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Standardisation mandate to CEN, CENELEC and ETSI in support of digital TV and interactive services

1 Title

Mandate to CEN, CENELEC and ETSI in support of the regulatory framework for electronic communications networks and services, namely:

- Directive 2002/21/EC of the European Parliament and the Council of 7 March 2002 on a common regulatory framework for electronic communications networks and services (Framework Directive).

This Mandate refers in particular to article 18 of the Directive on the interoperability of digital interactive television services.

2 Rationale

2.1 Introduction

The objective of the eEurope initiative is to promote an information society for all, with special emphasis on accelerating the deployment of broadband infrastructure and the creation of more attractive multimedia services. In this context, interoperability of digital interactive television is regarded as an important element in the European Commission's strategy to promote the free flow of information, media pluralism and cultural diversity across the European Union. The eEurope 2005 Action Plan acknowledges and encourages the role of digital television based on a multi -platform approach, for the further development of the information society. The objective is to provide widespread access to advanced communications and information services for all European citizens, including increasing broadband access. Digital interactive television may complement the PC/Internet based access to information society services if widely implemented in the EU.

The lack of commonly agreed standards in support of interoperability of interactive television services is considered as a barrier to the further deployment of interactive services in Europe. The objective of this Mandate is to stimulate further standardisation work in this field, with the view to support the effective implementation of the Directive 2002/21/EC.

2.2 The legal environment

Following article 18 of the Directive 2002/21/EC Member States are obliged to encourage the use of an open API by all providers of digital interactive services and all providers of enhanced digital television equipment. Based on article 17 of the Directive, the Commission has published on 31 December 2002 a list of voluntary standards to be encouraged by Member States, in view of reaching the required level of interoperability of services and accessibility to information by citizen. The list contains, inter alia, a reference to ETSI TS 102 819, the Multimedia Home Platform (MHP) specification. Thus, this standard may be considered as a possible solution to achieve the objectives of article 18 the Directive 2002/21/EC. However, other solutions may exist or be developed.

Article 18 (3) of the Framework Directive stipulates that, by no later than July 2004, the Commission will examine the state of play with regard to the level of interoperability. If interoperability and freedom of choice for users have not been adequately achieved, the Commission may take action under the terms of article 17, with the effect that a previously published standard may be made compulsory, following a public consultation and in agreement with Member States.

In preparation of this report, the Commission will publish a consultation document on interactive television interoperability by the end of this year; the consultation document will, in particular, include an assessment of the standardisation issue.

2.3 The standardisation environment

Further to the Directive 2002/21/EC, the Commission has invited the European Standardisation Organisations (ESOs), in August 2002, to assess how standardisation can contribute to achieve the required level of interoperability. The ESOs have been asked to identify existing standardisation initiatives at international, European and national level, both formal and informal, and to specify still existing standardisation gaps. On the basis of these findings, the ESOs were invited to present recommendations for future standardisation work.

The resulting draft report "Standardisation in digital interactive television", as prepared by CENELEC, has been further discussed at an open meeting held on 12 March 2003 in Brussels. The final report, including the recommendations, is annexed to this Mandate.

3. Scope of the Mandate

Based on the recommendations of the report "Standardisation in digital interactive television", the European Standardisation Organisations, CEN, CENELEC and ETSI, are invited to prepare a coherent set of standards, specifications and guidelines in support of the requirements set by article 18 of Directive 2002/21/EC.

The Mandate shall be executed in two phases. The objectives of the first phase are:

?? To establish an open digital interactive television standardisation platform, ensuring adequate participation of all relevant stakeholders. A Steering Group

shall monitor the activities to be taken in preparation of the standardisation workprogramme, representing the ESOs and the relevant industrial fora and consortia in a balanced manner.

- ?? To prepare a standardisation workprogramme, based on the legal requirements of Directive 2002/21/EC and taking into account the recommendations of the report on "Standardisation in digital interactive television". The workprogramme shall in particular define clear objectives, task assignments and timetables for the delivery of the required standards. The workprogramme shall be presented to the Commission not later than 6 months after the date of acceptance of this Mandate.
- ?? To assess, if necessary, the impact of competing standards for digital interactive television on interoperability, taking into account technical and economic aspects.

The objective of the second phase is:

- ?? To implement the standardisation workprogramme as agreed in phase 1, further to a consultation with Member States organised by the Commission, in close co-operation with relevant industrial fora and consortia.

4. Modus operandi and co-ordination aspects

The objective is to complete the standardisation work in support of Directive 2002/21/EC as soon as possible. The ESOs are invited to establish adequate and efficient co-operation mechanisms in view of achieving widest possible consensus amongst all parties concerned. In addition, arrangements shall be made to establish relevant international co-operation. In this respect, the following principles shall be followed:

- ?? Due account shall be taken of existing co-ordination structures, such as the role of the EBU/ CENELEC/ ETSI Joint Technical Committee (JTC) Broadcast.
- ?? Close co-operation with industry fora and consortia, such as DVB, EICTA and DigiTag shall be established.
- ?? International co-operation shall be ensured, in particular with IEC.
- ?? Results of relevant EU research projects shall be taken into account.
- ?? Particular attention shall be given to the involvement of national organisations and authorities concerned with the implementation of Directive 2002/21/EC and the provision of legal recognition of the standards through the publication of the references in the Article 17.1 list.
- ?? Generic eInclusion principles shall be implemented and, in particular, the recommendations made by the Sevilla Workshop, organised by Cenelec in June 2002 on " Broadcast for All" shall be taken into account.
- ?? Adequate co-ordination shall be established with the standardisation work performed in response to Mandate 328 concerning the review of the list of standards to be established in response to the provisions of Article 17.1 of Directive 2002/21/EC.

5 Execution of the Mandate

5.1. Within two months of the date of acceptance of this Mandate, CEN, CENELEC and ETSI shall present to the Commission a report setting out the arrangements they have made for the execution of this Mandate. Particular attention shall be given to the involvement of all relevant parties and to the working arrangements with relevant consortia and fora.

5.2. Within six months of the date of acceptance of this Mandate, CEN, CENELEC and ETSI shall present a report containing the deliverables specified in Phase I of this Mandate.

5.3 CEN, CENELEC and ETSI are invited to put in place as soon as possible, adequate monitoring mechanisms for the execution of the work.

5.4 With acceptance by CEN, CENELEC and ETSI of the Mandate the appropriate standstill period in accordance with article 6 of the Directive 98/34/EEC as amended will start.

Annex I to the M/331



Standardisation in digital interactive television

**Strategy and recommendations for a standardisation policy
supporting the effective implementation
of the Framework Directive 2002/21/EC
and the establishment of required interoperability levels
in digital interactive television**

Final version
April 2003

CONTESTCONSULTANCY

Preface

This reports reflects the results of a study on the regulatory and technical situation with respect to standardisation in digital interactive television. It describes the economic, regulatory and standardisation frameworks, and concludes a strategy for further standardisation activities in the field of digital interactive television.

The study was commissioned to CENELEC by DG Enterprises of the European Commission (order voucher CENELEC/ ENTR/e-Europe/2002-0497) in the autumn of 2002, following questions raised in the European Parliament on migration to a single standard for digital interactive television. It was carried out by ConTeSt consultancy on behalf of CENELEC and the JTC Broadcast between December 2002 and February 2003.

The outcome of this study should also be regarded as part of a larger framework focusing on the general accessibility of digital television services, following the 'Broadcasting for All' workshop held in Seville in June 2002. A second project resulting from this, encompasses the identification of ways to meet user requirements related to ensuring access to TV broadcasting and related services for people with disabilities.¹

Although it does not go deeply into technical details, throughout this report, specific terms, abbreviations and concepts are being used. Definitions of these terms and concepts, related to the scope of this report, are contained in a glossary included at the end of the report. A list of referenced documents can also be found at the end of the report.

The author wishes to thank representatives from all companies, institutes and government bodies that kindly offered their time and contributed to the report, and in particular Mr. Philip Laven, Mr. Stephen Temple, Mr. Ian Dixon, Mr. Henk Kolk, Dr. Henning Wilkens and Dr. Dietrich Westerkamp; a complete list of contributors can be found at the end of this report.

In order to reach consensus in the industry on the strategy and recommendations contained herein, a draft version of this report was presented during an Open Meeting taking place 12th March in Brussels at the premises of CENELEC, and discussed between stakeholders. In addition to the other contributors, the author therefore wishes to thank CENELEC for their support in carrying out the project, producing the report and organizing the Open Meeting.

29th April 2003

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¹ The final version of the report resulting from this is expected by the end of November 2003, an interim version will be available in June 2003; contributions to this report are invited and can be directed at CENELEC.

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Introduction

Digital interactive television is currently subject to considerable debate across Europe, not only on a political level, but also within the industry. This debate focuses on how to encourage consumer take-up of digital interactive services, and how to boost overall digital TV penetration, as both are not developing according to initial expectations, consequently endangering the economic potential embodied by analogue switch-off.

In this respect, the lack of interoperability on the software level, and the consequent lack of open, horizontal markets for interactive content and digital interactive receivers in Europe, are considered by many to be the key issues. Common solutions developed for this purpose based on voluntary adoption so far have not been able to address either one of these issues effectively, even though the industry itself developed these common solutions. For this reason, compulsory standards are currently being considered as a potential alternative by a number of participants to the debate. This however, is strongly criticised by others.

In order to promote the free flow of information, media pluralism and cultural diversity, EU legislation addresses interoperability in digital interactive television services in the provisions of Articles 17 and 18 of Directive 2002/21/EC ("the Framework Directive"). This directive provides a regulatory framework for all electronic communications networks and services, in the context of increased convergence in telecommunications, media and information technology. It was formally adopted on 7 March 2002 and published on 24 April 2002 (OJ No L108, p. 21). Article 17.1 of the Framework Directive requires the Commission to publish a list of standards to serve as a basis for encouraging the harmonised provision of electronic communication networks and services and of associated facilities. Once published, Member States are required to encourage the use of standards and specifications that appear in the list. The Commission published a preliminary list of standards on 31 December 2002, which includes the Multimedia Home Platform (MHP) standard.

Article 18 of the Framework Directive encourages providers of interactive television services as well as providers of enhanced digital television equipment to use an open Application Programming Interface (API). Article 18.3 requires the Commission to review interoperability and user choice by 25 July 2004. If the Commission concludes that interoperability and freedom of choice for users have not been adequately achieved in one or more Member States, it may decide to make the relevant previously published standards compulsory using the procedure set out in Article 17, which would require a public consultation and agreement of the Member States.

It is well recognised that the migration to such an open standard in many markets will have to be subject to an evaluation of technical, political and commercial considerations that may not lead to homogeneous decisions across all markets. Several initiatives have been undertaken by the Commission, of which this report is one that focuses on improvement of the dialogue within the industry on various aspects of voluntary migration. The present report, evaluates how additional standardisation could contribute to the goals specified in Article 18 of the Framework Directive, and evaluates how this could contribute to the effective implementation of the legal framework at Member State and at EU level.

This report takes into account relevant ongoing work as well as existing standardisation results and consensus-building work originating in national, regional and international standardisation organisations and industry consortia. Views from all stakeholders (i.e. broadcasters, network operators, regulatory authorities, industry consortia and manufacturers of digital customer equipment), active in digital interactive television, have been included in the evaluation process.

