

**Contract Title:
Digital Television Project:
Provision of Technical Assistance**

**Contracting Authority:
Department of Trade and Industry**

**Action Plan Task 5.13
Title: Product and Interoperability Testing and
Support**



DIGITAL TELEVISION PROJECT PROVISION OF TECHNICAL ASSISTANCE

Product and Interoperability Testing and Support

6 October 2003

Final Report
Version v1.04

Project Team: Gordon Drury, Paul Segar

© DTG Management Services Ltd 2003

Document Status:

The preparation of this report has been facilitated by DTG Management Services Ltd – a wholly owned subsidiary company of the Digital TV Group. The report has been compiled by acknowledged industry experts with the aim of providing answers to specific questions posed by the UK Department of Trade and Industry. While every effort has been made to ensure accuracy and to provide a consensus view when required, it should not be assumed that all member organisations of the Digital TV Group support all aspects of the report. The views expressed in the report are those of the authors and not the collective views of DTG Council.

Prepared for:
Ian Dixon
Department of Trade & Industry

Facilitated by:
DTG Management Services Ltd
7 Old Lodge Place
Twickenham
TW1 1RQ
Tel: +44 20 8891 1830
Fax: +44 20 8891 1999

This report contains an Addendum provided by DTG Council (inserted at the end of the document). The Addendum sets out the collective views of DTG Council members made in respect of the recommendations presented by the authors of this report.

CONTENTS

0	EXECUTIVE SUMMARY	5
0.1	Testing and approval of CE products	6
0.2	Testing and approval of SI and MHEG applications.....	6
0.3	Consumer helpline support	6
0.4	Professional installation service	7
0.5	Strategy	7
0.6	Legacy products and upgrading	8
0.7	Over-air downloads	9
0.8	Issues and Recommendations	9
1	INTRODUCTION AND PROJECT OBJECTIVES	11
1.1	Methodology.....	11
1.2	Specification	11
2	DEFINITION OF INTEROPERABILITY AND ITS CONSEQUENCES	13
3	ELEMENTS OF A COMPREHENSIVE TESTING REGIME FOR DIGITAL TELEVISION	15
3.1	Obligations on CE manufacturers	17
3.2	Obligations on broadcasters.....	17
3.3	Comprehensive specifications and feature sets of receivers	17
3.4	User interfaces and remote control	18
3.5	Installation	18
3.6	Systems development strategy and specifications.....	18
3.7	Conformance testing at single test centre	19
3.8	Single customer helpline	19
3.9	Common service centre	19
3.10	Conditional Access and call back.....	20
4	REVIEW OF CURRENT DTT CONFORMANCE TESTING AND INTEROPERABILITY ARRANGEMENTS.....	21
4.1	Rules of engagement	21
4.2	Testing regimes.....	22
4.3	Problem capture	23
4.4	Problem resolution	24
4.5	Equipment upgrading and legacy management.....	25
4.6	Security and liability.....	27
4.7	Identification of conformance	27
4.8	Controls, penalties, policing	28
4.9	Communication with consumers, industry and trade.....	28
5	WEAKNESSES AND GAPS IN CURRENT ARRANGEMENTS.....	29
6	SUMMARY AND RECOMMENDATIONS	33
6.1	Summary	33
6.2	Issues and recommendations	38
7	ACKNOWLEDGEMENTS.....	40
8	GLOSSARY OF TERMS.....	41
9	ADDENDUM: DTG COUNCIL FEEDBACK	43
9.1	General Observations	43
9.2	Feedback against Specific Recommendations	44

PRODUCT AND INTEROPERABILITY

TESTING AND SUPPORT

0 EXECUTIVE SUMMARY

With the demise of ITV Digital and the arrival of Freeview the UK DTT market has moved from a predominantly vertically-oriented, closed market model to a purely horizontally-oriented, open one. This latter model is new and untried for digital TV systems, and could become a model extensively adopted by other networks around the world. Other competing digital systems in the UK are operating vertical models, but whichever model is operated it is ultimately the consumer who will determine its success or failure. DTT must offer the same or better perceived levels of value, service and ease-of-use to those of its UK competitors to ensure its success.

This report examines the consequences for the interoperability of elements within the total broadcast chain, predominantly the CE receiver products and the MHEG applications. Interoperability in this context is defined as the assurance that all elements of the end-to-end broadcast system will operate and work together, with the corollary that any element in the system can be replaced by its equivalent, or successor version, without compromising the system performance. Without this level of interoperability, the introduction of new services will be hampered and limited to the lowest common denominator of functionality, with solutions becoming ever more intractable with the variety of products entering the market in forthcoming years.

Information for this report has been gained through a series of interviews with industry players, including broadcasters, CE manufacturers, applications producers and a regulator. The scope of this review is necessarily limited by the time available, and cannot therefore claim to be comprehensive in the opinions sought. The consistency however of those interviewed indicates that the key issues have been captured. The views in this report are ultimately those of the authors, having distilled and interpreted the information gained.

The elements of a comprehensive testing regime for digital television have been determined by examining the processes and regimes put in place through hard-earned experience by established digital television organisations operating on vertical market principles. However, one key difference between these operations and the current, open DTT model is the presence of a central party taking the role of platform operator, able to co-ordinate aspects of CE product release and testing, applications testing and customer support. The open market essentially relies upon a system of commitment, best endeavours and mutual dependency between all parties, with few if any formal agreements between players. This ultimately means there are no guarantees for the consumer that the system will work end-to-end, and that the product purchased will be easy to install, fault-free in operation and supported in the long term.

Whilst the business models between vertical and horizontal markets are very different, the technical and customer-support issues are much the same. We have therefore identified the weaknesses and gaps in the current open market DTT system by direct comparison with closed market operations in this regard, and it remains for the parties involved to address the commercial issues around how these can be rectified within an open market framework. Our findings show that there is no room for complacency despite the success of Freeview to date if the primary objective of delivering stable and future-proof products and services to the market in the long term is to be met.

PRODUCT AND INTEROPERABILITY

TESTING AND SUPPORT

0.1 Testing and approval of CE products

Manufacturers of CE products are all conscious of the need to test their products thoroughly before launch if they are to avoid high levels of product returns, build long term retailer relationships and keep customers satisfied. Most manufacturers currently supplying the market have good development and test facilities, and make use of DTG Testing Ltd. to complement their own testing. For the future, there is concern that smaller manufacturers may enter the market with product that may not be as well tested.

However, experience with the vertical market model has shown that final testing by the platform operator on fully representative systems, both in the laboratory and over-air to be an essential stage in identifying and resolving final problems before product release. Only products which pass this final testing receive approval for release to the market. Furthermore, all subsequent hardware and software revisions to a product are similarly tested before release. Examples of all products are then maintained in a "zoo" as references for all future testing.

The open market model currently does not have a similar central organisation to provide facilities for independent, representative testing, and to exercise the authority to approve or reject products for market. Manufacturers in general are opposed to third parties exercising control over their access to the marketplace, and a consensual rather than a mandatory regime in line with the philosophy of the open market needs to be found.

0.2 Testing and approval of SI and MHEG applications

There have been a number of occurrences of applications broadcast in the field causing receivers to crash. Applications are generally tested beforehand on representative receivers, but not exhaustively on all receiver types or through every different type of broadcast chain. The problems have been found to be in broadcast SI configurations, the object carousel encoding by different equipment and receiver MHEG engines.

Ideally, a single, independent applications test centre is needed for applications developers and CE manufacturers to verify their products before transmission, with a full suite of current and known up-coming applications and a receiver "zoo" of released products and software versions. In practice, there may be more than one such centre.

A Code of Practice is under development (currently at draft MoU stage) within DTG proposing the establishment of such a testing regime, though agreement has not yet been reached on who would construct, operate and fund such facilities

0.3 Consumer helpline support

There is currently little communication within DTT between applications developers, broadcasters and manufacturers to provide information on upcoming applications transmissions, changes of multiplex or channel configuration, software download schedules, product launches, and known problems with specific products. The result has been the inability to head off system problems before they occur, or then address customer problems quickly and efficiently after the event.

PRODUCT AND INTEROPERABILITY

TESTING AND SUPPORT

Whilst manufacturers, retailers and broadcasters all provide their own customer contact helplines, there is no central customer helpline or forum for sharing of information between the parties.

In the vertical model, a single helpline is used for all communication with customers, with agents fully briefed on any known events or issues who can deal swiftly and effectively with customer problems.

A central helpline should similarly be available to DTT customers. This would not replace manufacturers' and retailers' own helplines, and would be run by an organisation that is seen as independent and unbiased, in order to have the respect and ability to arbitrate between all parties. This is not without its difficulties.

0.4 Professional installation service

In the vertical market, the consumer equipment is generally provided free of charge (or heavily subsidised), and is professionally installed in the home. The installer not only puts in the antenna or cable, but also ensures the equipment is correctly connected and fully working before leaving the premises. The customer is therefore much less likely to have subsequent issues, and has a much higher level of confidence and satisfaction.

With DTT at present, the installation is entirely left to the consumer, and as such may create a level of doubt sufficient to prevent purchase that the product will work when they take it home. Whilst many consumers no doubt prefer this arrangement and can competently deal with issues themselves, the very high levels of products returned to retailers with no fault found when tested indicates a significant problem with the consumer's self-installation and reception environment. This may consequently be reducing customer confidence in DTT and discouraging take up.

Manufacturers should be, and in most cases are, aiming to make their products at least as easy to install as their analogue counterparts. This implies simple-to-use auto-tuning and set-up, with clear user displays and help text. In addition, diagnostics screen displays should be provided to assist with diagnosing problems when contacting helplines over the telephone or internet.

A reputable, low-cost centrally administered installation service could be offered to customers both at time of purchase or through the central helpline if problems arise. The installer would check the consumer's aerial performance (and arrange for new installation if necessary), and configure the DTT receiver with the customer's other domestic equipment in situ.

Aerial upgrade services are available in the market and it would be of interest to investigate how many consumers know of and use them, and their effectiveness in rectifying installation problems.

0.5 Strategy

Commercial, regulatory and technical strategies for the development of DTT need to be made clear, both to the trade and to consumers. Consumers still equate digital TV with pay TV, and have no idea that analogue services are planned to be switched off. Analogue-only products in retailers, particularly those high-value goods with a

PRODUCT AND INTEROPERABILITY

TESTING AND SUPPORT

long expected life, should be marked with a “health warning” to indicate that upgrading will be necessary in future.

Manufacturers are looking for a firm date for completion of switch-over, and a region by region plan so they can plan production accordingly. Large manufacturers have a 10 year view of technology developments and an international perspective when investing in research and development for future products.

A technical roadmap for developing new DTT services needs to be generated and promoted, together with pro-active development of standards and specifications. Where standards do not exist for the new services desired, DTT players should be prepared to drive the standardisation process in order to have timely launch of new services.

