Such users were not separately addressed in this research.

2.9.5 Preferred remote control button labels for each of the functions included in this study were selected on the basis of both subjective and behavioural data:

Function	Preferred Label
Subtitles	subtitles
Return to Programme (Go to Sound and Vision)	TV
Back to Previous Screen	back
Text	text
Exit Text	exit
TV Guide	guide
TV Guide (Now & Next)	progs
System Menu	setup

Identification of good practice in self-installation and connection instructions for digital terrestrial television

Objectives, methods and sample

- 2.10 The objective of this activity was to identify good practice in the provision of self-installation and connection instructions for DTT receivers. It was conducted through user trials with the most popular DTT set top boxes on the market at the time of the study (February – May 2004).
- 2.11 A four stage multi-method approach was designed and executed to meet the research objective. The four stages were: (a) a mystery shopping exercise for DTT set top boxes, included in recognition of the importance of a consumer having the necessary equipment (including any cables, leads, and/or batteries that may not be supplied with the set top box) and information prior to attempting to install the set top box; (b) an expert review of current practice in the provision of installation and connectivity instructions; (c) observational trials of nine novice users installing a range of (top-selling) DTT set top boxes using instructions provided by manufacturers; and (d) integration of insights from expert and user evaluations into a prototype checklist summarising best practice in the provision of instructions for self-installation of DTT set top boxes.
- 2.12 The main output of this study was a prototype good practice checklist for the provision of easy to use installation and connection instructions for DTT set top boxes. The prototype checklist is presented in Section 4 of this report in a new format.

Results

- 2.13 The outputs of the research identifying good practice in design for easy to use domestic digital terrestrial television equipment, and in the provision of easy to use installation and connection instructions, are short prototype checklists. In the following sections we present the prototype checklists.

- 2.14 In addition to the detailed points included in the checklist, some general insights were derived from the research on identifying good practice in the provision of easy to use self-installation and connection instructions for digital terrestrial television set top boxes. These are summarised below.
- 2.14.1 Optimising the purchase experience. Better purchase experiences were characterised by retail staff paying attention to: the customer's current situation; the other equipment to which the set top box would be connected; the aerial provision in the planned location of the set top box; and what the consumer hoped to achieve by the purchase. In some outlets high levels of customer service were evident. Better advice and a better service were obtained where sales staff asked more about the customer's requirements. There is a higher chance of a customer having to return to their retail outlet to collect additional leads needed to complete an installation where a salesperson does not take adequate time to understand customer requirements.
- 2.14.2 Optimising product packaging. Across the set top boxes evaluated wide variation was noted in: the quality of information provided; the simplicity of terminology used to convey the information; and the design of the packaging. As the packaging is one of the customer's first experiences of the set top box, ensuring that it attractively conveys as much information as necessary using simple clear terminology (e.g., product description, services available, which leads are included in the package, whether batteries are included) is most likely to result in a positive purchase experience.
- 2.14.3 Optimising pre-install information (all sections of the user manual presented before the connection set-up). Good pre-install information can increase a consumer's familiarity with the product. If it is attractive and interesting to read, user confidence and compliance in following the connection and set-up instructions can be raised. Characteristic of better pre-install information was: an intuitive and logical flow to the information presented; full illustrated listing of contents of packaging; provision of a 'quick start guide'; reminders of possible need to get an aerial upgrade and potential to check postcode for coverage; clearly labelled accurate images of front and rear of STB and remote control; jargon-free, accessible and concise terminology throughout.
- 2.14.4 Optimising installation information. Characteristic of better installation information was: presentation of simplest installations, such as TV-STB, and TV-STB-VCR first; a statement of which (and how many) cables an installation will require before the consumer starts the process; a statement of the functions that will be possible (and not possible) with any given configuration; separate illustrations of different set-ups; provision of information in a step-by-step flow (tied to illustrations/ images); detailing every step in the process, without assuming any step is obvious; presentation of accurate and realistic diagrams/ illustrations; presentation of legible labels on diagrams; presentation to consumers of literature without typographical or factual errors; use of consistent labels and/ or terminology in connection instructions and on the product.