The strategy and recommendations for further standardisation activities following from this evaluation are reflected in chapter 5. They are based on the many 'compatible' elements found in the requirements for further standardisation as put forward by stakeholders, and aim to generate a voluntary consensus thereon. The report may also serve as a basis for a further dialogue on migration in digital interactive television. Finally, and as a separate consideration, this report serves as input for the Commission's mandated assessment of interoperability and user choice required in Article 18.3 of the Framework Directive by July 2004.

1. Executive summary

Over the last 7 years digital interactive television services have been commercially deployed across a number of satellite, cable and terrestrial facilities within the European Community. Market players have used a variety of underlying, set-top box software interfaces, or APIs in the roll out of their platforms. This is one of the reasons why applications and content designed for one specific platform, operated by one broadcaster or operator, cannot be supported by other platforms that are used by other broadcasters or operators in the same market, without any intermediate technical conversion.

In order to promote the free flow of information, media pluralism and cultural diversity, the new e-communications regulatory framework requires Member States to encourage the use of an open API by providers of digital interactive television services and providers of all enhanced digital television equipment (Article 18.1 Framework Directive). In addition the new framework requires Member States to encourage proprietors of APIs to make their digital technology available to third parties on fair, reasonable and non-discriminatory terms and to make such interface information available as is necessary to enable providers of digital interactive television services to provide their services in fully functional form (Article 18.2 Framework Directive).

The MHP standard was included in the list of standards published by the Commission on 31 December 2002 under Article 17 of the Framework Directive. Implementation of this standard is subject to considerable debate within the industry. Opinions among market players as well as regulators across the different digital interactive markets in the Community tend to diverge strongly with respect to commercial feasibility, the introduction process, and roll out timing. If the Commission determines that a satisfactory level of interoperability has not been achieved by July 2004, it may make a previously published standard compulsory.

Nothing prevents the set of standards, specifications and guidelines from being expanded to extend beyond those currently on the list however. This report addresses this possibility and describes whether and how a consensus with respect to additional standardisation might be reached among the relevant stakeholders, in such a way as to contribute to the effective implementation of the new framework that would allow for a level of interoperability and freedom of choice for users to be adequately achieved across the EU.

Inherent in the notion of an 'effective' implementation is an assumption that the legislative objectives can only be achieved in a market driven way. This is based upon a general consensus among stakeholders, as well as on the fact that virtually all stakeholders who are expected to contribute to these objectives are operating in a commercial environment. This means that addressing standardisation matters initially means analysing economic and market conditions for digital TV and interactive digital TV services.

Market analysis shows that different economics apply to broadcasters, pay TV service providers, and network operators, and that different analogue starting positions cause different development curves for digital TV. For example, while the UK market has already crossed the 40% mark, there are also other Member States' markets that have not seen any significant development yet. The economic consequences of converting a single standard to replace an existing technology can therefore be negligible in one market while significant in another; in addition, the desirability of using such a standard, which could potentially boost existing levels of digital TV penetration is lower in markets where this penetration is already considerable.

Until sufficiently high penetration levels are reached, consumers' interest in digital interactive television appears to be almost exclusively generated by interactive content relating to television programming. There is no evidence for direct positive effects on digital TV penetration from interactive digital TV services in general, nor is there evidence for significant revenues to be generated by interactive services and content

(though these are envisaged by many when higher penetration levels will be reached). Taking into account the current economic circumstances as well, stakeholders are generally far less willing to invest in the development of digital interactive television, a reluctance that is unrelated to APIs.

Despite prosperous development of digital television in some national markets, overall penetration in the European Community is lagging behind our major trading partners, when compared to initial expectations or to similar processes, for example in the US. Consequently it is recognised among many stakeholders that standardisation could contribute in a positive way although different economic positions and different market circumstances generate different opinions on the applicability and timing of specific solutions.

As far as the relevant standards, specifications and guidelines are concerned, five categories of technology are identified in this report: i) Application Programming Interfaces (APIs); ii) presentation engines; iii) functional receiver specifications; iv) Service Information (SI) (including related operational guidelines), and; v) content authoring formats (and related guidelines). Currently, the list published by the Commission under Article 18 of the Framework Directive includes standards in categories (i) and (iv), because no mature standards are available in the other categories. However, ongoing work within several standardisation bodies, industry consortia and trade organisations, is expected to generate relevant material for categories (ii) through (iv) within a relatively short timeframe.

Requirements put forward by market players concentrate on presentation engines, additional functional receiver specifications and guidelines for the use of SI in the physical and transport layers, as well as on common authoring formats and guidelines that could be supportive with respect to interoperability between legacy platforms and content migration to MHP. When mapping these requirements with the level of standardisation currently reflected in the list published under the Framework Directive, the conclusion may be drawn that additions will be necessary in order to enable effective implementation in a number of existing and nascent markets. This results from the fact that these requirements span different geographic regions, different delivery platforms and various positions in the broadcast chain. This is underlined by a number of generic considerations that should be taken into account when evaluating the potential for successful standardisation processes.

Notwithstanding these additional requirements many accept that a common API standard may emerge across digital interactive television markets in Europe, although driven by different mechanisms, at different points in time. Moreover, if stakeholders decide to opt for such a common API standard, the platform of choice would be the MHP platform currently specified in the published list. No other API platform is put forward for standardisation by any stakeholder. Further, there is a common desire to pursue increased interoperability illustrated by the fact that the proposed additional standardisation aims to: i) ease the start-up of digital interactive television markets; ii) ease the migration towards a common API platform, and iii) improve interoperability between different legacy platforms deployed in the same market.

A standardisation strategy supporting the effective implementation of the Framework Directive should consequently aim to match the requirements from the market with the requirements put forward by the legislator. An important condition in this respect is that additions to the currently specified set of standards should not block – or even complicate – the roll out of digital interactive television equipment and services in those markets, where use of a common standard is favoured and the current level of standardisation is considered sufficient by the relevant stakeholders. Any set of standards, specifications and guidelines should therefore be coherent within itself.

As far as further standardisation activity is concerned, this report recommends that attention be concentrated on two types of specifications, i.e. presentation engine and authoring format/guidelines in the layers 'above' the API, as well as on two types of standards, i.e. baseline receiver specifications and SI guidelines in the physical and transport layers 'below' the API. The consequence of this would be not to add or

change anything to the level of specification and standardisation currently available in the API layer.

The recommendations aim to generate a set of specifications enabling market players to establish or improve interoperability in their respective markets by applying standardised, generic solutions, tailored to the specific requirements of the market they operate in, that may not be fully MHP compliant from the beginning but will be able commercially and technically to coexist with MHP services and receiver implementations in those same markets. Moreover, these solutions will not prevent MHP markets elsewhere to be launched, based on generic receiver implementations supplied through retail, similar to those supplied in markets that will have to go through a migration process.

In order to achieve this, ongoing activity on the specification of presentation engines in ETSI and DVB, as well as ongoing activity on the specification of baseline terrestrial receiver requirements and SI guidelines in EICTA, DigiTAG and IEC/CENELEC will have to be coordinated with specification activities and new standardisation activities. These activities would most usefully address functional receiver specifications for cable usage, as well as on content authoring formats and guidelines. The first of these new initiatives should be taken up by EICTA and coordinated by IEC/CENELEC while the second should be ensured by DVB. It is recommended that the CENELEC/EBU/ETSI Joint Technical Committee be charged with the overall coordination of the process, safeguarding coherence and compatibility.

Finally, there is a risk that this strategy may not deliver full interoperability within the timelines indicated in the Framework Directive; it would be a matter for the Commission to assess whether the progress achieved constituted a satisfactory level of interoperability. Given the voluntary nature of standardisation, and the lack of a legal requirement to use a single standard throughout the EU, these processes take time. This strategy has a good chance of ensuring the effectiveness of the implementation of the new regulatory framework given the level of support from the market.

2. Development of digital interactive TV in Europe

Interoperability of digital interactive television services should be encouraged in order to ensure free flow of information, media pluralism and cultural diversity in the Community. Interoperability of interactive services and equipment is regarded as an important precondition to achieve these goals, but this is currently at a low level in many markets within the Community. The absence of deployed standards ensuring the required levels of interoperability may be one of the elements causing this. The question therefore is whether additional standardisation could contribute to the Commission's goals in a balanced way.

The European market however is far from coherent as far as digital interactive TV is concerned, neither from a technical (hard & software platforms), nor from a commercial perspective (customers taking up services). As standardisation ideally is a market driven process², the question therefore rises whether (and which) solutions are sufficient, or whether different levels and types of standardisation are more supportive in addressing the different statuses of digital interactive TV, the different (market) backgrounds against which it developed, and potentially different interoperability issues.

In order to determine this it is necessary to understand the main mechanisms that have influenced the growth of digital interactive TV, either positively or negatively. As a first step this chapter will therefore briefly discuss the development of digital TV penetration (being the main precondition for the development of digital interactive services), as well as customer acceptance of, business opportunities in, and market models for digital interactive television. Although it is recognised that many specific circumstances have influenced this development on national levels as well, primary focus will be on general mechanisms that – some to a large and some to a smaller extent – have worked throughout the EU.

Before addressing this however, it has to be clarified what is understood by digital interactive television, as definitions of the concept tend to diverge across the industry. Some definitions limit the meaning to concepts offering the user an opportunity to communicate directly, through the application, with the 'outside world' by means of a physical return channel. Other views advocate that applications offering 'local' interactivity (i.e. the opportunity to select from content-options broadcasted in data-carrousel format), or a telephone response option³ should be included as well. This report will take the broader approach and take the user's perception of interactivity, rather than physical limitations within the broadcast chain as a starting point, as this appears to be the majority point of view (see also glossary of terms and abbreviations).

2.1 Digital TV market development

Currently, more than 26 million customers throughout all EU Member States receive digital television services via satellite, cable or terrestrial infrastructures⁴. Within a period of 7 years, digital TV and digital interactive services have thus managed to attract some 18% of households in the European Community; a disappointing – and

² *ibid.*

³ This refers to a programming format quite frequently used in analogue television, where the viewer is encouraged to react by calling a specific phone number, thus generating revenues for the broadcaster.

⁴ This number may be larger – though not considerable – as there probably is a quantity of receivers, previously used by registered pay TV customers, that remains in the market – though not accounted for anymore – as free-to-air DTH receivers; for penetration rates per market, also see figure 1.

according to many also concerning – figure if compared to previous innovations such as colour TV or the VCR⁵, or even to digital TV take up in the United States⁶.

A closer look however will show that differences between Member States are large: while in the United Kingdom 40% of households receive their television signals digitally, penetration has not yet managed to take the 5% threshold in countries such as Greece or Belgium⁷. The two main reasons for these differences in take-up are the fact that economics in analogue and digital TV distribution work differently for public broadcasters, private broadcasters, pay TV operators and cable operators⁸, and the fact that market pre-conditions in analogue were quite different across Europe, specifically where multi-channel penetration is concerned⁹.