0.6 Legacy products and upgrading

There are already significant numbers of legacy products in the DTT market which have limited functionality and react unpredictably to new services or applications. As we move forward, there can be expected to be a growing population of legacy products which have the potential to react incorrectly to new services. Even with the best products, manufacturers will always reach a point where ongoing support becomes uneconomic. It is highly probable that as DTT services evolve, increasing problems will therefore be had with legacy units before, during and post-switchover.

Although this issue seems focussed on the manufacturers, they alone cannot control all the developments that result in legacy products as services evolve and place new demands on old but sound, serviceable products. The legacy issue must also be faced by the broadcasters, as services launched today cannot be withdrawn or upgraded in future without potentially disadvantaging some of the population. This has implications in terms of costs and practicability in authoring content for more than one format, and in transmission bandwidth to duplicate services.

A Code of Practice needs to be developed to address how manufacturers in consultation with others declare products as legacy, and in what situation a broadcaster can transmit a service even though it may be expected to affect some consumers’ devices. Manufacturers are currently the judges of when a product becomes a legacy device; there is no obligation for them to provide support for any fixed period, or its lifetime. Encouragement or incentives may be required to persuade them to continue support for products beyond their normal economic limit to alleviate this problem. Ultimately, it is in manufacturers’ interests to allow new services to be introduced to drive sales of newer, higher specification products. But it is also in the interests of the service providers and the consumer that existing serviceable receivers continue to work at some agreed baseline level before and after switchover. The basis for such an agreement would be compliance with full DVB-T, MPEG Audio and Video and MHEG UK Profile 1.

Eventually, certain legacy products will inevitably become obstacles to new service introduction, and possible methods should be investigated to encourage consumers to replace them. This could be some form of cash-back deal or free upgrade, and potential funding sources for this should be considered.

PRODUCT AND INTEROPERABILITY

TESTING AND SUPPORT

0.7 Over-air downloads

Whenever a new product is installed, a download of software may be needed to bring it up to the latest specification, particularly if it has been in the distribution chain for some time. This requires all versions of current products' software to be continuously available in a carousel with a cycle time of ideally less than 24 hours.

Consumers are currently not made aware when over-air downloads occur, and indeed the operation of the product may be changed by the new code. Customers need to be provided with information on any changes that will be visible to them. Examining options for how this can best be achieved is an area for further investigation.

0.8 Issues and Recommendations

The issue of Interoperability is a basic, complex and long-standing one that all organisations involved in digital television, such as UK DTT, UK Cable, UK Satellite, DVB, DigiTAG, ATSC, CableLabs etc, have had to address. It will continue to be an issue and each has to find its own way through those complexities. UK DTT faces strong competition and the deadline of switchover; and therefore must pay close attention to offering a proposition to the consumer that is attractive but also delivers as faultless a technical performance as possible. The testing regime will contribute crucially to securing such performance especially where failures are immediately visible to the consumer.

In this report we have used the vertical market experience to act as a rigorous benchmark. It should be recognised that a vertical market test methodology is optimised for that market and not for a horizontal one and so is well suited to central control and to the imperatives of pay TV. The natural absence of such imperatives and control in horizontal markets are two of several reasons why we do not suggest that it should be applied directly, completely or indiscriminately to the UK DTT case especially in regard to the mandating of processes.

The main recommendations below therefore centre on learning from the vertical market experience, and investigating how the weaknesses and gaps that have been exposed in the current DTT platform may be addressed within a horizontal market model.

Specifically they include:

- i. Enhancing the current CE product testing regime so all products are tested and approved in their final form by an independent test centre before release. This does not need to be mandatory; this is a matter for discussion. The test centre will need considerably more facilities than exist at DTG Testing and must be seen to be completely independent and impartial. Testing must be sufficiently low cost to prevent barriers to entry for any manufacturer.
- ii. Developing a Code of Practice for CE manufacturers when launching or developing new products and code releases. Decide whether any form of product logo is desirable, and if so what.
- iii. Developing a comprehensive set of receiver specifications and profiles consistent with anticipated services development up to and beyond switch-

PRODUCT AND INTEROPERABILITY

TESTING AND SUPPORT

- over. In particular a minimum baseline specification needs to be agreed that covers DVB-T reception, MPEG processing and MHEG UK profile 1.
- iv. Completing the work on Applications Code of Conduct, and establish test and development facilities for applications. Ideally, there should be a single centre but practical factors may require there to be more than one.
 - v. Establishing receiver “zoos” at the CE product and the Applications test centres, which contain every significant hardware revision to every product and have access to every software version in an archive with the ability to download these into product.
 - vi. Proposing the formation of a full-time technical strategy team to plan and drive future DTT developments and develop a clear roadmap for the introduction of services up to and beyond switch-over. This team would be pro-active in proposing and participating in the development of UK, European and worldwide standards to support planned DTT platform service requirements.
 - vii. Developing a Code of Practice to address legacy products. This would include methods of providing incentives to manufacturers to continue product support for as long as possible, and explore possible incentives to assist the removal of legacy receivers from the marketplace.
 - viii. Investigating the setting up of a single consumer helpline organisation, with Code of Practice to ensure it has consistent communications of all issues between manufacturers, applications developers, broadcasters and transmission providers. It must provide a method for resolving consumer issues, arbitration between parties, training / briefing of customer service agents, and the capture and dissemination of reported issues.
 - ix. Investigating the operation of nationwide installation services, and conduct a consumer survey and pilot trial to establish whether they meet their objectives.
 - x. Communicating clear dates of switch-over to the trade and public to make consumers aware that analogue will be switched off. Reassure consumers of the continuity of DTT, and convince manufacturers to invest in products for the UK market.

The Code of Practice for applications already under development within DTG recognises and addresses much of item (iv) and some aspects of (ii, and v to vii). While the effect of this work remains to be demonstrated operationally, it is expected to stabilise MHEG behaviour going forward.

Item (x) is the subject of other Action Plan activities. Item (ix) suggests a review of the effectiveness in rectifying installation issues, and what proportion remain possibly as local coverage issues.

The remaining items are contentious in a horizontal market to varying degrees, with (i, ii and viii) possibly the most contentious. How these can be addressed within the spirit of a horizontal market, whilst successfully reaching the same or better standards of service offered by DTT's competitors is the challenge faced. It is the expectation of the authors that this set will be the subject of ongoing work that will shed more light on them. It will also allow opportunities for other methods of analysis such as comparing and contrasting UK DTT with the transitional analogue to digital consumer conversion experience in other areas, such as CD, DVD and mobile telephones, to point the way to additional recommendations.

PRODUCT AND INTEROPERABILITY TESTING AND SUPPORT

1 INTRODUCTION AND PROJECT OBJECTIVES

This report is provided under the DTG pull-down contract for DTI as part of the Digital Television Project. It constitutes a response to the TEG Action Plan Task 5.13: Product and Interoperability Testing and Support.

1.1 Methodology

The study was based on information gained from a number of interviews held with broadcasters, regulators, application developers and consumer manufacturers during June and July 2003. The scope of this review is necessarily limited by the time available, and cannot therefore claim to be comprehensive in the opinions sought. The consistency however of those interviewed indicates that the key issues have been captured. The views in this report are those of the authors, having distilled and interpreted the information gained. Acknowledgement of those who kindly agreed to be interviewed is given at the end of this report.

A questionnaire was prepared in advance, from a number of discussions within the project team, and used as an "aide memoire" during the interviews to ensure consistency in covering the same key points. It was not provided to the interviewees, in order to keep the discussions flexible and otherwise lightly structured. The aim was to offer the interviewee the maximum opportunity for expressing their views, concerns and suggestions for improvements.

1.2 Specification

The project specification as provided by the DTI was:

"To review the relevant testing of DTT products entering the UK retail market and make recommendations on the appropriate level of technical testing that should be applied to products sold in the UK and to report to the Digital Television Project Team. "

The activities to be undertaken during the study were to:

- i. Identify all the elements needed for a comprehensive and effective regime to assure a consistently high level of interoperability of both equipment and applications in the UK DTT marketplace.
- ii. Undertake a comprehensive review of current DTT conformance testing and interoperability arrangements to include:
 - rules of engagement of players (agreements, regulations, codes of conduct etc) and levels of accession to these arrangements
 - testing regimes for:
 - consumer equipment,
 - broadcasting chain
 - applications
 - problem capture (consumer feedback, monitoring systems, etc)
 - problem resolution (equipment maintenance, downloading, etc)
 - equipment upgrading and legacy management
 - security and liability
 - identification of conformance (logos etc)
 - controls/penalties/policing
 - communication with consumers, industry and trade

PRODUCT AND INTEROPERABILITY

TESTING AND SUPPORT

- iii. Highlight weaknesses and gaps in current arrangements for assuring interoperability in both the short and longer terms and recommend measures to address them. These could include promotional activities (e.g. to encourage the development of a supportive “culture” amongst market players) as well as specific solutions to particular issues.

2 DEFINITION OF INTEROPERABILITY AND ITS CONSEQUENCES

Interoperability in this context of the DTT marketplace can be defined as the assurance that all the elements of the end-to-end broadcast system will operate and work together as intended. Furthermore, any one element in the system must be able to be replaced by its equivalent, or successor version, without compromising the performance of the system in any way.

This naturally leads to the conclusions that there must be agreement between all the players involved, on the setting of:

- i. Common standards, interface protocols and specifications
- ii. Well defined, minimum acceptable performance requirements for system operation
- iii. Profiles and extensions for more advanced features and a future-proofed operation
- iv. Common test procedures, tools and methods, available to all for product development
- v. Reference test systems to ensure consistency, accessible to all on fair and equitable terms
- vi. Sharing of information on known issues, so others can take steps to circumvent problems for consumers
- vii. Regular communication between the parties to avoid problems before the event wherever possible, and speedily resolve issues once they arise.
- viii. Clear strategy setting for future technological and commercial development of the system

Within a vertical marketplace, as well proven by Pay TV operations, one party always dominates – the Platform Operator. The performances of all other parties are governed by commercial agreements with the Platform Operator, who is responsible for specification, testing and operation of the entire system. The system is marketed by the Platform Operator, who in turn is responsible to the consumer for its performance, and must deal with all consumer issues.

Where no single platform operator exists, as in a horizontal market, agreements between the parties are generally non-contractual, and commitments voluntary. They are essentially based on a system of trust, mutual dependency and best endeavours, and an understanding that all parties will abide by moral guidelines which provide the most benefit to the most people – a kind of broadcasting Hippocratic Oath.

This lack of a single authority however can lead to some essential but difficult, time-consuming or expensive tasks being omitted. Without some form of central co-ordination in a number of areas, the situation is likely to grow ever more complex and solutions more intractable as time goes by.

In the UK, with the end of ITV Digital and the launch of Freeview, we have moved rapidly from a DTT marketplace that behaved largely as a vertical model, to one now entirely horizontal. This report sets out to highlight weaknesses and gaps in the

PRODUCT AND INTEROPERABILITY

TESTING AND SUPPORT

current UK DTT arena needing to be addressed to achieve a stable and future-proof environment.