Brief evaluation of the ease of use of digital terrestrial television personal video recorders

Objectives, methods and sample

- 2.15 The objective of this activity was to obtain insight into the usability of solutions for recording television after digital switchover. It was conducted through expert evaluation and small-scale user trials with three DTT personal video recorders available on the market in March 2005.
- 2.16 A three stage research process was designed and executed to meet the research objective. The three stages were: (a) a mystery shopping exercise for DTT personal video recorders; (b) an expert evaluation of the ease of use of the products purchased; and (c) observational trials of three novice participants using the personal video recorders for a range of tasks, including changing channels, finding all channels available, accessing text/radio/TV listings (EPG), timed and immediate recording, and playback.

Results

- 2.17 Results of this initial evaluation suggested that personal video recorders hold great promise as easy to use recording solutions post digital switchover. The research identified a number of areas for potential improvement in terms of ease of use for current (DTT) personal video recorder products. Improving ease of use in relation to these areas will maximise the benefits of personal video recorders for consumers with limited expertise in using technology.
- 2.18 The mystery shopping exercise again revealed variable levels of service by retailers. A particularly important issue identified in this regard is the need for a common term for personal video recorders to be used in any communications with consumers.
- 2.19 The expert evaluations and user trials conducted for this activity revealed several of the same themes described above reference the evaluations reported above of digital terrestrial television set top boxes. These were in relation to product packaging, connection instructions and operation.
- 2.20 Consistent themes were identified with regard to the ease of operation of the personal video recorders tested. Participants appreciated: (a) the use of intuitive terminology, symbols and labels, both on-screen and on the products' remote controls; (b) clear signposting and good error prevention; (c) clear feedback as to what they were viewing (i.e., whether they were watching broadcast television programmes, programmes recorded previously, or time shifted programmes); (d) remote controls designed according to good practice; and (e) presentation of on-screen information consistent with good practice.
- 2.21 Results of this preliminary evaluation of the usability of personal video recorders have been shared with key stakeholders, including receiver manufacturers, Intellect, the Digital Television Group, and Government (Department of Trade and Industry and Department for Culture, Media and Sport).

Section 3

Prototype good practice design checklist: user interface design for digital television receivers

- 3.1 The following checklists are based on a mixture of new research and reviews of the literature. They summarise insights obtained into what design aspects of domestic digital television receivers users tend to find easy and difficult to use. Each insight summarises design features that have been found to work well. References are included to lead readers to more detailed information.
- 3.2 The lists are intended to be living documents, and Ofcom would welcome feedback with suggestions for new items or revisions. This can be sent to mailto:dtv_usability@ofcom.org.uk and captioned 'DTV Usability March 2006 – comments'.
- 3.3 Research involving a range of users with different abilities indicates that the following features tend to be associated with good ease of use of domestic digital television equipment:

A. The remote control

1. Handsets

Handsets that users tend to find easy to use are those that are:

- well balanced and sized, and shaped to be held and manipulated using either hand^{6 7};
- easy to grip, made from non-slip material^{6 8};
- easy to read and have glare free labels that can be read in various lighting conditions⁹;
- able to operate the digital receiver from a wide range of angles, so not requiring an accurate aim of the handset^{9 10};

⁶ ITC/Consumers' Association (Freeman, J., Lessiter, J., Williams, A., & Harrison, D.) (January, 2003). Easy TV 2002 Research Report.

⁷ For more information on anthropometric data see Department of Trade and Industry (May, 1998) Adult Data: The Handbook of Adult Anthropometric and Strength Measurements – Data for Design Safety. DTI Publications.

⁸ Pheasant, S. (2002) Bodyspace: Anthropometry, Ergonomics and the Design of Work. 2nd Edition. Taylor & Francis.

⁹ RNIB (2000) Guidelines for the design and development of a universal TV/VCR remote control unit for visually impaired people: <http://www.rnib.org.uk/wesupply/products/remote.htm>, accessed 2003.

¹⁰ Gill, J. (2002) Inclusive Design of Interactive Television: <http://www.tiresias.org/reports/dtg.htm>, accessed 2003.

- of a size that enable larger buttons, labels, and spaces between buttons⁶.