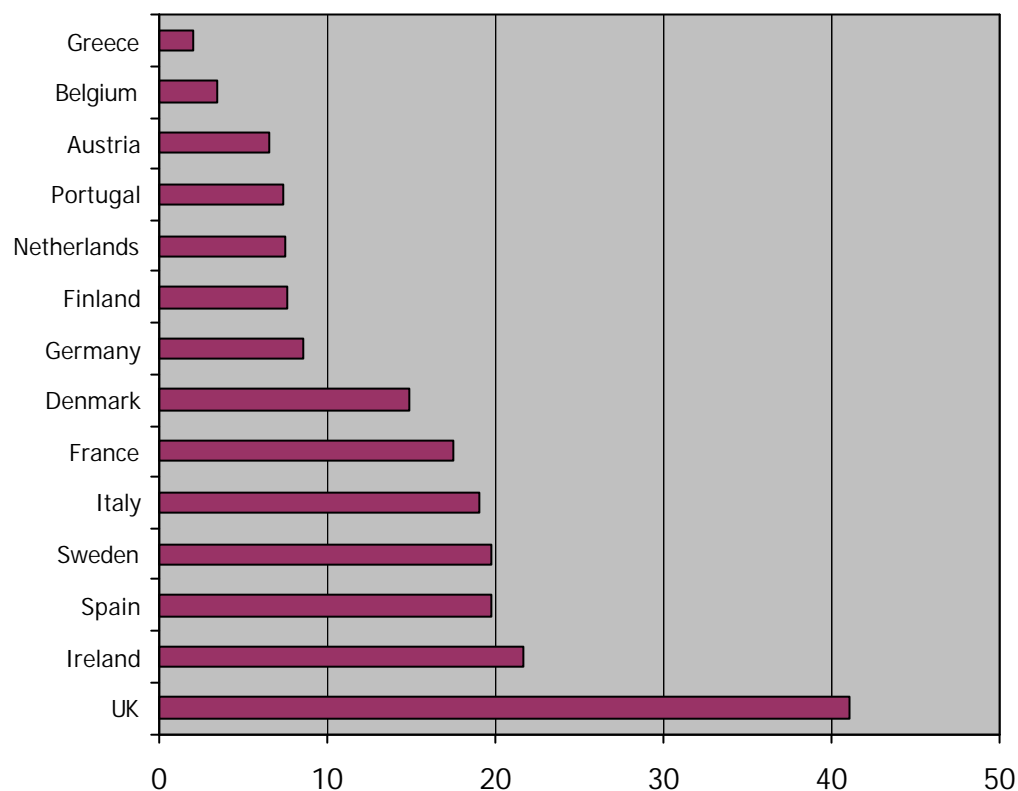


Figure 1: penetration rates of digital TV in individual markets across Europe; sources: Informa Media, SES-Astra, additional individual information from stakeholders

⁵ Colour TV penetration in Europe managed to reach 40% in 7 years time while VCR penetration crossed the 60% mark within a similar period (source: Digicast BV, Discussion Paper on Migration to DVB-T, April 2001)

⁶ Launched in 1996, with Hughes' DirecTV service, digital TV penetration in the US reached 35,5% of households by the end of 2002, out of which 18% cable and 17,5% satellite; specifically digital cable penetration is currently growing strongly (sources: National Cable Television Association, DirecTV, Echostar)

⁷ Source: Digital Switchover in Broadcasting, a BIPE Consulting study for the European Commission, 2001, p. 19.

⁸ See also: OXERA Study on Interoperability in Broadcasting: Consultation Paper, May 13th, 2002

⁹ The term 'multi-channel penetration' refers to customers' access to a variety of general and special interest free-to-air channels, next to national public and private broadcast channels.

2.1.1 Pay TV operators', cable operators', and public & private broadcasters' incentives

During the first 5 years of digital television, pay-TV operators have driven migration towards digital as their business concepts are based on generating subscriptions from a relatively small target group of customers with high quality and – increasingly – high quantity service packages. Consequently they faced relatively high – and increasing – fixed cost on the transmission side when continuing to broadcast via analogue DTH satellite, while revenues did not increase proportionally. Digital compression technology enabled them to cut distribution cost dramatically, making it commercially feasible to migrate an installed base of analogue DTH customers to digital, forcing the customer to switch from an analogue to a (subsidised) digital set-top receiver.

As their business models are based on maximising audience shares, free-to-air public and private broadcasters continue to rely heavily on existing analogue infrastructures, primarily terrestrial or cable but in some cases they may also offer transmissions via analogue or digital DTH satellite.¹⁰ As they broadcast a relatively limited number of channels, cost savings do not establish a similar incentive to migrate to digital as it is the case with pay TV operators; moreover, market experience so far indicates that additional revenue potential from DTT services for a broadcaster is negligible until penetration is high; specifically those relying on income from advertising are therefore not always anxious to put substantial resources into a push for DTT. From a purely economic perspective, this makes 'piggy-backing' on the growth of DTH a more obvious strategy during the first phases of digital TV roll out. Nevertheless, other motivations may lead to positive decisions on a push for DTT during the early stages anyhow (see also section 2.2).

Many European cable operators have closely followed DTH pay TV operators in their approach towards digital TV, and fine-tuned their portfolios to meet the specific demands of a cable environment¹¹. However, specifically operators in Scandinavia, Benelux and Germany, throughout the years had already upgraded their analogue channel offerings to basic packages consisting of 35 to 40 channels and were offering these at very competitive price levels. This has made it difficult for many of them to add sufficient value to their digital TV packages, as these were primarily competing against their own rich analogue basic packages. Consequently this caused digital penetration in cable to lag behind in most EU Member States, where cable is the dominant delivery platform for (analogue) television; in those countries where this is not the case, cable operators have managed to achieve higher digital penetration rates¹².

Different underlying economics in digital TV therefore put pay TV operators in a better starting position to migrate their analogue services to digital at an early stage and enabled them to seize some 76% of market share in digital transmission.¹³

¹⁰ Analogue DTH is usually not the ideal delivery mechanism for free-to-air broadcasters as this consequentially means distribution rights have to be paid for the entire footprint of the satellite (which is usually larger than the target area); this is not the case in digital, that offers the option to scramble and to address only receivers in the target area.

¹¹ Packages were offered at ever lower prices, programming targeting niche communities and product areas where cable could cost effectively compete, also services at low penetration levels, such as Near Video on Demand were added.

¹² This is in fact only the case in the UK and France. In virtually all other countries where analogue and digital cable co-exist, penetration figures remain below 5%, with the exception of Germany where it's 7%.

¹³ The last analogue pay TV DTH transmissions in Italy and Germany are expected to be faded out by the end of 2003, effectively completing the transition from analogue to digital DTH in the Western Europe.

Consequently, cable operators make up for only 17% of the market and terrestrial transmissions hold the remaining 7%.¹⁴

2.1.2 Multi channel television

Different economic benefits from a transition to digital however, do not yet explain all of the asynchronous development of individual digital markets across Europe. As indicated, the ability to provide multi channel television in a non-multi channel environment, is an important element in attracting consumers to digital TV: where these services are already widely available in analogue, either provided by cable operators or by free-to-air satellite, the additional value from digital TV, provided by any means of transmission, is perceived as limited by the vast majority of consumers; however in case these services are not widely available, the growth potential of pay TV and consequentially digital TV has proven to be significantly larger, not in the least because of its ability to provide multi channel television in a more cost effective way.

In the Benelux, where cable operators enjoy a de facto monopoly, as well as in Germany, where they maintain a leading position in the market, analogue free-to-air multi channel distribution was driven by cable and satellite operators at a relatively early stage, causing less favourable market circumstances for pay-TV operators to establish premium pay TV or multi-channel businesses, either via satellite or via cable. In the Nordic countries, encryption technology was introduced at a relatively early stage and cable as well as satellite operators started offering multi channel packages already in analogue.

On the other hand, in many of the larger national markets within the EU, such as France, the UK, Italy and Spain, analogue terrestrial transmission has been (and still is) the main distribution infrastructure for television. In these markets, access to multi-channel television was enabled at a later stage, when pay-TV operators took the opportunity of providing these services, and included free-to-air programming into their package portfolios.

2.1.3 Consequences

Different economic preconditions have led to a different development of digital TV throughout various markets. This leads to the conclusion that it will most likely also be different mechanisms (either economical, regulatory or even technological) that will determine further development, and that the role and development of interactive services may also have to be approached in a different way. It should be taken into account in this respect, that those strategies that have been successful during the first phases of digital TV roll out in a certain market are not necessarily the successful strategies for the other phases as well.¹⁵

As different market dynamics will influence growth in different markets, and possibly also across different delivery platforms, it is not unlikely different types and levels of standardisation¹⁶ will be required to support these processes. As standardisation in the context of this report primarily refers to the interactive component in digital TV, it should be addressed first how this has been developing – and most likely will develop – across different market situations.

¹⁴ Source: Digital Switchover in Broadcasting, a BIPE Consulting study for the European Commission, 2001, p. 19.

¹⁵ Growth of digital DTH is slowing down in several European markets, before the desired penetration levels have been reached; this could imply the necessity for tools to push penetration through other delivery mechanisms.

¹⁶ The word 'type' is used here to distinct between mandatory standards and encouraged – but voluntary – standards, while the word 'level' is used to distinct between standardization of receiver hardware, execution engines, presentation engines (or declarative languages), scripting language, scripting execution engine, implementation/authoring guidelines, etc.

2.2 Digital interactive TV market development

Although roll out of digital interactive TV started almost in parallel with the roll out of digital TV, the concepts are not linked exclusively. In Europe, local interactive TV has been around for more than 30 years in the form of Teletext. In fact, interactive TV through Teletext has not gone beyond local interactivity due to the state of development of communication technology during its earlier years. The emergence of digital TV does not fundamentally change the concept of interactive television through Teletext, although the character-oriented format has severe limitations and new content formats offer broadcasters increased possibilities.

The rise of digital interactive television however led to new business opportunities being identified and despite the fact that current analogue technology still offers considerably opportunities, it was recognised that the consumer would require more sophisticated and user-friendly tools to guide him through a variety of options and services (such as an Electronic Program Guide). Nevertheless, digital interactive television should also be regarded as an evolutionary path from Teletext.

2.2.1 Enhanced broadcast

Many (public) broadcasters saw the opportunity to increase the quality of their channels by offering viewers additional content and services, either directly connected with the program, or as an improvement of existing concepts such as Teletext. These applications, generally referred to as '*enhanced broadcast*', are usually based on a 'carousel' principle and relatively modest technical capabilities in customers' receivers.

Business models applied for enhanced broadcast services resemble the model underlying Teletext services: additional information is offered to the customer, improving the quality of the programming and related services such as Teletext and advertising. In doing so, a public broadcaster (or sometimes a platform operator) is able to defend its market position and at the same time lives up to public expectations requiring it to keep up with innovative trends¹⁷. In addition, a commercial broadcaster can offer its customers (i.e. the advertising community) new opportunities to communicate with target groups, thus remaining competitive with other media. Essential element in both models is that the end user is neither expected to generate additional revenues, nor is he expected to significantly change his usage of television.

2.2.2 Interactive broadcast and Internet access

In addition to this, digital platform operators introduced 'new' concepts, such as stand-alone applications (e.g. games or banking services), transactional services ('T-commerce'), or Internet access ('walled gardens') and e-mail. These applications are usually not linked to programming services and aim to add value to digital TV as a concept, rather than to specific programs. Moreover, as most of these also required an 'active' return path, these services are generally referred to as an '*interactive*' or – in case the applications should present and interact with content and services to and from the Internet – as the '*Internet*' profile.