PRODUCT AND INTEROPERABILITY

TESTING AND SUPPORT

3 ELEMENTS OF A COMPREHENSIVE TESTING REGIME FOR DIGITAL TELEVISION

The vertically-oriented market for digital television has been in existence for several years now, and operators have built up considerable experience of the testing and support regimes that need to be put in place to ensure successful interoperability.

It is instructive therefore to draw comparisons between the vertical and horizontal marketplaces. Whilst they clearly work at opposite ends of the spectrum in commercial terms, of closed vs. open or pay vs. free, the technical and customer support issues are much the same. A customer choosing free-to-air has every right to expect the same level of service as a pay TV customer; the only difference should be the content available.

It is not the intention of this report however to deal with the commercial issues in depth, in terms of how the differences between the two market models might be addressed. Specifically, it is not being suggested that the role of Platform Operator in the vertical market be played by a replacement organisation (whether regulatory or commercial) in the horizontal market. Rather, that creative ways are found of achieving the same ends in practice.

The key differences between the vertical operations and the current DTT operation are summarised in the table below:

Issue	Vertical market	Horizontal market
Obligations on CE manufacturers	Only manufacturers approved by Platform Operator enabled to provide products. Closed specifications. Must support products for their lifetime with software upgrades. Little or no product differentiation. Consumers given no choice in model they receive.	Any manufacturer can enter market, though encouraged to comply with open specifications. Products differentiated as widely as possible.
Obligations on broadcasters	Fees for transmission services and subscriber management to Platform Operator. Indemnities required for applications transmitted	Fees for transmission services to transmission company. No indemnities for applications transmitted.
Comprehensive specifications and feature sets of receivers	All manufacturers build products to common specifications, provided by operator.	Manufacturers seek to differentiate products by operation and feature sets
User interfaces and remote control	User interface specified by platform operator. All products have the same look and feel.	Manufacturers seek to differentiate by user interface and remote control design.

**PRODUCT AND INTEROPERABILITY
TESTING AND SUPPORT**

Installation	All products installed professionally in consumers' homes, and checked as fully operational and up-to-date before installer leaves.	Left to consumer. Commercial aerial upgrade services are available
Systems development strategy and specifications	Clear development strategy and development of specifications. Proprietary additions to open specifications developed where necessary to meet commercial goals. Receivers can be future-proofed by inclusion of extra features.	No single organisation responsible for systems strategy or specifications. Open standards only are used. Manufacturers driven by cost to implement minimum feature sets, hence potentially difficult to launch new services in future.
Conformance testing at single test centre	All products, software versions and applications are conformance tested at a single test centre on representative and over-air test systems. No products go to market unless approved.	No conformance testing. Products enter market when manufacturers choose.
Single customer helpline	Single point of contact for all enquiries and problems. Collects all information at central point, and has staff trained to deal with known potential issues.	Separate customer helplines run by manufacturers, retailers and broadcasters. No single repository or collection of information. Staff not well briefed to deal with upcoming events.
Service centre arrangements	All products are returned to common service centre by home visit teams. Consumer is given alternative new or re-furbished product.	Normal consumer goods retailer and manufacturer service arrangements. Unlikely to deal with problems caused by changes to transmission format.
Conditional Access and call back	Type, status and location of every receiver are known to operator. Assists customer service staff to deal with enquiries, allows prediction of scale of likely problems, and replacement of legacy units.	None There is no centralised knowledge of receiver types, software versions or numbers/locations of models in service at a given time. This knowledge is distributed amongst manufacturers and retailers who hold their own records.

Clearly, there are some major differences between the two models, and a more detailed examination of the individual issues is necessary to examine whether the horizontal model needs to be modified to become closer to the vertical, or whether both models can achieve the same ends by different means.

PRODUCT AND INTEROPERABILITY

TESTING AND SUPPORT

3.1 Obligations on CE manufacturers

In the vertical market situation, the number of CE manufacturers able to enter the market is closely controlled by the Platform Operator. Access to the market is determined by such factors as technological capability, reliability of supply, product quality, and price. The Platform Operator generally provides the consumers with the receivers directly, at a heavily subsidised price. The consumer usually has no choice of receiver model, and indeed, there is little or no brand differentiation by feature set.

Continuity of support for the receivers is part of the agreement, and new versions of code for download will be provided, not only for bug fixes but also for service enhancements. The contracts require that upgrades continue for the life of the receiver in the marketplace. This is significant in managing the legacy issue, extending the life of the receivers by adding new features and in addition preventing problems with new services in the broadcast streams.

In the horizontal market, no formal agreements exist, and the normal routes to market as for other consumer products apply. Manufacturers we interviewed made it clear that whilst they would support software receiver upgrades for bug fixes, they would not provide new functionality to products in the field free of charge. The length of time that a receiver is supported with upgrades is also left to the manufacturer, who can declare it as legacy at any time.

3.2 Obligations on broadcasters

In addition to carriage and subscriber management fees, contractual arrangements between the broadcaster and Platform Operator cover the transmissions of applications and other data. The operator requires indemnity from the broadcaster that anything transmitted will not in any way interfere with, or damage the normal operation of the receivers.

No such agreements exist in the horizontal market, and several instances have occurred where broadcast applications have caused various receiver types to crash. Resolution of these issues is difficult without a central, impartial arbitrator. In the past the regulator would have taken a leading role and been able to provide knowledgeable input to avoid or mediate issues.

3.3 Comprehensive specifications and feature sets of receivers

In the vertical market, where there is little product differentiation, the receivers are developed against a complete, fully detailed specification. The operator can therefore ensure that products contain features that will not only be required today, but also more importantly extend the product life by providing for future service requirements. In addition, implementation guidelines explaining the desired operation of the products become as important as the specifications in ensuring consistency across all receivers.

Where the feature sets and specifications of the receivers are left entirely to the marketplace in the horizontal model, a minimum receiver specification is essential to establish a service at day one. However, without a clear strategy going forward on the introduction of new features, manufacturers will be unable to design the receivers to ensure compatibility, and introduction of new services will be increasingly difficult. This points to the need for a central body that will move swiftly to agree and specify

PRODUCT AND INTEROPERABILITY

TESTING AND SUPPORT

these features, whilst encouraging manufacturers to develop a range of products at different feature levels. Unmoderated growth “like Topsy” will not lead to stability and consumer confidence.

3.4 User interfaces and remote control

The need for a single ‘look and feel’ across all receivers is an absolute requirement in the vertical market. The appearance and operation of the user interface, programme guide and access to services is identical regardless of make of receiver, and the remote control handset is generally sourced separately from a single supplier. A tremendous amount of effort is spent developing this aspect, and provides major benefits in terms of dealing with customer enquiries and maintaining a single version of user interface software.

Differentiation of product is key in the horizontal arena and the ‘look and feel’ of on-screen displays and the method of accessing them from the remote control differs significantly from manufacturer to manufacturer. Indeed, this aspect is one that manufacturers defend vigorously. Trying to provide a centralised customer service is extremely difficult, and consumers will generally be referred back to manufacturers for enquiries.

3.5 Installation

In most pay TV models, receivers are not generally sold across the counter in retail outlets, but provided free or heavily subsidised by the platform operator. An installer will provide whatever external connections are required (antenna, cable), and then install the receiver. As part of the installation, a download is performed to ensure the receiver has the correct (latest) code version, and is fully checked before he leaves site.

With the DTT retail model, where installation is the responsibility of the consumer, it has been reported by retailers and manufacturers that a major problem is the number of products returned as faulty, which on checking have no fault found. A reasonably priced installation service offered by retailers would probably reduce this problem significantly, whilst encouraging those who may otherwise be intimidated by the technology to purchase.

3.6 Systems development strategy and specifications

In the more closed environment of the vertical market, the operator can develop the systems specifications to his own strategic requirements, adding proprietary elements as necessary to implement new features. Whilst most operators make use of open standards where possible, they are not constrained by them. They do however generally seek to have proprietary features entered as open standards in due course.

The platform operator can define his receiver specifications to include features that would otherwise not be included by manufacturers, thus breaking the “chicken and egg” situation that otherwise exists. Typical examples include the provision of return path modems, CPU’s with sufficient power, and additional memory.

Without the central role played by the operator in defining clear strategy, the horizontal market uses existing or almost-ratified open standards. By comparison,

PRODUCT AND INTEROPERABILITY

TESTING AND SUPPORT

this can delay the introduction of new features and be at a competitive disadvantage. Examples include the lack of return path facility, comprehensive schedule information, and the introduction of PVR (Personal Video Recorder) technology.

3.7 Conformance testing at single test centre

The control exerted by a platform operator in the vertical market over the testing of all aspects of the system is in major contrast to the open model. The operator will have a test centre with reference test systems that are fully representative of those in live use, including hardware, configuration and data transmitted. In addition to "local loop" systems, there will be facilities to do final testing through a complete on-air chain.

All receiver products are thoroughly tested by the platform operator before being launched, which includes any relevant hardware revisions during the product life. Once approved, each hardware version is kept in a receiver zoo for testing of applications and new software.

All software revisions are fully checked on all receivers in the zoo before being approved by the platform operator for download. Whilst different receivers have their own code for hardware drivers, the use of common operating system/middleware code and EPG software simplifies this process in comparison with the open model.

All applications are also fully checked to ensure they perform as intended, and cause no problems for the consumer on any of the receivers.

One major benefit of this testing regime is the resulting stability of the platform, which instils consumer confidence and encourages broadcasters to develop their services.

In the open, horizontal model all testing is performed by manufacturers on their own products, using a variety of methods, including test tools and streams available on CD, access to DTG Testing Ltd facilities and off-air tests. Manufacturers are under pressure from retailers and end customers to ensure their products operate correctly, and are responsible for their fitness-for-purpose.

3.8 Single customer helpline

The branding of the Pay TV platform makes it clear to consumers who they approach with any problems or enquiries. A single helpline service therefore has advantages for the consumers, but also for the operator as all problems are captured at a single point. In addition, helpline staff can be briefed in advance of known events and provided with instructions (or scripts) on how to solve problems arising.

The operator is then in a position establish where problems lie and to resolve issues with the necessary parties (broadcasters, manufacturers), without the finger-pointing that may otherwise occur.

3.9 Common service centre

As all boxes in the Pay TV model are issued by the platform operator, any faults on those products can be dealt with by a house call and a free replacement. Consumers do not generally receive a replacement of the same model, so whilst expensive to implement this mechanism can be used to remove legacy receivers

PRODUCT AND INTEROPERABILITY TESTING AND SUPPORT

from the market, particularly if the customer can be encouraged to pay for new services.

3.10 Conditional Access and call back

Whilst Conditional Access provides the necessary security against piracy for revenue protection and rights management, it also has important benefits for the operator in establishing the type and status of each receiver with every subscriber. By addressing receivers over-air, either individually or in groups, they can be made to call back and report information such as successful software download.