2. Button layout and design

Button layouts and designs that tend to help users are those that:

- group buttons of similar functional categories together^{11 12};
- vary the spacing between buttons¹¹;
- position the most frequently used buttons in easy to find locations^{11 12 13 14};
- use a raised dot ('nib') on the number '5' button^{11 12 15};
- position buttons in a way that is consistent with functions, for example positioning the "channel up" button above the "channel down" button; or the "volume up" to the right or above the "volume down" button¹⁶;
- have button shapes that are consistent with their function, for example using arrow shaped buttons for navigation^{12 16};
- use concave buttons with clear ridges to make them easier to find and more comfortable to press^{11 16};
- accurately represent the colour buttons (red, green, yellow, blue), in the order they appear in on-screen menus, and that do not use any of the colour buttons more than once^{12 14 17};
- have good contrast between the buttons, labels and background^{11 16};
- use buttons of a size that are large enough to select discretely^{11 12};
- use toggle buttons to a minimum, and where they are used, that switch between as few states as possible¹¹;
- provide a simple feedback mechanism to confirm a button press (e.g., a click)¹⁸;
- include clear, legible, and durable button labels that are consistent with any on-screen text^{19 20 21 22}.

¹¹ RNIB (2000) Guidelines for the design and development of a universal TV/VCR remote control unit for visually impaired people: <http://www.rnib.org.uk/wesupply/products/remote.htm>, accessed 2003.

¹² ITC/Consumers' Association (Freeman, J., Lessiter, J., Williams, A., & Harrison, D.) (January, 2003) Easy TV 2002 Research Report.

¹³ e.g., DTP-TEG-C(03)2 Draft Minimum Remote Control Specification for DTT adaptors.

¹⁴ RNIB (Miller, C.) (March 2004) Guidelines for designers of digital TV user interfaces: http://www.rnib.org.uk/xpedio/groups/public/documents/publicwebsite/public_userinterfaces.doc, accessed 2005.

¹⁵ European Telecommunications Standards Institute (ETSI) standard ES 201 381 for tactile identifiers.

¹⁶ Trace R & D Centre, University of Wisconsin-Madison (working draft, 1992) Accessible Design of Consumer Products: Guidelines for the Design of Consumer Products to Increase their Accessibility to People with Disabilities or Who Are Ageing:

http://trace.wisc.edu/docs/consumer_product_guidelines/consumer.htm, accessed 2003.

¹⁷ Serco Usability Services (2000) Interactive TV and Electronic Programme Guides: Usability Guidelines: <http://www.usability.serco.com/research/susepgguide.pdf>, accessed 2003.

¹⁸ Trace R & D Centre, University of Wisconsin-Madison (working draft, 1992) Accessible Design of Consumer Products: Guidelines for the Design of Consumer Products to Increase their Accessibility to People with Disabilities or Who Are Ageing:

http://trace.wisc.edu/docs/consumer_product_guidelines/consumer.htm, accessed 2003.

- use symbols to a minimum, and only standard (or very clear) symbols²²;
- enable buttons to be intuitively differentiable by size, shape and texture^{19 22 23}.

B. The on-screen display

1. On-screen text – Physical properties

Physical properties of the text that tend to help users are those that:

- use good contrast between text and background^{19 20 24 25};
- have a limited number of colours on any screen²⁵;
- use only well understood symbols and colour conventions^{24 26};
- apply a text style that is legible and readable (e.g., with consideration given to font, weight and case)^{20 24 27};
- use fonts of sufficient size, ideally with user control of font size^{19 23 24 28};
- have minimal well spaced text in on-screen menus^{22 29};
- do not use moving text^{22 24};
- use rules, guides and markers to optimise clarity of information layout and help direct the user's attention^{22 24};
- are consistent (e.g., across different menus and pages, between on-screen prompts and remote control buttons, and in button sequences for different functions)^{30 31}.

¹⁹ RNIB (2000) Guidelines for the design and development of a universal TV/VCR remote control unit for visually impaired people: <http://www.rnib.org.uk/wesupply/products/remote.htm>, accessed 2003.

²⁰ Silver, J., Gill, J., Sharville, C., Slater, J., & Martin, M. (2000) A new font for digital television subtitles: http://www.tiresias.org/fonts/design_report_sf.htm, accessed 2003.

²¹ ITC/Consumers' Association (Freeman, J., Lessiter, J., Williams, A., & Harrison, D.) (January, 2003) Easy TV 2002 Research Report.

²² Trace R & D Centre, University of Wisconsin-Madison (working draft, 1992). Accessible Design of Consumer Products: Guidelines for the Design of Consumer Products to Increase their Accessibility to People with Disabilities or Who Are Ageing:

http://trace.wisc.edu/docs/consumer_product_guidelines/consumer.htm, accessed 2003.

²³ Gill, J., (2002) Inclusive Design of Interactive Television: <http://www.tiresias.org/reports/dtg.htm>, accessed 2003.