These concepts often introduce non-broadcasting entities such as department stores, mail-order companies, ISPs or financial institutions into the chain. In many cases they expect the customer to change his usage of television and sometimes even to pay subscription fees. The latter element is also caused by the fact that investments or operational cost on the side of the service provider or the third party can be relatively high, hence additional income has to justify investments when still at low penetration rates.

¹⁷ According to many public broadcasters, lagging behind in a technological sense is not an option for organizations supported by public funds; interactive services are therefore an integral part of the process in which the public is provided access to alternative form of content and other types of communication.

2.2.3 **Market experience**

Experience so far has shown that market acceptance of enhanced broadcast services has been relatively high among digital viewers, while appreciation of more sophisticated and 'truly' interactive applications is lagging behind (despite the fact that throughout the years, an impressive variety of these applications have been introduced). Consequently, there are no broadcasters or operators generating significant revenues from interactive services¹⁸ and the positive effect interactive television portfolios have had on the overall digital TV penetration – for example if compared to increased channel variety – is seen as rather limited.

Notwithstanding this general point of view, it is also recognised that more sophisticated concepts do work – and have the potential to generate sufficient revenue – when increased digital penetration, achieved over several years, has managed to take the end users through the necessary educational process and has generated the required installed base of active users. Specifically in markets that have not yet seen significant penetration of digital interactive television, it should however be realised that initial applications may largely be based on enhanced broadcast types of services as these are closest to the customers' current usage of television services.

These reasons for the relatively poor customer take-up of digital interactive services, should however not camouflage underlying issues with respect to non-interoperability across the various systems deployed in Europe. This has made it difficult for developers of interactive applications to produce technically generic content; many content producers believe that this situation has hampered the establishment of an independent application market.¹⁹ It is recognised by virtually all stakeholders that this issue will become more central in the years to come, when determining the growth potential for many different markets, it is consequently the main focus of this report when considering types and levels of standardisation that could support the effective implementation of the Framework Directive.

2.3 **Application Programming Interfaces**

In order for an interactive application to be able to function, it needs to interface with the user (e.g. via a User Interface, usually on-screen or established by the remote control), as well as with the software that controls the resources of the receiver (such as the tuner, the remote control interface, the return channel or the smart card interface). If the latter is not the case, a customer's command (e.g. entered via the remote control), cannot be executed by the receiver.

While there are several ways to implement the application's interfacing with the receiver's resources, the most frequently applied is through the use of an additional software layer, or API, in between the different applications and the receiver's hardware layer. This permits a variety of different applications to be used across different hardware implementations, if equipped with the same API.

At the time interactive services were launched in Europe, several solutions (standardised or proprietary) were available, however there was neither a de facto standard, nor was there sufficient consensus across the industry to implement a specific system as the generic API platform. The reasons for this were either technical (i.e. specific APIs better matched certain operators or broadcasters intentions with digital interactive TV) or commercial (controlling the access to an API platform across a receiver population also protects an operator's or broadcaster's investment into these receivers).

¹⁸ This should be understood in a relative sense here, 'significant' implying >10% of annual revenue.

¹⁹ See also: IDTV Developer Survey, Middleware Platforms and Standards, Strategy Analytics, 2001, p. 13-14.

Consequently 5 different software platforms appeared in the European market, applied by broadcasters and operators across different delivery infrastructures²⁰, all of these platforms (notably Beta Nova, Liberate, MediaHighway, MHEG-5 and OpenTV), holding different market shares in various national and regional markets²¹. Apart from hampering the development of an independent application and content market, this also complicates a retail market for digital interactive receivers to emerge as the necessary economies of scale are lacking²² and consequently complicates the growth of those markets that require horizontal development.

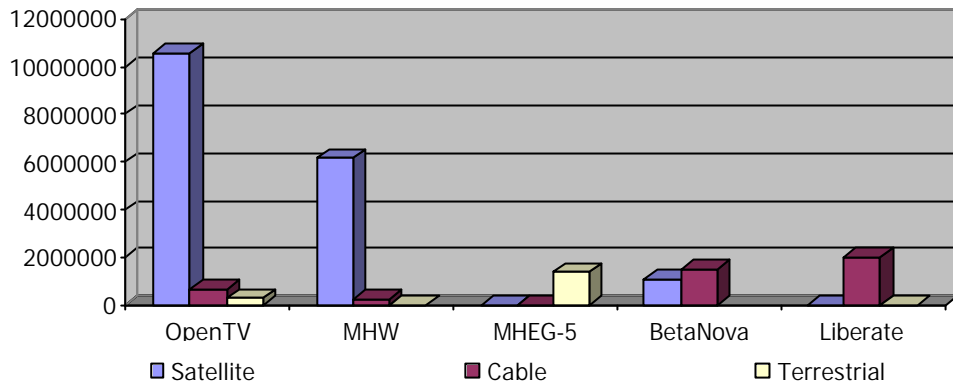


Figure 2: estimated market shares of 'legacy' API platforms across digital interactive television markets in the EU; sources: ConTeSt consultancy, individual industry sources

In order to support the development of these horizontal markets for digital interactive television, DVB specified the Multimedia Home Platform as a common API specification for the purpose of being used across all delivery mechanisms for digital interactive television. The platform currently is available in two versions. Version 1.0 profile supports the enhanced broadcast and the interactive broadcast profiles, while version 1.1 supports the Internet Access profile. Both versions are adopted by ETSI.

In order to support a migration from legacy platforms underlying digital interactive services in existing markets, the MHP platform is equipped with a generic interface, allowing legacy platform manufacturers to develop a plug-in version of their API, in order for MHP implementations being able to support existing interactive services based on these legacy APIs. This allows a population of MHP receivers to coexist with a population of receivers based on a legacy API. Up until now, the market has however not yet experienced this type of coexistence.

2.4 Conclusions

Analysis of market development in digital TV and interactive services so far leads to a number of conclusions that may be relevant when determining further types and levels of standardisation.

?? Different circumstances led to different penetration levels of digital TV, different levels of consumer acceptance and different incumbent market models with different commercial success; it is not unlikely that this also implies different

²⁰ Also see: Study on Interoperability, Service Diversity and Business Models in Digital Broadcasting Services, Volume 1, OXERA, February 2003, p. 24-25.

²¹ These existing API platforms supporting vertical or horizontal markets are referred to as 'legacy-platforms'; for their individual market share also see figure 2.

²² Apart from economies of scale not emerging in this situation, it should also be taken into account that the obligation to maintain several different software platforms in a single market in most cases is economically prohibitive for a CE manufacturer.

approaches, processes and tools are required to establish further development as well as migration scenario towards increased interoperability and a common API platform.

- ?? There is no support, either from market evidence, or from stakeholders that digital interactive TV so far has contributed significantly to digital TV penetration, nor is there support that it has significantly contributed to current revenues. Furthermore, high penetration rates of digital television do not necessarily lead to high take-up of interactive television services. This does not mean that this may not be the case in the future, however it does mean that the positive effects of (imposed) standardisation (or in fact of any tool improving interoperability at the interactive level), based on experiences so far, must not be overestimated.
- ?? Enhanced broadcast so far has been the only profile in digital interactive television with sufficient appeal to the consumer. This means that business models for interactive services look considerably different than originally expected and consequently cause hesitation among companies to invest regardless of the interoperability issue.

3. Regulation & standardisation

One of the central issues in this report is the question, which levels of standardisation, according to stakeholders, are desirable or required to support the implementation of the regulatory framework on interoperability in digital interactive television. However, before addressing this issue, the type of standards and specifications available (or which will become available in due time) for this purpose should be described. In addition to this, this chapter will describe which national or regional initiatives have been undertaken so far to pre-empt the regulatory framework or to promote the uptake of digital interactive television by using one of the available standards or specifications. In doing so, a few ambiguous concepts within the regulatory framework will have to be touched upon, for as far as this is necessary to illustrate further standardisation requirements.

3.1 The Framework Directive

Against the background of convergence between telecommunications, media and information technology, a Directive of the European Parliament and the Council was adopted in March 2002 on a common regulatory framework for electronic communication networks and services (the Framework Directive 2002/21/EC). This Directive constitutes a common regulatory framework covering all electronic transmission networks and services in the EU. In relation to the challenges presented by proprietary APIs in digital TV services, the main tools for achieving the objectives of the new regulatory framework is a combination of access rights for third parties to associated facilities such as APIs, together with interoperability requirements set out in Article 18 and provisions for standardisation in Article 17.

The general approach to promoting interoperability is set out in Article 17, motivated by Recital 30. Article 17 lays down the approach to standardisation wherein a published standard may be made mandatory following a public consultation and with agreement of the Member States. As a general rule, standardisation should remain primarily a market-led process.

In order to encourage the harmonised provision of electronic communication services and associated facilities and services, Article 17 requires Member States to encourage the use of standards contained in a List, of which an interim version was recently published²³. According to section 3 of the published List, *"The use of standards listed...in encouraged but there is no legal obligation to implement them"*. Paragraph 4 of this article addresses situations where it may be appropriate to require compliance with specific standards at Community level, i.e., only to the extent strictly necessary to ensure interoperability of services in one or more Member States and to improve freedom of choice for users.²⁴

Article 18 promotes 'Interoperability of digital interactive television services' as explained in Recital 31. In order to promote the free flow of information, media pluralism and cultural diversity, Member States shall encourage both providers of digital interactive services to use an 'open' API and providers of digital television equipment to comply with an 'open' API in accordance with the minimum requirements of the relevant standards or specifications.

Article 18.2 requires Member States to encourage "Proprietors of APIs to make available on fair, reasonable and non-discriminatory terms, and against appropriate

²³ List of standards and/or specifications for electronic communication networks, services and associated facilities and services (interim issue) (2002/C 331/04), OJ C 331/32, 31.12.2002, p. 32-49.

²⁴ See also Recital 30 of the Framework Directive.

remuneration, all such information as is necessary to enable providers of digital interactive services to provide all services supported by the API in a fully functional form". Article 18.3 commits the Commission to a review of the effects of Article 18, by July 2004.²⁵ If interoperability and freedom of choice have not been adequately achieved in one or more Member States, the Commission may propose making compulsory a previously published standard, using the procedure set out in Article 17, paragraphs -3 and -4.

During the last year a significant part of the debate on digital TV concentrated on the potentially positive commercial effects from having a single – and 'open' – API platform as a standard for digital interactive services in Europe. Essential in this debate is the question how a migration to such a single platform could (or should) be organised and encouraged, as the European Commission in this respect has the option to impose one specific standard²⁶. However, it can also require further standardisation from CEN, CENELEC or ETSI if deemed necessary, for example to support a market driven migration process.