This allows statistics to be gathered as to the likely number of subscribers to be affected by any specific issues, and provides information for customer service agents in dealing with enquiries.

In addition, the addressability provided by Conditional Access allows over-air testing of new services to specific receivers without being visible to the general consumer. Since any such testing of "ghost services" is using the full broadcast chain, it provides considerable confidence that the service will work correctly once launched.

4 REVIEW OF CURRENT DTT CONFORMANCE TESTING AND INTEROPERABILITY ARRANGEMENTS

4.1 Rules of engagement

With the demise of ITV Digital, the UK DTT market has moved from a predominantly vertical model to a purely horizontal one. However, no new rules of engagement have been agreed between the parties, and indeed those that were in place through ITV Digital have now disappeared. Much of the leadership in providing receiver guidelines, live test systems and strategy for platform development has gone, without yet being replaced.

There is currently therefore no mandate for any of the players to meet defined specifications, or seek approvals before launching any products or applications into the market. The ITC exercises control over its licensees also with a lighter touch than previously. The strategy for developing the DTT system is therefore currently being left entirely to the market, which is currently taking a predominantly short term view of growing subscriber numbers through cheap, minimum specification set-top boxes.

All manufacturers are endeavouring to meet the published specifications in DTG D-book and DVB, though ultimately there are no assurances for consumers of conformant operation. DTG Testing offers a valuable and well used service to manufacturers, allowing them to test products at any stage of their development on representative test signals and providing common, consistent test scenarios. It is essential that in future all manufacturers be encouraged to make use of DTG Testing facilities, and that prices for the service are kept reasonable so as not to price the smaller manufacturers out.

There are however a huge unknown number of receivers at different stages of hardware and software revision. The practicality of testing on all possible combinations in a "receiver zoo" is already impractical, and will become impossible in future. This is compounded by the number of integrated sets (IDTV's), and the space required to house them. This is a steadily growing challenge and renders any reliable knowledge of the issues to be faced in the future largely impossible to construct.

In an attempt to reduce the testing problem, the number of software versions kept in the DTG Testing Ltd. "zoo" are limited to the current and previous release for each receiver model.

Manufacturers have made the point that a clear schedule towards analogue switch-over is essential to them if they are to have products available at the right time in the necessary volume. Switch-over itself should take place region by region over a matter of months, both to learn from experience how to handle the process, and to prevent a huge peak in demand, followed by a huge slump. Also the provision and modification of transmitters cannot be done practically and economically over a short time scale. When other national administrations (e.g. US) have stated firm dates, the manufacturers have responded by applying the resources to meet the anticipated market demand. Major CE manufacturers generally develop products for a global

PRODUCT AND INTEROPERABILITY

TESTING AND SUPPORT

market, and the UK market is only likely to be of interest if reasonable volumes can be anticipated, and specifications can be incorporated into chipsets in time.

4.2 Testing regimes

4.2.1 CE products

Most if not all major CE equipment manufacturers have their own test systems and procedures in house, which encompass development testing, final product testing, and off-air trials with 30-100 users. There are however no reference test signals available off-air to enable full end-to-end system testing.

DTG Testing Ltd. sells a number of test suites which enable manufacturers to perform most of the testing themselves. When sufficiently confident, manufacturers can submit their product to DTG Testing, who will perform a full set of tests with a report for £3,500. Partial testing is also offered. No scores or marks are given by DTG Testing, and all test information is kept strictly confidential. DTI is however provided with a trend analysis of receiver front-end performance for spectrum planning purposes.

There are no plans for mandatory testing or conformance marking by DTG Testing. All manufacturers asked have stated that conformance marking is neither necessary nor desirable, and prefer to sell on brand image. Some retailers have asked to see test results before stocking equipment, and some manufacturers have disputed agreements with sub-contractors over poor performance. Some manufacturers have also complained that D-book specifications are too stringent, particularly around front-end performance.

Should any conformance regime become desirable, manufacturers would prefer to self-certify equipment, with enforcement being provided by Trading Standards as being fit for purpose. The Trading Standards authorities will however need to have some reference against which they themselves can test for this purpose. Any equipment put on sale without payment of all royalties on appropriate licences should also be addressed by Trading Standards.

There is no agreed minimum receiver specification at present although one is in preparation as the Baseline Receiver Specification. Manufacturers see a distinction between basic performance issues, which should be in a specification, and features which should not. Several manufacturers suggested that DVB-T, MPEG2 AV and MHEG UK Profile 1 compliance was all that was needed to be specified for a baseline receiver.

Some manufacturers were concerned that the availability of test suites was lagging significantly behind the specifications, predominantly in the testing of MHEG UK Profile1 v1.06. There was a need for the necessary resources to be applied in future to develop test suites as part of the specification process.

Other activities of DTG Testing include dealing with software download testing prior to transmission, and scheduling of the downloads on the BBC Engineering Channel.

DTG Testing however needs to be more flexible to be able to support the differing needs of large and small CE manufacturers.

PRODUCT AND INTEROPERABILITY

TESTING AND SUPPORT

By contrast, BSkyB has a large test department who test and approve every receiver hardware and software version before being authorised for release. This includes local loop testing with in-house systems, followed by extensive field testing by staff provided with sets of test scripts to ensure specific areas of performance are checked.

4.2.2 Broadcast chain

The equipment for the broadcast chains has been sourced from different suppliers according to broadcaster. All testing of the chains has been done by the broadcasters themselves.

Differences in the performance of the chains have been reported, primarily in connection with encoding and transmission of applications. Problems with applications in several cases have become apparent in certain regions only, suggesting differing software revisions or configuration causing differences.

4.2.3 Applications

Applications have been tested primarily by those authoring the code, either within the broadcaster or production house. The testing has been done on a “representative sample” of receivers, but not against a “zoo” of all receivers in the market place.

Some applications (Who Wants to be a Millionaire, Big Brother) have consequently caused problems with certain receivers in the field.

The DTG Interoperability group has recently drafted a Code of Practice for application testing which proposes the setting up of a zoo. This currently has MoU status. The availability of a test centre in Central London that can offer access to application developers and ensure confidentiality, openness and fairness is seen as essential.

With reference to BSkyB, all applications must be submitted for test and approval by Sky Subscriber Services Ltd before transmission. Significant penalties can be levied on the broadcaster if the application damages or disrupts the receiver population.

Application writers are however supported by being given knowledge of known receiver issues. “Ghost services” can also be run over the live broadcast chain to ensure correct performance prior to going live.

4.3 Problem capture

4.3.1 CE products

Reporting of problems in the field by consumers come back to several points. Mostly, the retailer is the first point of contact, either directly in-store when equipment is returned as faulty, or to customer service helplines. Retailers report that returns and problems on DTT products are far higher than other consumer products. Whilst this clearly does not necessarily mean faulty product, the consumer knows no different and will brand the whole experience as unsatisfactory which will travel around the market by word of mouth.

PRODUCT AND INTEROPERABILITY

TESTING AND SUPPORT

All manufacturers we contacted have their own helplines and/or email address, and some have web sites offering advice and FAQ's. Most receivers have diagnostics pages which help with locating problems over the phone with customers' services.

The broadcasters spoken to (ITV, Channel 4) have no additional helplines above their general customer contact points, and tend not to receive many calls, most of which are on reception matters.

There is an email Alert service provided by DTG Testing, whereby dealers or others in the trade can report any problems they see, and these are confidentially directed to those who can resolve the issues.

There is no central helpline service offered to the consumer, which would offer considerable benefits in increasing customer confidence in the reliability and integrity of the DTT offering, as well as providing a valuable single point of collation of issues.

4.3.2 Broadcast chain

The broadcast chains are monitored by automatic monitoring equipment which logs network and transmitter performance. Whilst this is of value to the operators, the parameters measured are local to the chain and the performance of the whole chain to the consumer is not addressed here.

4.3.3 Applications

The reporting of problems once applications are transmitted is from those consumers whose boxes are affected, possibly causing them to crash and need re-powering. Reporting has been back to manufacturers, broadcasters and ITC.

Applications have shown problems in specific transmitter regions, indicating broadcasting chain differences as noted above.

Communication between applications developers, broadcasters and manufacturers has been poor. No notification of the broadcast of new applications has been provided. Establishing clearly the cause of the problem and resolving the issue without finger-pointing and denials has been an issue.

There would be benefit in an open but confidential forum for sharing information on known receiver issues and testing prior to transmission is necessary.

4.4 Problem resolution

4.4.1 CE products

Manufacturers provide regular code downloads using the BBC Engineering channel. This is operated on a four weekly schedule with two or three receivers downloads per week. The code is tested by DTG Testing first to ensure it will allow further downloads, and ensure other receivers do not respond.

One issue that is not well addressed is the update of code in receivers as they enter the market. The code that was loaded at time of manufacture may well be a previous version, possibly with significant bugs. The customer needs to receive the latest code version as soon as possible after installation. This points to having all current

PRODUCT AND INTEROPERABILITY

TESTING AND SUPPORT

code versions transmitted in a continuous carousel with a cycle time preferably shorter than 24 hours.

Mostly the downloads are for resolving code bugs, which are invisible to the consumer, but issues may arise when the operation of the product is altered. Information promoting the change will have to be provided by the manufacturer, but cannot be targeted as the whereabouts of the products are not known. Furthermore, some customers may be aggrieved at the change, and will complain to a service centre.

Hardware problems are resolved in the normal way as other consumer products, by retailer replacement or manufacturer service. Once outside warranty however, consumers who experience problems, potentially caused by downloads, have no recourse to free repair or replacement.

There is no equivalent central platform operator with a mechanism for home visits to fix faults or exchange products in the field, or organise their repair.

If retailers experience consistent high return rates of specific manufacturers' product, they will exert pressure on manufacturers to fix the problems or be de-listed.

4.4.2 Applications

The resolution of applications problems is potentially difficult once they are being transmitted. Locating the source of the problem may not be straightforward, and agreeing who should modify their code (application author, broadcaster, transmission operator or CE manufacturer) can be difficult.

The challenge is to prevent accusations, and involve all parties in agreeing a solution without apportioning blame. No forum currently exists to allow this to happen.

In the past, some application authors (Carlton) have written test applications and recorded streams to help specific manufacturers locate problems. However, commercial pressures mean this is unlikely to continue, and should be less important if more thorough testing is done before transmission.

4.5 Equipment upgrading and legacy management

Looking across the whole end-to end chain of equipment in a DTT broadcast system, it is the consumer equipment that presents the major problem from an upgrading and legacy management perspective, simply because of the impracticality of identifying and reaching them. The upgrading or enhancement of broadcasting facilities is entirely within the broadcasters' control, and any new systems can be fully tested on off-air chains before going live.

However much new systems are tested beforehand, there will always be issues with consumers' products when new services go to air. The sheer number of variants of receivers in the field with differing hardware and software versions of all possible combinations is already huge, and will continue to grow rapidly in future.