²⁴ RNIB (Miller, C.) (March 2004) Guidelines for designers of digital TV user interfaces: http://www.rnib.org.uk/xpedio/groups/public/documents/publicwebsite/public_userinterfaces.doc, accessed 2005.

²⁵ Darby, S. (May 1997) Enhancing the Accessibility of Digital Television for Visually Impaired People. (Edited by Paul Snee). RNIB Publication: <http://www.rnib.org.uk/wesupply/products/digtv.htm>, accessed 2003.

²⁶ Trace, University of Wisconsin-Madison [Jan 1998] Accessible Design of Consumer Products, Section 1: Output/Displays.

²⁷ For more information on the Tiresias family of typefaces see www.tiresias.org.

²⁸ Usher UK: Usher UK's Response to the Communications Bill: <http://www.usheruk.org.uk/download/uukcommsbillresp.htm>, accessed 2003.

²⁹ Office of the e-envoy, UK online: <http://www.e-envoy.gov.uk/> see Guidelines for UK Government Websites – Illustrated Handbook for Web Management Teams (May 2002) Ch. 5: Developments (5.2: Your Website on Television), accessed 2003.

2. On-Screen Text – Semantic Properties

Semantic properties of the text that tend to help users are those that:

- use abbreviated words to a minimum³²;
- where possible, accompany words with pictures or icons³²;
- use simple, unambiguous language and active, direct statements³²;
- convey important information with appropriate prominence³²;
- make good use of channel groupings (e.g., by genre) that include all available (including radio) channels to help in channel searches^{30 31 33};
- require a minimum number of button presses to reach a destination within menu structures³².

3. On-Screen Processes and Services

Designs of on-screen processes and services that tend to help users are those that:

- provide clear feedback to indicate and acknowledge delays in the system response^{31 34};
- include easy and intuitive prompts on all menus to take the user back to the previous screen and back to normal television viewing^{32 35};
- use consistent layouts (e.g., placement of icons) and processes (e.g., action-response sequences) to access information^{30 33};
- present on-screen information that corresponds directly to remote control buttons and labels³⁰;
- provide cues to users, to help navigation³⁶;
- use a minimum number of steps to complete a process;

³⁰ Serco Usability Services (2000) Interactive TV and Electronic Programme Guides: Usability Guidelines: <http://www.usability.serco.com/research/susepgguide.pdf>, accessed 2003.

³¹ Lessiter, J., Freeman, J., & Dumbreck, A. (2005) Personal video recorders: Usability insights. Product Usability in the Digital Age, 11th October 2005, Intellect Offices, Russell Square House, London (oral presentation).

³² Trace R & D Centre, University of Wisconsin-Madison (working draft, 1992) Accessible Design of Consumer Products: Guidelines for the Design of Consumer Products to Increase their Accessibility to People with Disabilities or Who Are Ageing:

http://trace.wisc.edu/docs/consumer_product_guidelines/consumer.htm, accessed 2003.

³³ ITC/Consumers' Association (Freeman, J., Lessiter, J., Williams, A., & Harrison, D.) (January, 2003) Easy TV 2002 Research Report.

³⁴ RNIB (Miller, C.) (March 2004) Guidelines for designers of digital TV user interfaces: http://www.rnib.org.uk/xpedio/groups/public/documents/publicwebsite/public_userinterfaces.doc, accessed 2005.

³⁵ See Lessiter, J., Freeman, J., Davis, R. & Dumbreck, A. (2003) Helping viewers press the right buttons: Generating intuitive labels for digital terrestrial TV remote controls. PsychNology, Vol 1(4), 355-377.

³⁶ ITC/Consumers' Association (Freeman, J., Lessiter, J., Williams, A., & Harrison, D.) (January, 2003) Easy TV 2002 Research Report.

- use shortcuts wherever possible³⁶;
- allow users to view a programme while simultaneously accessing an information service³⁷;
- minimise the need for users to repeatedly switch between screens during interactive service use³⁶;
- support direct (single-button) access to subtitles³⁶;
- keep subtitles activated until the user switches them off (i.e., that do not require reactivation after a channel change)³⁷;
- inform users if no subtitles are available for some programmes where the user has activated subtitles;
- minimise delays in system response;
- request users to specify their television aspect ratio when first installing their set top box³⁶.

C. The Digital Receiver

Designs of the digital receiver that tend to help users are those that:

- enable users to perform some basic operations (channel up/down, volume control, power on/off) without the remote control^{36 37};
- provide a simple way to reboot the set top box without the user having to disconnect the receiver from the mains.