The prime focus here is to identify how further standardisation can contribute to the effective implementation of the Framework Directive and the goals reiterated above, not least because virtually all stakeholders contributing to this report favour this option over making standards compulsory, which many believe will have a negative impact on market growth²⁷. As stated above, the legislation requires that the Commission makes an assessment by July 2004 whether interoperability and freedom of choice have been adequately achieved. Even if these objectives have not been achieved, the Directive foresees, but does not compel the Commission to take action. However, the assessment process has a clear timetable, which implies that any relevant standardisation activities should be well underway by the time of assessment so that the Commission can take these activities into account. Determining what is sufficient for this purpose may however prove complicated as neither the concept of 'interoperability', nor the concept of an 'open API' has been unambiguously defined so far, either by the industry itself, or by the proper authorities. The debate embraces both notions of commercial openness and technical openness, for instance.²⁸

3.1.2 Interoperability

In the Framework Directive interoperability, perceived from the perspective of the consumer, relates to the capability of receiving, regardless of the transmission mode, all digital interactive television services. It is however also recognised that interoperability is an evolving concept in dynamic markets²⁹, indicating that it is a process, in which different levels can be identified. Taking this point of view, interoperability can be defined as the degree to which end users are capable of expe-

²⁵ I.e. one year after the date of application of the Framework Directive (24/07/03), which again is 15 months after the date the Framework Directive was published in the Official Journal (24/04/02).

²⁶ Using the procedure defined in Directive 2002/21/EC of the European Parliament and of the Council of 7 March 2002 (Framework Directive), OJ L 108, 24.4.2002, Article 17, p. 45

²⁷ In this respect the recommendation on interactive TV standards contained in the BIPE-report reflect this same viewpoint; see also: Digital Switchover in Broadcasting, a BIPE Consulting study for the European Commission, 2001, p. 195 – 197.

²⁸ See also the Commissions forthcoming communication on remaining barriers to the achievement of widespread access to new services and applications of the Information Society through open platforms in digital television and 3G mobile communications.

²⁹ Directive 2002/22/EC of the European Parliament and of the Council of 7 March 2002 (Universal Services Directive), OJ L 108, 24.4.2002, p. 56

riencing all content and functionality that has been incorporated in applications by broadcasters and service providers.

Taking a consumer perspective does not mean however, that interoperability issues solely occur at the receiver level. Looking at the entire broadcast chain, there are several points, notably when the application itself is developed, when it is broadcast, and when it is transmitted via a specific network, where interoperability issues are of concern, in addition to reception at the terminal level. This has two types of consequences:

- i) a certain level of non-interoperability, related to the specific design of the application, the specific intentions of the broadcaster or the specific capabilities of the transmission network, will remain – even when a single (open) API can be used throughout the broadcast chain – as broadcasters and service providers will want to optimise their applications for a specific business model or transmission platform^{30 31}, and;
- ii) depending on the existing organisation of the broadcast chain and the relationship between different players, (technical & economic) circumstances may either call for temporary solutions, improving interoperability levels only at one specific point in the chain, or they may deem the implementation of a standardised API necessary.

This implies that the best tools to achieve a maximum level of interoperability under given circumstances may vary between markets, despite the fact that they may all lead to a single standard (and may consequently lead to a single interpretation and application of the concept ‘interoperability’) at a given time in the future.

3.1.3 Open systems

Two aspects need to be taken into account when discussing the openness of API platforms. First, the main criterion to define an API as open is the question whether or not all necessary technical specifications and essential Intellectual Property Rights (IPR), either to provide digital interactive services or to manufacture receiver implementations, are available on Fair, Reasonable and Non Discriminatory (FRND) terms. This implies that an API can be ‘functionally open’ in such a way that it complies with the technical, functional and commercial requirements of relevant players in a specific market. In reality however, it may be hard to eliminate all potential conflicts of interest, as revenue potential may depend on it, and additional regulation (for example on a national level) may be required to impose such FRND terms.

Secondly it remains a subject of debate whether an API that is under the control of a single market entity instead of a standards body, can actually be sufficiently open, though ‘functionally open’. One of the arguments put forward here by several manufacturers and broadcasters is the fact that dependency on a single API manufacturer’s technological and pricing policy is commercially not acceptable (‘vendor lock-in’).

On the other hand, the argument is put forth that, contrary to a proprietary API, one can never be 100% sure that all IPR contained in a standardised API is actually known, declared, and available on commercially viable terms.³² Moreover, commercial and technical processes associated with (maintaining) a standardised API may negatively

³⁰ See also: Requirements for Content Interchange Specification Associated with MHP Migration: Interchange with Content Developed for Legacy Systems, G. Plumb, J. Hunter & R. Cartwright, BBC, 2002

³¹ It is stressed by a number of stakeholders that the number of delivery platforms will even increase within the next years, for example due to the rise of hand-held devices.

³² Recent developments show that, specifically in situations where multiple specification or standardization bodies are involved in producing a single standard, IPR is a matter of growing concern.

impact the innovative strength of those using it. Implementing such a standardised API may therefore bear a commercial risk as well³³.

All in all, different views on openness of API platforms lead to two relevant conclusions in the context of this report:

- i) stakeholders in different markets may not come to the same conclusions when evaluating the risks associated either with the implementation of a functionally open API, or the implementation of a formally open API as described above, and;
- ii) different market circumstances may lead to different conclusions on whether 'functionally open' is (temporarily) sufficient to support the objectives of the Framework Directive.

3.2 Available standards, specifications & guidelines

As far as standards for digital interactive TV, relevant to the increase of interoperability are concerned, the first question is which categories or areas can be identified, and consequently should be taken into account. In this respect, discussions with stakeholders resulted in identifying the following 5 categories:

- a) APIs, meaning the software interfaces between the applications and the resources in enhanced digital receivers; examples are OpenTV, MediaHighway, Liberate or MHP;
- b) presentation engines, simply displaying interactive content on a TV screen rather than interfacing with resources inside the receiver; examples are DVB-HTML, DASE (or DAE), MHEG-5 or WML;
- c) consumer equipment, i.e. minimum functional requirements definitions for enhanced digital receiver equipment supporting a standardised API, specifically in horizontal terrestrial and cable transmission networks and market environments;
- d) Service Information (SI), or guidelines addressing the currently ambiguous interpretation and usage of elements in the SI standard underlying interactive applications such as an Electronic Program Guide;
- e) authoring formats and guidelines, supporting the development and authoring of specific interactive content making it 'portable' - through transcoding - across various legacy API platforms, by using a single declarative or mark-up language.

Currently, the interim issue of the List contains specifications and guideline specifications in only two of the five categories, notably the Multimedia Home Platform (MHP)³⁴ in category a) and the DVB-SI specification, together with 2 related guideline specifications³⁵ in category d). However, looking at it from a global perspective, additional standards and specifications are available in these, as well as in some of the other categories:

- A) **OCAP**: On top of its OpenCable hardware specification for digital cable set-top boxes in the US, CableLabs released the Open Cable Application Platform (OCAP) middleware specification in the beginning of 2002, largely based on the MHP specification from DVB. This was followed by a 2.0 release, incorporating web-based technologies like XHTML, XML and ECMA Script in May 2002. Though MHP based, the specification in itself cannot be used in Europe, as it is tailored to specific US signalling and transmission requirements, but will most likely be

³³ Similar findings were also concluded by DVB, in a recent internal assessment on how to define 'Openness' and 'Interoperability'.

³⁴ MHP is listed in two versions: MHP 1.0 (ETSI TS 101 812), or its most recently adopted version MHP 1.0.2 and MHP 1.1 (ETSI TS 102 812). It should be noted here that the references to the versions of the specification as contained in the List differ from the ETSI version numbers (i.e. they seem switched around); in the context of this report however the ETSI version numbering is used.

³⁵ It concerns ETSI EN 300 468 as well as ETSI TR 101 211 and ETSI ETR 162.

adopted shortly by ATSC as the API platform for terrestrial broadcast services as well.³⁶ There are no commercial OCAP implementations yet.

GEM: In order to harmonise the use of API platforms on a global level, the initiative was launched at the end of 2001 to investigate the possibility of having a Globally Executable MHP (GEM). The process, resulting in a guidelines document rather than in a new specification, was concluded in a technical sense at the end of 2002 and was supported by ARIB, CableLabs and DVB.³⁷ It specifies how MHP should be implemented across different regions, taking into account these regions' specific requirements, for example on the transport and signalling levels (see also 3.3).

- B) **MHEG-5:** In the UK an extension of the ISO standard MHEG-5³⁸ was adopted in 1997 to support enhanced terrestrial broadcast in an open horizontal market. In addition to the original specification, several elements, such as the DSM-CC object carousel and the use of signalling were added³⁹. MHEG-5 is being deployed across some 1,5M digital terrestrial receivers and about 15 different hardware implementations in the UK (see also 3.3).

DASE: ATSC in the US recently specified its DTV Application Software Environment (DASE) specification. This presentation engine can be implemented, for example in terrestrial receivers, on a stand-alone basis. The specification is in the process of being standardised by ATSC and will most likely be adopted by CableLabs as presentation engine on top of its OCAP specification (see also under a) above). There are no commercial DASE implementations yet.⁴⁰

BML: In 2000, ARIB specified the XML based BML format as a presentation engine supporting enhanced broadcast services. It is currently being used across more than 1 million digital receivers in Japan.

- C) **E-Book:** As far as the reception of DTT is concerned, at least one international standard is available; this is the 'Baseline Digital Terrestrial TV Receiver Specification', developed by EACEM⁴¹ in cooperation with DigiTAG, and standardised by IEC and CENELEC⁴². The standard aims to improve the economies of scale, which is limited by various incompatible platforms. It builds upon work being done by the NorDig consortium as well as on the UK D-Book.

³⁶ The agreement between CableLabs and ATSC formally has not been concluded yet; nevertheless expectations are that it will be shortly.

³⁷ The GEM guideline specification is also available as ETSI TS 102 819.

³⁸ MHEG-5 is a way to describe objects that have to be displayed on screen as well as an interface for the viewer to interact with a receiver; it was standardized in 1995 as ISO/IEC 13522-5 .

³⁹ See also: Report on Technical Issues of Coexistence of MHEG-5 and MHP based services and enabling Migration to MHP, I. Medland & D. Cutts, S&T, 2002.

⁴⁰ Recent developments with respect to the integration of OCAP and DASE led to some changes in the terminology; currently DASE is therefore referred to as DAE (Declarative Application Environment).

⁴¹ The European Association of Consumer Electronics Manufacturers, recently succeeded by EICTA (see glossary).

⁴² Available as EN 62216-1:2002 (IEC 62216-1) and more commonly referred to as the E-Book.

NorDig: The NorDig consortium⁴³ produced a receiver specification applicable for all transmission networks (including IP based networks) for use in Scandinavia. The aim of the specification is to ensure all consumer equipment supports a common set of minimum requirements, independent from the infrastructure that is used. The 1.0 version of the NorDig-Unified specification, published 16 October 2002, provides a family of specifications addressing profiles without interactive capabilities up to an Internet Access profile, based on the use of the MHP profiles.⁴⁴

NorDig/cable: Based on the NorDig Unified specification, the Finnish cable TV association, in December 2002 published additional requirements for the Finnish cable market.⁴⁵ The specification is primarily nationally oriented as it makes the use of a specific (embedded) CA system (Conax) compulsory; although it is currently the only specification for a digital cable receiver including a common API platform, this specific reference may cause it to be less useful in other European markets.

3.3 Ongoing activity in standardisation bodies, trade associations and industry forums

There are currently three major areas where activities are ongoing that may lead to additional standards and specifications relevant to increase interoperability in interactive television. These areas are: i) harmonisation of execution engines and presentation engines on a global level; ii) specification of presentation engines supporting the 'enhanced broadcast' profile on a stand-alone basis, and; iii) further work on baseline receiver specifications and the use of SI.