For CE products that are in current production, one may reasonably expect manufacturers to correct known software problems, and provide new code in over-air downloads. Even this expectation may not be true of some manufacturers, and there

PRODUCT AND INTEROPERABILITY

TESTING AND SUPPORT

will be no definitive timescales to produce new code. However, it is the legacy units, for which manufacturers have ceased any further development and support, or which have limited technological capacity that can potentially cause major obstacles to the launching of new enhanced services.

The view of one CE manufacturer can be summarised as follows, comprising three aspects of upgradeability:

- i. The consumer buys a product and it is faulty, then the manufacturer will fix it either by over-air download (for software bugs), or by dealer service/replacement.
- ii. For new product features subsequently introduced which are not part of the product at point of sale, the consumer cannot expect and will not receive a free upgrade.
- iii. When broadcast specifications are being changed, the manufacturers will not be obliged to produce code for all products already in the field.

Broadcasters also must address the legacy issue. Services provided by broadcasters today to existing products must continue to be provided in future. Customers should not find themselves disenfranchised from receiving, for example information services, because the broadcaster now wishes to encode the data in a new way. This raises issues of having to author content more than once in different formats, and consuming additional transmission bandwidth if services containing effectively the same content are broadcast in different data streams.

In the vertical market model, there are three safeguards to avoid legacy problems. Firstly, the CE products are all tightly specified by the operator, and are all running much of the same software; secondly the CE manufacturers are obliged under contract to supply software upgrades for the life of the product in the field; and thirdly, the operator knows where the legacy units are, and can make house visits to replace them as a last resort. None of these applies in the horizontal market.

Dealing with legacy is therefore a much more difficult problem in the horizontal market, for which there does not currently appear to be a satisfactory solution. Particularly whilst the current emphasis is on minimum specification, low-cost receivers, issues from legacy units will arise sooner rather than later and the situation is becoming more complex and extensive day by day.

There needs to be a clear development strategy for the DTT system with defined profiles, causing minimum specification products to be designed correctly to ignore any features they cannot support. Manufacturers we interviewed stated that development timescales were of the order of 10 years for new technologies.

Furthermore, decisions need to be made now on how the DTT environment will change post-switch-over. These range from ensuring all receivers will cope automatically with transmitter frequency re-allocation, re-allocation of services within multiplexes, or 8k (SFN) transmissions, to new data services to support initiatives such as e-government.

It is however certain that certain products will cease to work at some stage as the system develops, and a strategy needs to be developed to deal with the issue.

PRODUCT AND INTEROPERABILITY

TESTING AND SUPPORT

4.6 Security and liability

The current facilities at DTG are limited in space, allowing only one manufacturer at a time access to the test transmission system if confidentiality is to be preserved. Manufacturers are understandably sensitive about bringing prototype products to be tested without having their own test area which can be kept locked under their control.

There is some concern among manufacturers that having to wait for testing slots may give commercial advantage to other manufacturers.

There are no liabilities between DTG Testing Ltd. and those using the facilities. DTG Testing produce a written test report for a fee, though no score or pass/fail is given. However, manufacturers may have sub-contractors providing elements of the products, who may have liabilities which are incurred as a result of the testing.

No conformance marking is offered by DTG Testing. Liabilities may be incurred if such marking was to be required.

The broadcasting of applications could incur liabilities on broadcasters if the application causes receivers to malfunction. If this were to lead to degraded brand image or poorer sales, they could seek compensation. To date no manufacturer is believed to have suggested this.

4.7 Identification of conformance

All those we interviewed were unanimously against any form of identification of conformance, or logo marking.

The options for logo marking that have been variously considered are:

- i. DTG Testing logo, to indicate all relevant testing has been passed
- ii. Freeview logo – more of a brand than a test verification
- iii. Digital tick mark – to indicate receiver meets a baseline specification, or at least it did on the day of test prior to receiving any downloads/upgrades
- iv. Switch-over logo (similar to 2k compliant) to warranty the product will work after switch-over. This clearly needs detailed knowledge of the post switchover environment

Manufacturers all wished to self-certify their products, rather than submit for external conformance testing. Their argument was that all other aspects, including potentially more serious issues such as safety, are already self-certified.

The main issue is to be clear what standards are to be met for conformance, in terms of a baseline receiver specification, any higher-level profiles (and compatibility with these), and future developments post-switch-over. The view of several manufacturers was that DVB-T, MPEG2 AV and MHEG UK Profile 1 compliance was all that was needed for a baseline specification.

PRODUCT AND INTEROPERABILITY

TESTING AND SUPPORT

4.8 Controls, penalties, policing

The major contrast between the vertical and horizontal market models lies in the absence of any central organisation exerting control in the latter case. No formal contracts exist between parties, other than between broadcasters and the ITC, or standard commercial agreements between parties and their subcontractors.

Penalties and policing of products are therefore limited to the same trading standards issues of safety, emissions, etc, of all other consumer goods.

In the spirit of the horizontal market, companies appear to be acting in good faith to improve their products and resolve issues as quickly as possible. It is not clear that putting mandatory controls in place would necessary help the growth of the market at this stage, whilst it could well hinder by causing added delays.

However, without some form of central organisation that is providing strategy, specifications and testing facilities across the whole broadcast system the interoperability between elements will become a major concern in future, and is likely to prevent the technology developing to its full potential and lead to diminution of consumer take up.

4.9 Communication with consumers, industry and trade

Consumers can potentially communicate with manufacturers, retailers and broadcasters and all of these parties have telephone, and often email, customer service points. Whilst each party briefs their own staff on events they are about to initiate, each of these parties is independent, and communication between them to solve or avert problems appears minimal.

There is no single helpline for the consumer to call, and be assured that his problem will be fixed. The consequences of this include the following:

- i. Manufacturers and retailers do not know when new applications are broadcast, so are not ready to react if a problem arises
- ii. Broadcasters and retailers do not know when new products are launched, or software downloads are taking place
- iii. Each party claims it is not their fault and may blame the other, i.e. lack of arbitration
- iv. There is no central collection of fault information and statistics

The overriding result of this is that the consumer often has a poor experience, and evidence of this may be seen in the high numbers of products returned to retailers with no fault found.

There would therefore appear to be great benefit in having an independent organisation to provide a single customer service helpline and co-ordinate all customer facing activities. In addition, this could undertake educational activities for the retailers and trade, as well as providing information, fault finding guides and FAQ's to the public on a web site

5 WEAKNESSES AND GAPS IN CURRENT ARRANGEMENTS

From the lessons learned by the vertical market players, a number of areas can be identified within the current DTT model that are weak or missing.

5.1.1 Single independent test centre for CE products

The most significant of these is the absence of a single testing regime and test centre for all consumer products. Experience of vertical model players has demonstrated, at least at this stage in the development of the market and technology, that independent comprehensive testing (laboratory and over-air) of all hardware and software before it enters the market in a complete representative system is essential, and reaps rewards in terms of platform stability and consumer confidence.

Whilst this role is currently played to an extent by DTG Testing in providing test reports on equipment submitted, usually during development, there needs to be a clear understanding that all equipment in its final form should be tested and passed before going to the consumer. The testing facilities will need to be greatly extended so that a number of manufacturers can visit and test simultaneously in confidence, and can submit products for approval and expect a reasonable turn-around on a transparent, fair and equitable basis. The cost to manufacturers must not be a barrier to even the smallest manufacturers using the facilities and entering the market.

This very importantly includes any updates to the equipment during its lifetime, particularly software updates for over-air download. A problem in a new product can be identified and rectified often by a manufacturer before too many are sold (though recalling these is problematic enough). However, the potential for downloading faulty code to perhaps several tens or hundreds of thousands of products already in the field could be disastrous. The lack of any Conditional Access system with DTT means there is no way of addressing over-air downloads to selected receivers in the field, as can be done with other systems. Means to enable this feature in the field with DTT would be valuable, and it is believed that it is now practical for pilot trials using specially enabled receivers.

A model for establishing how such a test centre could be set up and operate effectively in a horizontal market, without the control exercised by a platform operator, needs to be identified.

5.1.2 Single test centre for applications

The DTG Interoperability Group has developed a draft Code of Practice for MHEG interoperability, which proposes that all applications are subjected to approvals testing against a “zoo” of receivers known to be in the field before being transmitted.

The test centre however has not been identified, and will require considerable facilities if it is to provide the service for applications developers to visit and test their code during development. For convenience to applications developers it is suggested this facility needs to be located in central London. Whilst a single centre would be ideal, practical considerations may require there to be more than one.

For comprehensive testing, the receiver “zoo” will have to contain large numbers of receivers to represent the various hardware and software versions, and their

PRODUCT AND INTEROPERABILITY

TESTING AND SUPPORT

combinations. Most problematic is the storage space for numbers of IDTV sets (many of which are large, widescreen models), and manufacturers appear reluctant to supply “tubeless” versions of these in small cases because of cost.

A model for a suitably independent organisation to establish and operate this test centre needs to be identified.

5.1.3 Single consumer support helpline

A single consumer helpline with the ability to resolve any problems would considerably enhance the customer experience and encourage take up of DTT for the reasons discussed above. The helpline would have contact with all of the parties, broadcasters, applications producers, transmission operators and CE manufacturers, and could refer customers to the correct party if they cannot solve the issue. It would be kept informed of events before they happen, and would help to arbitrate over issues between parties.

A model for funding such an organisation needs to be identified, but needs to be jointly with all parties involved in the end-to end broadcast chain.

5.1.4 Installation

One of the major hurdles is the reliance on the consumer to install their own equipment, evidenced by reports of problems encountered. The high rate of returns of DTT equipment is indicative of a serious problem in this area, and the fear that the product may not work when the customer takes it home can be a major barrier to purchase.

The opportunity for the customer to have their box or iDTV installed for them at a reasonable price could be a solution, with the installer checking (and refitting if necessary) their aerial system, ensuring the latest software is installed and configuring the connections with their existing equipment.

This service could either be offered through the retailers at time of purchase, or if the consumer subsequently contacted the helpline with problems.

5.1.5 Legacy

Many legacy receivers already exist in the DTT marketplace, and with the number of manufacturers able to enter the market, this will increase significantly in future. Manufacturers themselves decide when they no longer will support a particular product, and must as a minimum be seen to behave responsibly in ceasing upgrades. Customers who are left with products in an unsatisfactory state may need recourse to Trading Standards if the product is not fit for purpose.

It is highly likely that many of these legacy receivers will exhibit problems before, during or following switch-over, when new services are added or the transmissions are altered. Manufacturers have stated that they cannot support upgrades to deal with issues caused by broadcasters adding new services or features that were not there when the product was released. Broadcasters and manufacturers therefore have to take responsibility jointly for minimising difficulties with legacy products.