³⁷ RNIB (Miller, C.) (March 2004) Guidelines for designers of digital TV user interfaces: http://www.rnib.org.uk/xpedio/groups/public/documents/publicwebsite/public_userinterfaces.doc, accessed 2005.

Section 4

Prototype good practice design checklist: easy to use set-up and connection instructions for digital terrestrial television set-top boxes³⁸

4.1 This checklist summarises the features of product literature (including product packaging, quick start guide and the user manual), on-screen instructions and hardware design that users tend to find helpful in the connection and set-up of digital terrestrial set-top boxes.

1. Packaging

- Package labelling that users tend to find most useful provides sufficient information about the product content and product features.

2. Pre-installation instructions

Pre-installation instructions that users tend to find most helpful are those that:

- inform users that there are different options for connecting their new equipment with their existing equipment and guide them to the most suitable option;
- specify the equipment requirements for each basic connection option³⁹;
- provide text instructions and diagrams for the most basic connection options (i.e., television only; television and video cassette recorder);
- present each connection option separately⁴⁰;
- indicate whether the set top box has re-modulated output and explains the relative merits of using a re-modulated output as opposed to a Scart connection;
- provide connection options for more complex clusters of home entertainment equipment in a separate section.

4.2

³⁸ The information contained in this checklist for easy to use connection instructions for digital terrestrial television set top boxes was based on primary research (user trials and expert evaluations) conducted by i2 media research ltd. under contract to Ofcom in 2004. All of the points contained in this section are based on these evaluations of products on sale in the UK in 2004.

³⁹ For example, you will have... [x scart sockets on television/video cassette recorder]; you will need... [x cables of each type] of which... [x cables] are provided with this product; with this connection set-up you will be able to... [functions enabled].

⁴⁰ Consumers find it helpful when the connection diagrams available show all elements present in their own equipment.

3. Step-by-step installation instructions

Instructions that users tend to find helpful are those that:

- present each connection step separately and provide both picture and text for each connection step⁴¹;
- bullet-point or number each step of the text instructions;
- document every step, including obvious steps, such as switching the products on and off;
- clearly state when the order of steps is important⁴²;
- provide in one place all the connection information a user might need⁴³;
- provide detailed guidance for set-up using the on-screen display;
- present corresponding screen shots to accompany each step of the on-screen display set-up;
- indicate when to use the television remote control and when to use the set top box remote control;
- provide troubleshooting options where appropriate⁴⁴;
- display an on-screen message to indicate if the aerial cable is not inserted correctly⁴⁵;
- avoid unnecessary on-screen display set-up options⁴⁶;
- explain how to change channels after completing the on-screen display set-up.

4. Diagrams and illustrations

Users tend to find diagrams most useful when they:

- illustrate the rear panel of the set top box as accurately as possible;
- unambiguously illustrate other products in the home entertainment set-up (e.g., television/video cassette recorder);
- illustrate the typical rear panels of other products (television/video cassette recorder)⁴⁷;

⁴¹ Consumers tend to value having both pictures and descriptions for each step, enabling them to cross-check each step.

⁴² For example, it is easier for consumers to insert the second scart plug if its socket is unobstructed by a first scart; consumers can fail to respond to on-screen instructions that they do not expect.

⁴³ Some users prefer not to have to flick between several pages in a manual, preferring a concise quick start guide.

⁴⁴ For example, 'If television pictures are the wrong colour, check scart connectors have been fully inserted'.

⁴⁵ For example, 'Check you have inserted the rooftop aerial cable. This may have previously been located in the back of your television or video cassette recorder'.

⁴⁶ Some consumers do not understand on-screen requests, for example, to choose between television output of 'RGB', 'video' and 's-video'.

- illustrate the cable connectors realistically and accurately rather than with, for example, arrows so that they are identifiable to novice users;
- have clear and readable details (e.g., sockets, labels and cables);
- illustrate all cables and connectors (including power cables shown complete with connectors);
- clearly distinguish the main aerial cable from other aerial (loop through/ re-modulated) cables⁴⁸.