- i) In the ITU⁴⁶, a discussion between representatives from Japan, the US and Europe to come to a single global API standard, is ongoing. The common ground for this is the GEM specification produced by DVB. Based on its current status, the discussion has two possible outcomes:
 - 1) ITU will standardise a single GEM-based execution engine as a global API standard that can be fitted with different presentation engines (e.g. DVB-HTML, DASE or BML) following regional requirements, or;
 - 2) ITU will manage to reach an agreement on the use of a single presentation engine as well, and will standardise a single GEM-based execution engine including an optional, single presentation engine.

Pending discussions in a number of organisations on the use, definition and specification of presentation engines, within the context of harmonising the application environment for interactive television applications, ITU currently focuses on the potential for communality in the procedural application environment, also

⁴³ The NorDig consortium represents the majority of broadcasters, network operators and service providers in Denmark, Finland, Iceland, Norway and Sweden; for an exact list of members, see: NorDig Unified Requirements for profiles Basic TV, enhanced, interactive and Internet for digital integrated receiver decoders and relevant parts of Digital Integrated TV sets for use in cable, satellite, terrestrial and IP based networks, Annex A, p. 68.

⁴⁴ It concerns the 4 profiles for Basic TV, enhanced broadcast, interactive broadcast and Internet Access; these refer to the similar hierarchy in the MHP 1.1 specification (ETSI TS 101 812), see also there.

⁴⁵ Requirements for MHP compliant interactive CATV Set-Top-Boxes for the Finnish market, Finnish Cable Television Association (Suomen Kaapelitelevisioliitto ry), December 2002.

⁴⁶ Standards for digital interactive television within the ITU are dealt with by ITU-T SG-9 as well as by ITU-R WP6.

referred to as the 'execution engine'; this will most likely lead to the agreement on a world wide recommendation to apply a standard based on MHP and GEM.⁴⁷

- II) Several processes are currently ongoing, aiming to specify or standardise a presentation engine. The background of these efforts is threefold: either to facilitate migration from an existing platform towards MHP, to further harmonise the use of software platforms underlying digital interactive applications, or to establish a first step towards MHP in nascent digital interactive markets.

A study, carried out by S&T in the UK indicated that coexistence of MHEG-5 and MHP receiver implementations in the same (terrestrial) market is possible under the condition that certain changes are being made to the MHEG-5 as well as to the MHP specification⁴⁸. As far as MHEG-5 is concerned, this work is ongoing in ETSI and synchronised with the possible incorporation of additional requirements for other (terrestrial) markets than the UK⁴⁹. So far agreement has been reached on the detail of the core specification and on the outline of additional elements relating to signalling, security and return channel. The core of the specification will be available by April 2003.⁵⁰ Upon request from the DTG and the ITC, DVB is investigating the required changes to the MHP specification in parallel. In case of a positive outcome of these processes, MHP receivers, fitted with an MHEG-5 plug-in, will be capable of receiving the same interactive content as MHEG-5 receivers, thus enabling a market driven migration process based on backward compatibility.

Following the specification of MHP 1.0 and 1.1, DVB recently initiated a process investigating the specification of a presentation engine next to its API platform. This is based on similar backward compatibility principles as described above in the MHEG-5 specification process. In doing so DVB will primarily concentrate on solutions currently available in the market. At this point in time there is however no certainty that this process will succeed, nor when it will succeed.

Parallel to this, DVB are investigating a possible harmonisation of the DVB-HTML presentation engine, integrated into its MHP 1.1 specification as a native plug-in, with the DASE presentation engine from ATSC. If this exercise is successful, there is a considerable chance that this will result in a single global API standard, also containing a single presentation engine. As this process has only recently started however, timelines are still unclear.

- III) Further work on the EN 62216-1:2002 (IEC 62216-1) standard within EICTA will most likely lead to an update of the specification by mid 2003. It is expected that this updated version will specify the MHP 1.0 as an option. After its update, the specification will follow the standardisation process in IEC.

EICTA is further in the process of carrying out an inquiry in cooperation with DigiTAG, on the use of SI by broadcasters. Reason for this is the many degrees of freedom in the DVB-SI specification.⁵¹ This process may lead to additional updates in the EN 62216-1:2002 (IEC 62216-1) (E-Book) specification, and may also result in a number of guidelines and recommendations for service operators.

⁴⁷ See also: ITU, Vice Chairman of Joint Rapporteur Group 1, Report on common core specifications of Application Environments (Updated) 6M/163-E, March 2003.

⁴⁸ Report on Technical Issues of Coexistence of MHEG-5 and MHP based services and enabling Migration to MHP, I. Medland & D. Cutts, S&T, 2002, Annex 1, 2 & 3.

⁴⁹ Primarily for the French DTT market, the possibility to include the transport, signalling and security parts of the MHP specification into MHEG-5, is investigated.

⁵⁰ See also: Cutts, D; Report to ETSI/EBU JTC, re: MHEG Broadcast Profile, March 2003.

⁵¹ It concerns the fact that the ETSI EN 300 468 for example allows for different bit rates and different bandwidth to be used. This can cause incompatibility between receivers in different infrastructures.

3.4 Existing regulation on national levels

In several EU Member States, governments or industry consortia pre-empted the EU regulatory framework and concluded legislation, guidelines or multilateral agreements encompassing the usage of one or more of the specifications, standards and guidelines mentioned above. Aim of these exercises generally is to facilitate migration or implementation of an open API platform in order to stimulate the growth of a horizontal market for digital interactive services and consumer equipment.

3.4.1 Belgium

In the Flemish part of Belgium, private broadcasters and cable operators December 2002 announced they would be using MHP as a standard for digital interactive television. Recently this understanding was concluded in a multilateral agreement that included the public broadcasters as well.

3.4.2 Finland

As no legacy API platforms were deployed in Finland, its government decided digital interactive television should be based on MHP. DTT services were consequently launched end of August 2001 and cable transmissions are expected to start in the 2nd half of 2003. It is estimated that some 2.500 MHP compliant DVB-T receivers are deployed in the Finnish market today.

3.4.3 France

The French CSA declared the signalling, security and transport parts of the MHP specification compulsory for DTT in France in their requirements document concluded mid 2001.⁵² No transmissions have started yet however.

3.4.4 Germany

The German regional governments concluded regulatory guidelines on the implementation of digital interactive services already in 2000.⁵³ As far as digital interactive television is concerned the regulation imposes the use of a 'generic open European standard' on those entities enjoying a dominant market position.

In addition to the regulation, the joint German broadcasters and regulators agreed on the use of the MHP platform for these purposes in their 'Declaration of Mainz'⁵⁴. In the declaration, the signatories agreed to launch new interactive applications only in MHP format (starting July 2002⁵⁵) and agreed to migrate existing applications to MHP (albeit within a non-specified timeframe).⁵⁶ It should be noted however, that contrary to the situation in Scandinavia (see also 3.4.5) German cable operators did not subscribe to this declaration.

⁵² See also: Services et profil de signalisation pour la diffusion de la TV numérique de terre, CSA, July 2001 (Doc CTE – TNT/GT3 – 03).

⁵³ Satzung über die Zugangsfreiheit zu digitalen Diensten gemäß § 53 Abs. 7 Rundfunkstaatsvertrag.

⁵⁴ In full, the 'Gemeinsame Erklärung der deutschen Programmveranstalter und der Landesmedienanstalten zur zügigen Einführung von MHP', signed by RTL, ARD, ZDF, Kirch Gruppe and the joint Directors of the regional media authorities (DLM), September 2001

⁵⁵ For example ZDF-Digitext is available in MHP format for about half a year now.

⁵⁶ ARD and ZDF have scheduled the switch-off of their OpenTV based interactive services for the end of 2003.

3.4.5 Scandinavia

Companies united in NorDig, end of 2002 concluded a migration scenario enabling the transition from an existing installed base of digital (interactive) receivers based on non-standardised API platforms, to a market environment where these receivers are based on MHP.⁵⁷ The scenario specifies that broadcasters will provide their interactive services in MHP format as well, as soon as MHP compliant receivers are being launched on national markets; moreover, digital services launched from January 1st 2003 should be based on MHP, as should digital interactive receivers introduced after that same date⁵⁸. Broadcasters and network operators are however free to use the legacy API formats for a transitional phase, which is not limited to a specific period.

3.4.6 United Kingdom

The DTT market in the UK was originally designed in a horizontal way and was launched in 1998. For this purpose, an adaptation of the MHEG-5 standard was used, being the only standardised platform for digital interactive purposes at that point in time. In order to ensure coexistence of MHEG-5 and MHP receivers in the same (i.e. DTT) market, as well as to enable a possible migration to MHP, work is currently ongoing within the CENELEC/EBU/ETSI JTC as well as in DVB.⁵⁹

3.5 Conclusions

Analysis of available standards, specifications and guidelines leads to the conclusion that there are at least three areas where work has been done – or is still ongoing – that could provide solutions covering blank spots identified by a number of stakeholders in the current version of the list underlying article 17 of the Framework Directive. These areas are:

- ?? Platform harmonisation, potentially leading to the definition of a global MHP-based execution engine, possibly also leading to an agreement on the use of a single presentation engine combined with MHP, is ongoing; this process involves DVB, ITU, ARIB, CableLabs, ATSC and ETSI and will take considerable time still before clear results can be shown.
- ?? There are a number of ongoing initiatives aiming to specify or standardise presentation engines that are capable of coexisting with and enabling migration towards a common API; these processes among others, involve the ETSI, DVB and ATSC and according to those close to the processes may lead to results (although not necessarily to a single presentation engine) within a reasonable timeframe (i.e. before the end of 2003).
- ?? Initiatives to improve and widen the level of standardisation in the physical and transport layers of the digital interactive television chain have resulted in a baseline specification for digital terrestrial receivers; this functional specification is currently being updated. Also work is being carried out to get a better understanding among broadcasters on the requirements with respect to a more unified use of the SI standard.

⁵⁷ NorDig – Migration to a common digital platform, October 2002.

⁵⁸ Formally digital receivers introduced after this date should comply with the NorDig Unified specification (see also 3.2 item C)); this means that receivers supporting only the Basic TV profile do not have to be fitted with an API; receivers supporting one of the 3 higher profiles will have to have the respective profiles of MHP on board.

⁵⁹ See also: Report on Technical Issues of Coexistence of MHEG-5 and MHP based services and enabling Migration to MHP, I. Medland & D. Cutts, S&T, 2002.

- ?? In many regions where horizontal markets for economic reasons are expected to drive further development of digital interactive television, national regulators as well as nationally and regionally active industry groups have already concluded a number of guidelines and agreements how and when to apply those standards identified on a European regulatory level, as well as additional specifications considered required.

4. Implementation of standards

In order to evaluate how standardisation can contribute to an effective implementation of the EU legal framework, i.e. generate sufficient levels of interoperability across different digital interactive TV markets in EU Member States, it should be identified what the specific requirements among stakeholders are, given their specific market positions, and through which form of standardisation these requirements can be addressed. However, before doing this, it needs to be defined which circumstances in general contribute negatively or positively to the success of (compulsory) standards, as this determines the basis for their effectiveness in this case as well. This is described in section 4.1.