A strategy is needed for dealing with legacy products:

PRODUCT AND INTEROPERABILITY

TESTING AND SUPPORT

- i. To minimise the number in the market by anticipating and developing the specifications necessary to maximise the lifetime of products, such as seamless retuning for frequency or modulation changes, and ensuring stability with SI (Service Information) descriptions of services the receiver cannot support.
- ii. Broadcasters and applications developers need to be made aware of the limitations and issues with specific products, so they can best avoid causing problems.
- iii. To provide consumers with the best advice and solution when they encounter problems with a legacy product. This may include special offers for upgrading, trade-in, etc.

5.1.6 Strategy

A clear strategy for switchover is needed for manufacturers, who have to plan major product developments up to ten years ahead. Setting a firm date is seen as key, though it is equally important that switch-over is a phased approach, undertaken region by region, thus allowing issues to be resolved as it progresses and preventing a huge peak in demand for products.

Manufacturers see the setting of a firm date as the assurance they will need to commit resources to developing the new products that will in turn drive consumer confidence in the marketplace.

Once a date is set, all analogue only equipment in retail premises needs to be clearly marked that it will need adaptation to continue working post-switchover.

Technical strategy also needs to be driven more forcefully to map out clearly the development of the system and its services over the years up to and beyond switch-over. If DTT is to be seen as a viable offering by the consumer alongside those provided by other systems, new services will need to be introduced in a timely manner. Current weaknesses include the absence of a programme guide and return path connection, both key issues to the development of new products and services such as PVR's and revenue-earning applications.

To provide the necessary drive to the strategy development, it is expected that a full-time team should be drawn together, if possible from all the parties involved to draw up a clear plan for the long-term.

5.1.7 Specifications

The weaknesses identified above in the testing of CE products and applications can only be resolved if there are clear product specifications for all elements in the broadcast chain to be able to judge whether the product meets the approved standard. In the case of CE products, a set of Implementation Guidelines for Features is as important as specifications to ensure the interpretation of feature operation is consistent.

The DTG has instigated a Specifications Group which has developed a minimum set of specifications for consumer receivers. It will be necessary to extend these to develop a set of feature profiles for products with different functionality and price points. These specifications must be sufficiently detailed to determine whether a product has been passed or not for approval. Guidelines for Implementation will also

PRODUCT AND INTEROPERABILITY

TESTING AND SUPPORT

be necessary to ensure the specifications are interpreted consistently by all manufacturers. These specifications will need to be a living set of documents and continue to develop as new services are planned.

6 SUMMARY AND RECOMMENDATIONS

The DTT market in the UK has transitioned from being a largely vertical operation under ITV Digital to an open, horizontal model with the advent of Freeview. It is very much at the forefront of operating this market-driven model, and is world-leading on the scale and rate of growth it has already achieved.

There is however, no room for complacency before the primary objective of delivering stable and future-proof product to the market is met.

6.1 Summary

6.1.1 Experience of vertical market

The DTT players need to draw on the experience gained by those running successful digital TV operations today, namely the vertical, closed market platform operators. Comparison with these systems indicates a number of areas of weakness in the present DTT regime which need to be addressed if the platform is to achieve the same level of stability. This is vital if DTT is to instil the necessary consumer confidence and encourage investment in its future development.

The open, horizontal market has to find ways of achieving the same ends, for a single entity to act as a focal point and provide independent approvals, co-ordination and authority, but preferably exercising authority by voluntary and consensual means

6.1.2 Testing and approval of CE products

CE manufacturers are all conscious of the importance of fully testing their products before launch, and cite commercial pressures such as level of warranty returns and retailer selection as sufficient to ensure compliance with specifications. Manufacturers do not want to subject their products to mandatory conformance testing, and suggest reliance on Trading Standards to determine fitness for purpose. Furthermore, there was no enthusiasm amongst those interviewed for any form of logo marking, whether related to conformance testing or not.

The experience of other digital TV platforms however indicates that the importance of final testing of CE products cannot be underestimated. Testing at a single test centre on fully representative transmission systems is considered an essential step. A Code of Practice should be developed and agreed by all parties that they will submit final versions of products for independent approval before release, and be prepared to abide by the verdict. Whether this is voluntary or mandatory is for discussion.

To perform this level of approval testing will require a much more extensive test centre than currently exists at DTG Testing Ltd. It will necessitate facilities for several manufacturers to be on site simultaneously and a test system that is fully representative of all equipment in the different broadcast chains.

The centre also will need a staff of test engineers who can perform approval testing on products before release, with all hardware and software versions of products being verified and an approval report provided.

PRODUCT AND INTEROPERABILITY

TESTING AND SUPPORT

In order for manufacturers to test as much as possible of their products before visiting the test centre, a full range of test tools similar to those used by the centre should be made openly available. The test tools to support new features and services should be developed significantly in advance of broadcaster use to enable manufacturers to develop products in good time.

A clear set of product specifications of minimum receiver performance and profiles, against which approvals testing can be done, do not currently exist and must be agreed as soon as possible.

In addition, the centre will need to house a receiver “zoo”, with manufacturers contributing one of every hardware product type released to the field. A solution to the IDTV space issue must be found. A copy of every software version that has been over-air downloaded should also be held in an archive, such that it could be loaded onto a test product at any time.

At present, there is no facility for end-to-end over-air testing using the actual live broadcast equipment except during normal service. Provision for a (minimum bandwidth) test channel should be provided by each broadcaster / transmission provider.

The pricing of the test and approvals regime has to be seen to be fully open, fair and equitable, and prices for the services must be kept at sufficiently low levels to prevent their being a barrier to market entry by any player.

6.1.3 Testing and approval of SI and MHEG applications

Applications are not currently being tested on the full range of CE products in the field before being transmitted. This has led to problems occurring with specific receivers, often in specific transmitter regions.

Ideally, a single applications test centre is needed for applications developers and CE manufacturers to verify their products, with a full suite of current and known upcoming applications, and a receiver “zoo” of released products and software versions. In practice more than one facility may be needed.

In addition, final applications code or SI modifications should be tested on a fully representative end-to-end live broadcast system before being transmitted to the consumer. Currently this is not done, and may not be feasible without Conditional Access or some equivalent mechanism to prevent unauthorised reception.

A Code of Practice is under development (currently at draft MoU stage) within DTG for the establishment of a testing regime for all applications on an extensive receiver “zoo”. No agreement has yet been reached on who would host a suitable test centre.

Whilst the test centre for SI and applications would require many of the same facilities as that for testing CE products, it would need to focus on providing for the needs of applications developers, and probably be located in central London.

As a result of continuing software developments, it can be said that many of the “teething problems” with MHEG engines have been dealt with, and UK Profile 1 version 1.06 promises much more stable operation and better performance.

PRODUCT AND INTEROPERABILITY

TESTING AND SUPPORT

6.1.4 Consumer helpline support

There is currently little communication between applications developers, broadcasters and manufacturers to provide information on upcoming applications transmissions, changes of multiplex or channel configuration, software download schedules, product launches, and known problems with specific products.

As a result, problems have occurred with applications causing specific receivers to crash, or products entering the market that do not work with current applications.

Whilst manufacturers, retailers and broadcasters all provide customer contact helplines, there is no central co-ordination. The consumer can therefore not be assured that he will receive correct information and his particular problem will be solved, causing frustration and poor customer satisfaction. In addition, the opportunity is being missed to capture the feedback from consumers to identify problems, and to arbitrate between those parties who can resolve the issues.

There should therefore be a central customer helpline service, where the customer can expect their problem to be resolved. This should be run by an organisation that is seen as independent and unbiased, in order to have the respect to be able to arbitrate between all parties. This is not without its difficulties because in a horizontal market the manufacturers rely very heavily on maintaining a close direct relationship with their customers. It would not be the intent of the consumer help line to "hide" the manufacturer from its market or to prevent direct access but to ensure the consumer is directed to the organisation best placed to deal with them. The ultimate remedy for consumer dissatisfaction is a replacement product which only the retailer or manufacturer can agree to provide.

6.1.5 Professional installation service

Several of those interviewed reported high rates of returns for DTT products, much higher than expected for similar consumer products. When tested, most of these have been found to have no fault. This points to the installation environment, including aerial and reception factors, of DTT products being a particular problem, even to those consumers normally confident with comparable products.

Anecdotal evidence suggests that even amongst those who do install successfully, there are still problems which the consumer lives with, such as difficulty making recordings on VCR, or inconvenient switching between digital and analogue services.

A reasonably-priced, professional home installation service that could be offered to customers at point of sale or by customer-support helplines should help reduce these return rates, improve the customer experience and increase confidence and take-up.

Whilst aerial upgrade services are available, their effectiveness in rectifying installation problems is not widely known and it would be useful to review how many installations remain problematic, possibly due to local coverage issues.

6.1.6 Strategy

The strategy for DTT from commercial, regulatory and technical perspectives needs to be developed and made clear both within the broadcast industry and to the consumer. Currently consumers may still associate digital with pay TV, and are suspicious of promotions offering free viewing. There is also some concern in

PRODUCT AND INTEROPERABILITY

TESTING AND SUPPORT

consumers' minds over the long-term survival of Freeview. A government backed publicity campaign may be needed to educate consumers to the proposed changes to terrestrial TV.

Manufacturers are looking for a public announcement of analogue switch-over, and a clear timetable and firm dates. A region by region switch-over is desired, to learn from experience and have time to rectify issues, and to remove a huge peak in demand for product.

Once a switchover programme is confirmed, analogue-only products in retailers could be marked with stickers informing that adaptation for digital will be needed in future.

In addition, the likely scenario post-switchover should be clarified, so manufacturers can start to plan and invest in new product developments. Large global manufacturers have strategies that extend more than 10 years into the future.

A technical roadmap for developing new services over DTT needs to be generated and promoted. This must be accompanied by rapid development of standards and specifications to provide these services, current examples of which include: receiver profiles; programme schedule; dealing with legacy; provision of return path; recording issues; and converting 2nd/3rd sets. DTT players may need to be more pro-active in developing or refining standards where they are currently unsuitable or non-existent, as has been done by some of the closed system operators, in order to have timely launch of new services.

The addition of a return path for transactional applications is seen by several as essential if the DTT platform is to develop revenues sufficient to maintain future investment.

Of major significance is to ensure that all products currently being sold can deal seamlessly with the changes to transmissions anticipated at switch-over, including auto-retune for transmitter frequencies, multiplex reorganisations, change of modulation e.g. 2k/8k

6.1.7 Legacy products

The issue of legacy consumer products is far more complex and intractable for UK DTT than in a vertical market model. Even with more extensive testing to refine new products entering the market, there will always come a time when they are no longer supported by manufacturers. Indeed, there are already significant numbers of legacy products which have limited functionality and react unpredictably to new services or applications.

If the DTT services are to evolve and new enhanced services be launched, it is certain that increasing problems will be had with legacy units, both before, during and post-switchover. Although this issue seems focussed on the manufacturers, they alone cannot control all the developments that result in legacy products. Broadcasters have a responsibility to ensure existing services available to consumers today will continue, and not be upgraded or withdrawn such that certain receivers fail to receive them. The development of new services will therefore need to dovetail with those existing to keep the need for additional content authoring and transmission bandwidth to a minimum.