5. Wording and terminology

Wording and terminology that users tend to find most helpful are those that:

- provide simple reasons why various steps are necessary⁴⁹. For instance:
 - describing the functional benefits of scart connections (e.g., picture quality and automatic functions);
 - informing that the remote controls of set top boxes could also control other products including televisions and video cassette recorders;
 - suggesting ways of checking whether digital or analogue television outputs are being viewed;
- use consistency in labelling (i.e., within the manual, and between the manual and the set top box);
- provide and describe alternative labels where appropriate (e.g., for scart sockets – AV, EuroAV, EXT);
- employ simple intuitive phrasing (e.g., ‘aerial in’ is better than ‘RF in’).

6. Hardware

Users tend to find the connection and set-up process easier when the hardware:

- provides clearly visible labels on the rear of the set top box⁵⁰;
- is supplied with suitable Scart and/or RF coaxial cables as appropriate.
- Users tend to find helpful hardware-related instructions that:

⁴⁷ Include a statement that the diagrams may not perfectly match the consumers' product(s), for example, the sockets may be in a slightly different position.

⁴⁸ Consumers are better able to identify the main rooftop aerial cable when it is represented using an aerial symbol and accompanying instructions note that it that it might ‘previously have been plugged into the back of the television/video cassette recorder’.

⁴⁹ Providing explanations increases users' compliance in following instructions and helps them with troubleshooting

⁵⁰ For example, moulded labels should be coloured to contrast with the background.

- suggest that a degree of force may be required to fully connect scart cables;
- state that the Scart cables supplied should be used for connecting the set top box to the television where possible⁵¹.

7. General appearance

Users tend to find helpful instructions that:

- appear un-intimidating and easy to read for novice user

⁵¹ Because other Scart cables may not be correctly wired.

Annex 1

Publications from this research

Academic publications and presentations based on the research described

Lessiter, J., Freeman, J., Davis, R. & Dumbreck, A. (2003). Helping viewers press the right buttons: Generating intuitive labels for digital terrestrial TV remote controls. *PsychNology*, Vol 1(4), 355-377.

Lessiter, J., Freeman, J., Davis, R., & Dumbreck, A. (2004) Understanding DTT remote control button labelling: a multimethod approach. Second European Conference on Interactive Television (euroiTV 2004), University of Brighton, 31st March - 2nd April 2004 (oral presentation).

Lessiter, J., Freeman, J., Davis, R. & Dumbreck, A. (2003). Button labelling for DTT remote controls. (Workshop presentation – position statement) HCI 2003, Workshop 8: Accessibility Issues for Interactive Television. 9 September, University of Bath, UK (oral presentation).

Freeman, J. & Lessiter, J. (2003). Using attitude based segmentation to better understand viewers' usability issues with digital and interactive TV. Euro iTV, 2-4 April, Royal Albion Hotel (hosted by The University of Brighton), Brighton, UK (oral presentation).

Oral presentations to industry forums

Lessiter, J., Freeman, J., & Dumbreck, A (2005). Personal video recorders: Usability insights. Product Usability in the Digital Age, 11th October 2005, Intellect Offices, Russell Square House, London

Lessiter, J., Freeman, J., & Dumbreck, A (2005). Personal video recorders: An easy recording solution for DSO? DTG DSG Meeting, St. Margarets, 13th July 2005

Lessiter, J., Freeman, J., & Dumbreck, A. (2004). Insights on user experience and best practice for self-install connection instructions for DTT STBs. DTG Meeting, St. Margarets, 29th March 2004.

Freeman, J., Dumbreck, A., & Lessiter, J. (2003). Understanding the Digital TV switch-over process. DTI Conference Centre, (24th November) London, UK

Lessiter, J., Freeman, J. & Dumbreck, A. (2003). A design checklist for ease of use of DTT receivers. Digital Terrestrial Television Product Usability Seminar (organised by Intellect), 10th July, DTI Conference Centre, London, UK.

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Freeman, J., Lessiter, J., & Harrison, D. (2002). The Easy TV Initiative. Digital TV Group (DTG Widescreen Forum), 27th May 2002, Royal Television Society, London, UK

Freeman, J. & Mack, C. (2002). Digital Explained. Digital Visions, A Media Literacy Event, Museum of Science and Industry, 14th June 2002, ITC Manchester, UK.

Freeman, J. (2001). The future of TV viewing – an academic’s view. The Media Research Group (MRG), Issues 2001: Preparing for Change, 8th November 2001, Royal Society of Arts, London, UK.

Freeman, J. (2001). The public’s perception of the ease of use of domestic digital TV equipment. The ITC, Design Council, and Consumers’ Association’s ‘Easy TV Seminar’, 28th November 2001, CBI Conference Centre, Centre Point, London, UK.