As Section 4.2 will show however, economic considerations are the main reasons for many stakeholders to advocate market specific solutions generating increased interoperability on a national, regional or infrastructure level, rather than implementing currently listed standards. This economic component weighs heavy in the total of considerations as findings in chapter 2 have already shown that it's these circumstances rather than the lack of standardisation that have hampered the growth of digital interactive TV.

4.1 General considerations in standardisation processes

There are a number of general criteria to determine – or in this case better: to predict – whether the imposition of standards or specifications will be successful, i.e. will have the desired effects⁶⁰. These can be summarised as follows:

- i) there have to be sufficient consumer interest and benefits for all stakeholders involved;
- ii) standards should come neither too soon, as technology may be immature, nor too late, as the market may have already made other choices;
- iii) (backward) compatibility with existing technical solutions in a market is required to prevent premature amortisation and additional investments;
- iv) standards must be supported by the entities that are expected to invest into it, and should not put specific suppliers in a more favourable competitive position than others;
- v) standards have to be sufficiently future proof, i.e. it must be reasonably certain that they do not have to be exchanged half-way through the implementation process because they are technically or economically overtaken;
- vi) there has to be a certain guarantee that IPR issues arising after imposition do not legally or commercially block the roll out of related equipment or services.

Mapping these criteria with the different digital interactive TV markets in Europe and with the positions taken by the relevant stakeholders in these markets, and at the same time taking into account the currently defined standards in the List⁶¹, generates the following findings:

- 1) For many 'low-penetration' markets, as well as for the further development of interactive DTT markets, benefits of a common standard are recognised (also reflected by a number of agreements listed in section 3.4), although there is doubt

⁶⁰ The criteria listed establish a summary of a document kindly provided by Mr. Stephen Temple, former chairman of the DVB Ad Hoc Group on Regulatory Affairs, entitled "The Six Criteria for when technical standards might be successfully legally enforced on the market", January 2003.

⁶¹ List of standards and/or specifications for electronic communication networks, services and associated facilities and services (interim issue) (2002/C 331/04), OJ C 331, 31.12.2002, p. 47.

whether the standards currently listed are sufficient.⁶² In most markets with higher penetration neither the benefits nor the customer interest – at least for the short term – are recognised by stakeholders.

- II) It is obvious that choices for one or more delivery mechanisms⁶³ have been made in certain markets (notably the UK, France, Spain and Italy) several years ago, to deploy non-standardised technology supporting digital interactive TV, and that these choices resulted in relatively large installed bases of 'legacy' API platforms; this could make imposed standardisation (at least for the respective delivery mechanisms) less effective here. Contrary, recommended rather than imposed standards could have a positive effect in Germany, Scandinavia and the Benelux, where penetration is at a low level. This is stressed by all relevant stakeholders in these markets, although there is considerable doubt, specifically among network operators, whether the standards currently referred to in the Framework Directive are sufficiently mature.⁶⁴
- III) Due to the 'asynchronous' penetration rates of digital interactive television, backward compatibility issues (i.e. replacing legacy equipment in case it cannot be fitted with standardised software) are not regarded equally significant across different national markets within the EU. In markets with high penetration, financial consequences will be disproportionate and additional tools supporting the implementation of the Framework Directive will be required. In markets with low penetration, this requirement is recognised, though not deemed essential to the success of a standard. In any case, these issues may not always be regarded as being inside the regulator's scope, i.e. may have to be dealt with on a bilateral basis between the service operator and the provider of the legacy technology.
- IV) There is no claim brought forward by stakeholders that currently defined standards are more (or less) favourable to specific equipment suppliers than they are to others; consequently decisions either or not to invest among hardware or software manufacturers do not depend on this. Although support for currently defined standards is strong among public & private broadcasters as well as manufacturers, it is considerably less among pay TV and cable operators however.
- V) There is a relatively high level of consensus among stakeholders that currently defined standards are sufficiently future proof, although a few companies highlighted the fact that formats used in the Internet domain may in time play a more prominent role in digital interactive TV.
- VI) The threat of non-declared IPR becoming a financial burden with respect to the currently defined standards is seen as a serious issue by some stakeholders; despite the fact that most players in the European industry seem reasonably relaxed in this matter, these, and other IPR issues related either to standards themselves or processes around those standards, should not be underestimated in terms of establishing potential threats to the commercially successful implementation of such standards.⁶⁵ In addition it should be noted that specific

⁶² In the UK and France, most stakeholders favour an adapted version of the MHEG-5 profile rather than the full MHP implementation as far as DTT is concerned, while in 'low-penetration' markets several cable operators favour a standardized presentation engine in general.

⁶³ I.e. cable, terrestrial and/or satellite distribution.

⁶⁴ This does not only refer to the standard itself, but also to the 'operational framework' around it: specifically the process of self-certification is regarded as insufficient to guarantee the proper functioning of all features across all implementations in all networks in a reasonably comparable way.

⁶⁵ It should also be noted that platform harmonisation processes aiming at global standardisation, as described in section 3.3, involve even more and potentially more complicated IPR issues that may not be taken lightly and consequently establish a threat to these processes in terms of possible delays and even failure.

IPR rules (or differing IPR rules between certain standardisation bodies or specification forums worldwide), under circumstances and for commercial reasons may discourage holders of relevant intellectual property to put this up for standardisation or to submit this to be included in standards or specifications from these organisations.

4.2 Economic aspects

Further to generic criteria determining the effectiveness of implementing a regulatory framework through standardisation, specific market circumstances generate specific additional requirements. Although there are many of these differences between a variety of market players, depending on pre-digital market conditions, the position in the broadcast chain or the delivery mechanism used (as already illustrated in section 2.1), there are basically four different 'profiles' in terms of requirements put forward, two of which among stakeholders in embryonic or nascent markets and two in existing ones.

4.2.1 Interoperability in nascent digital interactive TV markets

In these markets⁶⁶, digital interactive services are either about to be launched on terrestrial or cable or are about to be migrated or re-launched due to lack of commercial success. Pay-TV operators, using DTH or cable either in analogue or in digital have usually been relatively unsuccessful here, and to a large extent growth is expected to be driven by public and private broadcasters, enabling cable operators (being the dominant delivery platform in these markets), to provide attractively priced packages.

As relatively small markets are concerned, broadcasters do not have resources to author to different formats and application developers do not have resources to maintain applications in different formats. Although several operators envisage maintaining vertical market models in parallel to horizontal ones,⁶⁷ CE manufacturers are generally looked at to provide consumer equipment in retail. Two sets of requirements are found in these markets:

1. The larger group of broadcasters and operators in these markets, for financial reasons supports the horizontal model where receivers are purchased in retail. Consequently stakeholders in these markets recognise the need for a single API standard to allow manufacturers to reach the economies of scale and to minimise the cost for software maintenance required to reach attractive price levels. As the major CE manufacturers support MHP, this is recognised as a requirement allowing a retail market to flourish. Consequently interoperability is also strongly perceived at the receiver level and the 'openness' of a platform is perceived in the more formal way in being guaranteed through standardisation.
2. In addition several cable and terrestrial operators recognise that specifically in low penetration markets, cost is the most important incentive to the customer for taking up digital TV services. For this reason an interim solution based on rental receivers fitted only with a presentation engine supporting enhanced broadcast type services and compatible with MHP is required to minimise cost, both on the operational side as well as on the side of production.

4.2.2 Interoperability & migration in existing digital interactive TV markets

⁶⁶ Notably the Benelux and Scandinavian markets as well as the German market.

⁶⁷ This usually has two reasons: first of all markets need to be jump-started for which a rental model is more suitable, and secondly cable networks, due to their return path capability and the fact that a physical medium is shared by multiple transport mechanisms, are relatively vulnerable to malfunctioning equipment, specifically when this equipment has not yet passed the stage of childhood diseases.

Existing digital interactive television markets⁶⁸ generally suffer from a lack of interoperability between different legacy platforms throughout the broadcast chain. This has grown for historic and economic reasons and for reasons of disproportionate commercial consequences cannot be addressed by the imposition of a single API standard replacing the existing ones in a defined period of time. Interoperability issues are dealt with in two different ways across these markets, leading to two different sets of requirements.

3. In some markets (such as France) up until now, the existence of two different API platforms in digital satellite and cable is regarded as an important tool to generate competitive advantages and hence to drive penetration. Consequently, there is little activity going on to improve interoperability as this is not perceived as a major block to the further development of digital interactive television⁶⁹. As far as the development of DTT is concerned in these countries, positions are ambiguous, both with respect to overall support of this development, and with respect to the API, that should be applied.⁷⁰ Consequently there are no specific additional requirements coming from these markets.
4. In the UK, being the largest digital interactive TV market in Europe, considerable effort is being put into processes improving interoperability at the content level rather than at the API or receiver level. For one, this has resulted in broadcasters as well as third parties authoring their interactive content and applications in a common format (XML) after which these are transcoded to – and optimised for – one of the specific broadcast formats used in the UK market.⁷¹ This process, generally referred to as Multiple Platform Authoring, according to relevant stakeholders, has led to satisfying interoperability levels across different platforms, at acceptable cost.⁷² Interoperability consequently is strongly perceived at the content level rather than at the receiver level, and functionally open systems are regarded sufficiently open, at least to achieve the level of interoperability pursued here.

Another option currently deployed in the UK market is the use of a presentation engine as a common broadcast format. This approach works on the principle that the vast majority of relevant content is available in a format that can be displayed via a single application (i.e. a browser), rather than through a variety of different applications (that again would need an API and consequently require more costly re-authoring processes). Browsers in turn, can be tailored to specific API platforms.

⁶⁸ Notably the UK, France, Spain and Italy.

⁶⁹ It should be noted here that in France, as well as in Spain and Italy, processes are ongoing for a considerable time now, to merge the two competing (and at the API level incompatible) digital TV platforms. Although it can be expected to result in the establishment of a single platform over time, it is not clear whether this will also encourage these new platforms' migration processes to a common standard.

⁷⁰ Specifically in France and Italy private broadcasters question the commercial viability of DTT (see also: Digital Terrestrial Television: "the bound to fail" syndrome, Patrick Le Lay, in: EBU - the SIS briefings, September 2002).

⁷¹ In this case Liberate, OpenTV, MHEG-5, HTML and Teletext.

⁷² Additional cost of authoring an application to another platform, according to stakeholders remains within 15-20% of the generic development cost. It should however be noted that the capability to sustain these cost is very much dependent on the size of the operation as well as on the size of the organization, i.e. for smaller (broadcasting) organizations servicing smaller communities through digital terrestrial, satellite and cable transmission the additional cost will still establish an entrance barrier.

Both concepts address current interoperability issues in their markets in a way that is acceptable to all relevant stakeholders. In principle they also allow for coexistence of incumbent platforms with new common APIs (either via authoring for an additional platform or by using the plug-in mechanism⁷³). In that respect it could be regarded in line with research currently carried out into the coexistence of the MHEG-5 presentation engine and the MHP platform (see also section 3.4.6).

Notwithstanding this there is a clear requirement among many players, also in other markets than the UK, to better specify a common authoring format and to produce guidelines for processes such as multiple platform authoring as this is currently addressed in different ways by individual stakeholders. A solution for this could for example be found in the use of a common language for these purposes.