PRODUCT AND INTEROPERABILITY

TESTING AND SUPPORT

A Code of Practice therefore needs to be developed to address this issue. Currently the ITC expects broadcasters to support all products in the field and not cause any problems. However, this approach will almost certainly become impractical if services are to evolve. Sooner or later a decision point will be reached – do we allow a service to be broadcast that knowingly adversely affect some receivers – or, do we cease developing new services.

In an ideal world, all receivers should be designed so that if any services are transmitted that are unknown or incorrectly configured that they cannot decode, they should ignore them but otherwise continue to function normally. It is very difficult in practice to achieve this, made worse by the number of different models and code versions in the market, without some systematic means of signalling by the broadcaster and a process in the receiver that can reliably act upon it. DTT operational practices should provide for this and so should avoid problems, otherwise it must be assumed that some of today's products will cease to operate correctly at all times, and on all signals.

Manufacturers are currently the judges of when a product becomes a legacy device; there is no obligation for them to provide support for any fixed period, or its lifetime. Encouragement or incentives may be required to persuade them to continue support for products beyond their normal economic limit to alleviate the problem. Ultimately, it is in manufacturers' interest to allow new services to be introduced, so newer, higher specification products can be sold. But it is also in service providers' interests and those of the consumer that existing serviceable receivers continue to work at some agreed baseline level before and after switchover. The basis for such an agreement would be compliance with full DVB-T, MPEG Audio and Video and MHEG UK Profile 1.

In addition, when specific legacy products are known to be obstacles to new service introduction, a method may need to be found to encourage consumers to replace them. This could be some form of cash back deal, or free upgrade, and potential funding arrangements for this should be considered.

6.1.8 Over-air downloads

The consumer is not made aware of when over-air downloads are occurring, and is not given the option to choose to have his equipment updated. If the functionality is not changed this is probably of little consequence, but changes to "look and feel" or other operational aspects may cause confusion and dissatisfaction.

In other systems which have a common user experience regardless of product manufacturer any changes may be advertised by the broadcaster, and indeed promoted as enhancements or new services. In the horizontal market with many diverse products this is not possible, and some other way may need to be found to reach the consumers.

A software download is often required when a customer installs a product to update it to the latest version. Ideally, the current code versions of all products should be available over-air in a carousel with a cycle time of less than 24 hours.

6.2 Issues and recommendations

The issue of Interoperability is a basic, complex and long-standing one that all organisations involved in digital television, such as UK DTT, UK Cable, UK Satellite, DVB, DigiTAG, ATSC, CableLabs etc, have had to address. It will continue to be an issue and each has to find its own way through those complexities. UK DTT faces strong competition and the deadline of switchover; and therefore must pay close attention to offering a proposition to the consumer that is attractive but also delivers as faultless a technical performance as possible. The testing regime will contribute crucially to securing such performance especially where failures are immediately visible to the consumer.

In this report, we have used the vertical market experience to act as a rigorous benchmark. It should be recognised that a vertical market test methodology is optimised for that market and not for a horizontal one and so is well suited to central control and to the imperatives of pay TV. The natural absence of such imperatives and control in horizontal markets are two of several reasons why we do not suggest that it should be applied directly, completely or indiscriminately to the UK DTT case especially in regard to the mandating of processes.

The main recommendations below therefore centre on learning from the vertical market experience, and investigating how the weaknesses and gaps that have been exposed in the current DTT platform may be addressed within a horizontal market model.

Specifically they include:

- i. Enhancing the current CE product testing regime so all products are tested and approved in their final form by an independent test centre before release. This does not need to be mandatory; this is a matter for discussion. The test centre will need considerably more facilities than exist at DTG Testing and must be seen to be completely independent and impartial. Testing must be sufficiently low cost to prevent barriers to entry for any manufacturer.
- ii. Developing a Code of Practice for CE manufacturers when launching or developing new products and code releases. Decide whether any form of product logo is desirable, and if so what.
- iii. Developing a comprehensive set of receiver specifications and profiles consistent with anticipated services development up to and beyond switchover. In particular a minimum baseline specification needs to be agreed that covers DVB-T reception, MPEG processing and MHEG UK profile 1.
- iv. Completing the work on Applications Code of Conduct, and establishing test and development facilities for applications. Ideally, there should be a single centre but practical factors may require there to be more than one.
- v. Establishing receiver “zoos” at the CE product and the Applications test centres, which contain every significant hardware revision to every product and have access to every software version in an archive with the ability to download these into product.
- vi. Proposing the formation of a full-time technical strategy team to plan and drive future DTT developments and develop a clear roadmap for the introduction of services up to and beyond switchover. This team would be pro-active in

PRODUCT AND INTEROPERABILITY

TESTING AND SUPPORT

- proposing and participating in the development of UK, European and worldwide standards to support planned DTT platform service requirements.
- vii. Developing a Code of Practice to address legacy products. This would include methods of providing incentives to manufacturers to continue product support for as long as possible, and explore possible incentives to assist the removal of legacy receivers from the marketplace.
 - viii. Investigating the setting up of a single consumer helpline organisation, with Code of Practice to ensure it has consistent communications of all issues between manufacturers, applications developers, broadcasters and transmission providers. It must provide a method for resolving consumer issues, arbitration between parties, training / briefing of customer service agents, and the capture and dissemination of reported issues.
 - ix. Investigating the operation of nationwide installation services, and conduct a consumer survey and pilot trial to establish whether they meet their objectives.
 - x. Communicating clear dates of switch-over to the trade and public to make consumers aware that analogue will be switched off. Reassure consumers of the continuity of DTT, and convince manufacturers to invest in products for the UK market.

The Code of Practice for applications already under development within DTG recognises and addresses much of item (iv) and some aspects of (ii, and v to vii). While the effect of this work remains to be demonstrated operationally, it is expected to stabilise MHEG behaviour going forward.

Item (x) is the subject of other Action Plan activities. Item (ix) suggests a review of the effectiveness in rectifying installation issues, and what proportion remain possibly as local coverage issues.

The remaining items are contentious in a horizontal market to varying degrees, with (i, ii and viii) possibly the most contentious. How these can be addressed within the spirit of a horizontal market, whilst successfully reaching the same or better standards of service offered by DTT's competitors is the challenge faced. It is the expectation of the authors that this set will be the subject of ongoing work that will shed more light on them. It will also allow opportunities for other methods of analysis such as comparing and contrasting UK DTT with the transitional analogue to digital consumer conversion experience in other areas, such as CD, DVD and mobile telephones, to point the way to additional recommendations.

PRODUCT AND INTEROPERABILITY TESTING AND SUPPORT

7 ACKNOWLEDGEMENTS

The authors would like to thank the following individuals and organisations for their kind co-operation and generosity with their time in providing information and their views on which this report has been based.

Person	Organisation	Date visited
David Bradshaw	DTG Testing Ltd	16 June 2003
Terry Hurley Mark Londero	Sony	19 June 2003
Howard Farmer David Johnston	Philips	27 June 2003
David Holliday	BSkyB plc	30 June 2003
Oliver Durkin	Novapal Ltd	8 July 2003
Paul Gardiner Derek Hawthorne	Independent Television Commission	9 July 2003
Robert Lawrence Greg Newman	Channel 4	11 July 2003
David Cutts	Strategy and Technology	11 July 2003
Clive Malcher	ITV Interactive	15 July 2003

8 GLOSSARY OF TERMS

Application	Software code, text and graphics (written according to the ISO MHEG standard) that is loaded into the receiver over-air, and executed upon user command. Typical examples would be to allow viewers to participate in quiz shows, or run a game that is based on the programme to which it is related
Broadcaster	The organisation responsible for assembling and presenting all the programme sources into the broadcast networks which feed the transmitters. Generally provide MPEG-2 compressed video and audio in a multi-programme Transport Stream, with sub-titling, text services, application data and SI Information data
Code of Practice	A document setting out an agreed set of rules and modes of behaviour by which participants agree to be bound
Conditional Access	Means whereby a broadcaster can secure the delivery of content for subscription or pay-per-view, and through which associated revenues can be levied. Allows individual subscribers to be accessed.
Conformance	The assurance that an item of equipment or software or indeed a complete system can be shown to meet the requirements of all the relevant standards.
D-book	A specification for all elements of the DT platform performance document prepared and maintained by the DTG.
DTT	Digital Terrestrial Television
EPG	Electronic Programme Guide.
Freeview	Brand name for re-launched UK DTT platform with free to air programming and no subscription fees.
Horizontal market	A consumer market in which the supply of product is not restricted and is open for all players to participate on open, commercial principles.
IDTV	Integrated Digital Television
ITC	Independent Television Commission
Legacy product	A product in the market that is still functioning, but is no longer supported by its manufacturer with any code updates.
MHEG	Multi -and Hyper-Media Expert Group. A sister group to MPEG in the ISO multimedia standardisation process. It gives its name to the code that is written to create applications, and the software engine in consumer products that can execute the code.
Over-air download	A means of replacing the resident software in the receiver with a new version broadcast in the MPEG Transport Stream.
Platform Operator	The organisation that is responsible for the operation

PRODUCT AND INTEROPERABILITY

TESTING AND SUPPORT

	and support of the complete television delivery system.
PVR	Personal Video Recorder. A recording device (normally using hard disc or DVD-R) which can provide much more flexible recording operations linked to broadcast schedule data.
SFN	Single Frequency Network. An OFDM network of transmitters operating on the same frequency and broadcasting the same information, synchronised together.
SI	Service Information data, as specified by ETSI. Embedded data provided in a transmission to enable the receiver to find and decode all the services.
Transactional services	Services that involve a bi-directional transaction between broadcaster and consumer, normally over a telephone or internet connection.
User interface	The layout of graphics, text and buttons, and underlying functions of the on-screen displays and remote control that enable the consumer to operate the receiver.
Vertical market	A market in which one central organisation, usually the platform operator, controls all aspects of design, specification, operation and supply of equipment for an end-to-end broadcasting system.

9 ADDENDUM: DTG COUNCIL FEEDBACK

The following observations and views represent the collective view of DTG Council. They are assembled to clarify the view of DTG Council in respect of the recommendations made in the Interoperability Review commissioned by the Department of Trade and Industry and undertaken by DTG Management Services Limited in August 2003.

9.1 General Observations

The challenge of interoperability lies at the very heart of the DTG's reason for being. All DTG activities are undertaken in support of the fundamental objective of ensuring interoperability between digital TV products and services. The DTG, through its collaborating membership, has made enormous strides towards such a goal and today, more than ever, is engaged in a comprehensive range of activities to build on the initial work required to launch the DTT platform. It is clear to Council members that the DTG has a huge task ahead and will require ongoing support from both industry and government to ensure the level of interoperability needed to enable switchover to happen.

The report has, as expected, highlighted a number of key areas where there is a divergence of views within the industry. The DTG Council view here is that whilst the report represents a snapshot in time, the challenge of achieving and sustaining interoperable products and services is a long term, ongoing process during which significant milestones can be realised. The DTG Council remains committed to this process and urges caution where sudden interventions may provide short-term benefits but prove constraining or restrictive in the longer term. The DTG Council would welcome the opportunity to review progress with the DTI on a regular basis.

DTG Council acknowledges that the report, given the agreed time and budget constraints, represents a reasonable view of the key issues. The Council is not, however, wholly aligned with the relevance of the comparisons drawn between horizontal and vertical markets throughout the report. The Council draws attention to the following general observations and highlights specific issues arising from each recommendation made in the report.

a) 'Natural' Interoperability - The Council believes that there may be more merit in seeking a route towards a 'natural' interoperability for the horizontal market rather than seeking to emulate the characteristics of a vertically integrated system. We should consider that we are in a transition state on DTT. The work on conformance needs to be completed (SI, service management, MHEG 1.06, etc) and this needs considerable attention (more than it has at the moment). If conformance cannot be achieved to a sufficient level, then the industry and government will have significant problems in realising any switchover objectives. Achieving conformance is not the same as enforcing a central test facility for application and receiver acceptance. We have some basic operational parameters to stabilise as a priority.

b) Corrections - The following corrections should be noted where generalisations have been made:

PRODUCT AND INTEROPERABILITY

TESTING AND SUPPORT

- 'Applications are not tested through all broadcast chains.' - In fact, applications only need to be tested through equipment representative of the broadcast chain(s) in which they will actually be transmitted.
- 'There is little communication between application developers, broadcasters and manufacturers.' - In fact, a great deal of effort is put into this by the BBC, who have extensive liaison arrangements between its developers and R&D people with other broadcasters and manufacturers.
- 'There is a lack of application testing independent of the developers authoring the code.' - In fact, the BBC has a dedicated QA team.
- 'Applications are only tested against a "representative sample".' - In fact the BBC does everything possible to have all receivers in its test farm.
- 'Manufacturers [and retailers] do not know when new applications are being broadcast.' - In fact the BBC has a dedicated email reflector for this purpose.

c) Specific issues mentioned in the report that are worthy of more detailed consideration in ongoing industry groups include:

- Problems with dealing with legacy products.
- Implications of IDTVs on the physical size of test farms
- Remote controls.
- The multiplicity of software versions in the field for some individual products.

9.2 Feedback against Specific Recommendations

Recommendation i: Enhancing the current CE product testing regime so all products are tested and approved in their final form by an independent test centre before release. This does not need to be mandatory; this is a matter for discussion. The test centre will need considerably more facilities than exist at DTG Testing and must be seen to be completely independent and impartial. Testing must be sufficiently low cost to prevent barriers to entry for any manufacturer.

DTG Council would like to highlight the valuable role played by DTG Testing Limited in the creation of testing facilities and testing materials and processes. It continues to play a pivotal role in the development of the DTT platform. Government and industry alike must continue to support the test centre if switchover objectives are to be realised.

The model used for the basis of the report recommendation is stated to be that of the vertical (BSkyB) market. Whilst it is true that the testing of product in this market is more formalised, it is also a fact that the vertical market is essentially a closed one. There are only a few manufacturing players serving this sector, and because the specification of the product is completely controlled by the Service Provider, all products offer essentially the same features and functionality.

The horizontal market for DTT is completely different and is characterised by a far higher number of manufacturers, supplying many different types of product (eg DCB's and IDTV's) all with varying features and functionalities. Added to this, the distribution route is through retailers of varying characteristics (Specialist stores, Supermarkets, Internet, Mail order, Catalogue Houses, etc). This provides the elements of a highly competitive market, offering consumers a wide choice of

PRODUCT AND INTEROPERABILITY

TESTING AND SUPPORT

products through a wide distribution network, which is necessary to drive the volume requirements needed to achieve the Government criteria for ownership that will allow switchover.

Given these characteristics, it is necessary for product development, and 'time to market' to be as rapid as possible. A more formal testing regime will, given the huge diversity of product, be a barrier to this rapid deployment of new product. The number of manufacturers will grow significantly, and this will further fuel competition, creating an even quicker development need for new product. This would also put further pressure on any formal test regime.

It is for these reasons that it is essential to have options for manufacturers to either utilise an independent accredited test house, or provide their own self-certification of product 'switchover compliance'. There is also the question of confidentiality, both for technical and commercial reasons, of any formalised test data, and dispute resolution processes, further delaying time to market. An additional delay problem will doubtless arise by the sheer number of anticipated products (100s of devices) that would need to be tested.

Finally, such a mandatory centralised regime is liable to create market distortions which could affect manufacturers competitiveness and the take-up of DTT, and therefore have legal implications such as non-tariff barriers to market entry for new players.

For all these reasons, such a mandated approach cannot work in a truly horizontal market, and indeed there are no precedents that illustrate success using this model.

Recommendation ii: Developing a Code of Practice for CE manufacturers when launching or developing new products and code releases. Decide whether any form of product logo is desirable, and if so what.

Further detail would be required about the proposed code of conduct before DTG Council could provide meaningful comment.

As far as logos are concerned, there is a distinct possibility that a proliferation of logos will only serve to confuse consumers. Currently there is a Freeview brand and potentially there may be more service providers in the future, no doubt with their own brands. There may well be a 'Woolmark' logo in addition. Most importantly, Manufacturers have their own brand, upon which their reputation lies. Failure to deliver a functioning, reliable product will result in market rejection of that brand. A multitude of logos is therefore counterproductive in the interests of a simple message that provides consumer confidence in the product they are purchasing.

Recommendation iii: Developing a comprehensive set of receiver specifications and profiles consistent with anticipated services development up to and beyond switchover. In particular a minimum baseline specification needs to be agreed that covers DVB-T reception, MPEG processing and MHEG UK profile 1.

The D-Book as the technical encyclopaedia for manufacturers. The D-Book should therefore be regularly maintained as an up to date reference book. The Baseline Receiver Specification is a technical list from which manufacturers will choose functions to install into their product development plans, as they see fit for the market

PRODUCT AND INTEROPERABILITY

TESTING AND SUPPORT

in which they wish to operate. If the purpose of this recommendation is to have a set number of fixed 'strata' specifications for different applications, it may result in a restricted choice of products for consumers.

Currently there is no clear agreement or definition of a 'Switchover Compliant' receiver, other than the Government's own stated criteria as published in the Digital Television Action Plan. At this time proposed D-Book extensions should be carefully considered in the context of whether they help or hinder switchover. It is not clear that all consumers require the higher profile features that may be available, and therefore if choice is restricted this could have a negative impact on consumer uptake of DTT.

Recommendation iv: Completing the work on Applications Code of Conduct, and establish test and development facilities for applications. Ideally, there should be a single centre but practical factors may require there to be more than one.

DTG Council acknowledges that this important strand of collaboration between broadcasters and manufacturers is progressing steadily and agrees that more than one test facility will be a likely outcome. This is consistent with the consensus view being expressed by those working within the DTG Interoperability Group.

Recommendation v: Establishing receiver "zoos" at the CE product and the Applications test centres, which contain every significant hardware revision to every product and have access to every software version in an archive with the ability to download these into product.

DTG Council notes that the substantial cost of stocking and staffing the 'zoo' is not addressed in the report. As manufacturers largely bear the cost of product testing, whether by third party test facilities or self-certification, it would be fair to suggest that the cost should be borne in part by Broadcasters who would also benefit from such a facility.

Recommendation vi: Proposing the formation of a full-time technical strategy team to plan and drive future DTT developments and develop a clear roadmap for the introduction of services up to and beyond switch-over. This team would be pro-active in proposing and participating in the development of UK, European and worldwide standards to support planned DTT platform service requirements.

It is the view of DTG Council that the Action Plan has been a useful vehicle for such strategy formulation and that this role will be increasingly important passing, most probably, to the organisation created to manage switchover implementation. It is the Council's view that the DTG is the best-placed body to undertake this function drawing together its extensive membership in an effective and efficient manner.

Recommendation vii: Developing a Code of Practice to address legacy products. This would include methods of providing incentives to manufacturers to continue product support for as long as possible, and explore possible incentives to assist the removal of legacy receivers from the marketplace.

PRODUCT AND INTEROPERABILITY

TESTING AND SUPPORT

Manufacturers design and build products to a level of specification and functionality to suit the market requirements of their choice. They cannot, and will not, guarantee that these products will be able to receive any new services that the product was not designed to receive. The nature of a highly competitive market is such that it is not attractive to consumers to buy product, at a higher price, which has been designed to receive possible, but not guaranteed, additional services at some point in the future. Equally, manufacturers cannot guarantee that a product can be upgraded to receive additional services. There are many examples of the CE industry producing different levels of product to address extra services provided by broadcasters, e.g. Text and Nicam.

This is a matter of choice for the Consumer, to buy a product that suits their requirements at a price appropriate to their budget. To meet these market requirements, manufacturers will only guarantee that the product should be capable of continuously receiving those services for which the product was designed. It is therefore absolutely essential that any new broadcast services do not cause existing product to crash, or reduce their functionality. If this were to happen, the Consumer will expect the manufacturer to pay for rectification of the problem, even though the problem was outside of their control.

Even if manufacturers decide to support those products for a period of time appropriate to the anticipated lifetime of the product, or for a period of time decided for their own commercial reasons, it becomes uneconomical to continue this indefinitely.

Recommendation viii: Investigating the setting up of a single consumer helpline organisation, with Code of Practice to ensure it has consistent communications of all issues between manufacturers, applications developers, broadcasters and transmission providers. It must provide a method for resolving consumer issues, arbitration between parties, training / briefing of customer service agents, and the capture and dissemination of reported issues.

Whilst there could be theoretical merit in such an idea; the enormous variance in specification of available product, and consequent domestic home entertainment system configurations, it is not as simple as taking the vertical market model as a reference, for the reasons stated in comments to recommendation (i) above.

Recommendation ix: Investigating the operation of nationwide installation services, and conduct a consumer survey and pilot trial to establish whether they meet their objectives.

DTG Council supports this recommendation.

Recommendation x: Communicating clear dates of switch-over to the trade and public to make consumers aware that analogue will be switched off. Reassure consumers of the continuity of DTT, and convince manufacturers to invest in products for the UK market.

DTG Council agrees with this recommendation, but would point out that manufacturers and broadcasters have already made very heavy investments in the UK DTT market. In fact, clarity from government is vital to ensure that these

PRODUCT AND INTEROPERABILITY

TESTING AND SUPPORT

constituencies remain committed to that, and further investment, rather than diverting resources to more time-certain markets. Furthermore, it is also important that any communication initiatives must be handled in such a way to prevent damage to the currently already buoyant market.