4.2.3 General requirements

In addition to requirements expressed by specific groups of stakeholders in specific markets, two general issues emerged that should also be noted here. These concern missing elements and unclear or ambiguous issues in standards, specifications or guidelines in the physical and transport layers, that are not exclusively relevant to interoperability issues in digital interactive television, but have to be taken into account in respect of further standardisation as these do establish essential pre-conditions.

5. It is expressed frequently that the SI standard currently used⁷⁴, contains too many degrees of freedom, and consequently offers too many options for interpretation and usage, despite the implementation guidelines that come with it⁷⁵. It is stressed, for example by manufacturers, that the specification needs to be narrowed down where the use of bandwidth or bit rates is defined, and for example by broadcasters that the range of possibilities offered by the use of EIT Schedule information needs to be narrowed down for its effective usage.⁷⁶ It is recognised however that additional fine-tuning – also for reasons of timing – should partly be taken care of in a ‘baseline receiver’ specification process (see below) and should partly be dealt with between stakeholders on a national or regional level.⁷⁷
6. Several manufacturers and network operators consider a baseline receiver specification for the 3 delivery platforms that are most commonly used for digital interactive television as an important condition to promote horizontal market development. This baseline specification, that is currently standardised only for terrestrial usage (a.k.a. the ‘E-Book’) should be functional rather than technical and should include specifications or guidelines for a more precisely defined usage of the

⁷³ See also section 2.3 on MHP.

⁷⁴ ETSI EN 300 468, also listed in: List of standards and/or specifications for electronic communication networks, services and associated facilities and services (interim issue) (2002/C 331/04), OJ C 331, 31.12.2002.

⁷⁵ I.e. ETSI TR 101 211 and ETSI ETR 162.

⁷⁶ An associated issue relates to the increasing popularity and usage of Personal Video Recording devices contained in digital receivers. There is a growing requirement for broadcasters to provide program information targeting these devices in a more unified and more efficient (i.e. compressed) way, possibly separate from SI delivery. The fact that this will in time also affect interactive services should be taken into account.

⁷⁷ This is the case, for example in Scandinavia.

SI tables. It should however be mentioned that this need is felt less by operators in mature digital markets, that would rather rely on the use of a common authoring format for increased interoperability.

4.3 Conclusions

When trying to assess the objectives laid down in the regulatory framework to promote further interoperability in digital interactive television, with requirements put forward by stakeholders as well as with generic considerations determining the success of standards, the following conclusions can be drawn:

- ?? Adoption of a single API standard may prove to be reasonably successful in markets with low overall digital TV penetration as well as in nascent DTT markets; this is supported by general conditions for the success of standardisation processes. Conditions in a number of other European markets, servicing the vast majority of digital viewers, do however not support an effective implementation of the Framework Directive (taking into account the standards, specifications and guidelines currently listed), if held against previous experiences in standardisation.
- ?? Market circumstances differ greatly across Europe and the current level of specification only addresses a single situation. In order for the regulatory framework to be able to encourage increase of interoperability in most other situations, additional specifications, standards and guidelines are required.
- ?? Many requirements put forward by the market can be met, not so much by additionally existing material, but by including standards, specifications and guidelines resulting from currently ongoing processes in industry consortia, standardisation bodies and trade organisations in the review to be undertaken by the European Commission.
- ?? As not all requirements can be met by results from ongoing processes, or cannot be met in time, additional work will be necessary, carried out by standardisation bodies, industry consortia as well as trade organisations. As many issues are interconnected, overall coordination will be necessary.

5. Strategy & recommendations

The objective of the evaluation process carried out and presented in this report, is the definition of a strategy and related recommendations for a standardisation work program contributing to the effective implementation – as far as digital interactive television is concerned – of the Framework Directive. Such a strategy should therefore be primarily based on the cornerstones for the further development of digital interactive television, identified in this regulatory framework.

However, in order for this strategy to be successful it will also have to take already existing consensus, as well as the results from previous and ongoing standardisation and specification processes into account; moreover it will have to include as much as possible the positions of the relevant stakeholders in this process.

This chapter therefore contains the proposal for a strategy addressing market requirements within the boundaries indicated by the regulatory framework and within the capabilities of standardisation and specification bodies and processes. In addition it contains a number of recommendations ensuring the effectiveness of this strategy and supporting objectives of the Framework Directive in general; finally, a paragraph on the risks involved when following the strategy is included at the end of this chapter.

5.1 Market feed-back and historic experience

Virtually all findings listed in the previous chapters stress the positive role that further, selective standardisation can have in the development of digital interactive television in Europe, and underline its potential contribution to the improvement of interoperability, despite the differences in opinions on how this exactly should be achieved. However:

- i) observing specification and standardisation processes in several organisations leads to the conclusion that the 1.0.2 version of the MHP platform, currently listed as a common standard to be encouraged by national governments, may emerge as a global standard;⁷⁸ nevertheless, it should be noted that individual stakeholders' decisions whether (and if so, when and how) to implement such a common standard strongly depends – as also indicated in chapter 2 – on specific market circumstances as evaluated by these stakeholders;
- ii) there is no consensus yet, neither on a global level nor in Europe, on the presentation engine (or presentation engines) to be used either or not in conjunction with MHP; different solutions are still favoured here, notably HTML, DVB-HTML, XDML(DASE), BML, WML and MHEG-5, despite ample work on harmonisation. This is partly due to the fact that different purposes are pursued with these solutions: sometimes their aim is to serve as a common authoring format on top of existing APIs, sometimes to serve as a migration path towards MHP and sometimes to serve as a solution in nascent markets to offer 'basic' interactivity using common technology but without having to implement the full functionality of MHP. Nevertheless, this shows these formats, either or not in conjunction with an API platform, to be considered increasingly important in view of market circumstances, to establish interoperability in existing as well as in nascent digital TV markets.
- iii) in several nascent or embryonic markets (e.g. Finland) MHP is regarded as sufficient for supporting digital interactive television growth; this concerns horizontal (mostly terrestrial) markets where supply of consumer retail equipment is assumed by CE manufacturers; however, establishment or improvement of interoperability

⁷⁸ This does encompass agreement on the execution engine part of the specification only; i.e. it so far excludes the DVB-HTML presentation engine that is integrated into the 1.1 version of MHP.

cannot be addressed in a generic way across all digital interactive markets in Europe, as a result of too many commercial and technical differences; although a common platform may ultimately emerge, processes leading in this direction, for economic reasons, may have to take different routes, require additional tools, and may require different periods of time;

- iv) imposing a single standard may have a positive effect only in some nascent markets, but there is no guarantee due to the limited commercial value digital interactive services currently have in these markets; on the contrary, generic criteria (as mentioned in section 4.1) illustrate that in those markets where digital TV has developed in a positive way, imposing a single standard will have a negative effect; these negative effects however may be minimised if a single standard is backed by a number of tools addressing specific circumstances in legacy markets;
- v) specification and standardisation processes so far have generated solutions that can be applied filling the 'gaps' identified by several stakeholders; however this is not yet sufficient to address all market requirements. Still missing are:
 - a) functional baseline receiver specifications for cable;
 - b) specifications or guidelines to support authoring processes supporting coexistence of legacy platforms with, or migration towards a common platform;
 - c) guidelines decreasing the degrees of freedom in the current SI standard to an operationally acceptable level;⁷⁹

5.2 Cornerstones of the regulatory framework

⁷⁹ It should be understood that activity in all three areas mentioned has been initiated; although explorative work is being carried out though, the items are not yet covered as 'official' work areas in organisations, in terms of formally described targets and deliverables.

There are a number of relevant principles that will bear upon any assessment of a possible strategy for further standardisation.. These are i) internal coherence of a set of standards, specifications and guidelines; ii) timing of market development in different EU Member States; iii) promotion of free flow of information, media pluralism and cultural diversity assessed through the criteria of interoperability and user choice and; iv) market consensus.

- I) As having only a single standard is one of the natural preconditions for its success, it should be noted that requirements from different stakeholders taken into account here are those that do not generate conflicting or mutually exclusive standards, specifications or guidelines. This does not imply that a consensus position among all stakeholders on a single standard is necessary to safeguard the Framework Directive's objectives, but it does underline the position taken here that expanding the set of standards, specifications and guidelines currently listed can only be done whilst ensuring its internal coherence.
- II) Timelines have already been set (see also section 3.1) and specification & standardisation processes tend to take a considerable period, specifically as they are usually based on consensus. This means that solutions that can generate results within a reasonably short period may be preferable, i.e. coordinating existing processes should first of all be looked at.
- III) Standardisation should primarily be a market driven process. However, when facilitating general social, economical or political objectives through (compulsory or non-compulsory) standards, it may not always be possible to safeguard all commercial interests of all stakeholders.
- IV) Solutions have a better chance to succeed if they are based on consensus between all – or at least the vast majority of – stakeholders involved. This is best achieved through defining a package of standards, specifications and guidelines that contains tools for at least this vast majority of stakeholders to achieve similar goals in terms of interoperability, without disproportionate economic consequences.

5.3 Standardisation work items

To enable the effective implementation of the regulatory framework across all European markets and to address interoperability in all markets, a coherent set of additional specifications, standards, and guidelines will have to be defined. This concerns the layers 'above' the MHP platform (addressing content authoring, migration and legacy issues), as well as the physical and transport layers below it (addressing underlying interoperability issues, independent from the API platform applied). This generates the following work items:

- i) The specification of a presentation engine, or presentation engines, that is/are capable of functioning with, as well as without the support of an underlying API
- ii) Functional baseline specifications for DVB-C receivers, and guidelines for the use of SI;
- iii) Authoring guidelines and specifications.

The current situation with respect to these work items can be described as follows:

- I) There are several processes ongoing that may lead to the specification of presentation engines (or alternative solutions) addressing the different requirements specified in paragraph 5.1 sub ii. The MHEG-5 standardisation process referred to in paragraph 3.3 sub II, may reach completion relatively soon (at least as far as the core specification is concerned), however it is not yet clear whether this solution address all market requirements in the best possible way; ongoing work in DVB may clarify this however.

Looking at a number of other ongoing activities on other presentation engines, additional solutions may emerge as well. This is primarily related to the fact that solutions that are best fit to be used in conjunction with an API are not necessarily the same solutions as those that should be able to function without the 'help' of an API. It should therefore be considered that a single presentation engine will most likely not meet all market requirements. Moreover, it may prove that

standardisation of both 'types' of presentation engines is not equally necessary though equally desirable.⁸⁰ Coordination between different processes is therefore essential. It will be important to ensure that a standardisation body with proven track record for managing such processes takes overall responsibility.

- II) Initiatives, leading to processes aiming to define specifications, similar to the E-Book for terrestrial purposes, for usage in cable networks, have been started up between EICTA and some cable operators, building – where feasible – on standards and specifications already existing.⁸¹ In order to get a better perspective on timing, procedures and deliverables, these processes should get a more formal character. Optionally it may be considered to start up similar processes aiming to specify a baseline receiver specification for satellite purposes, although the necessity to do this is not felt similarly across all markets. As this is closely related, this work should also encompass the tighter definition of the use of the SI standard for all delivery networks and should integrate the results generated by the consultation process carried out by DigiTAG (see also section 3.3).
- III) There are currently no guidelines or formats specified or standardised supporting authoring or content migration processes, but recently initiatives have been deployed in DVB to specify the commercial requirements for such a common format, which for example could result in the specification of a common mark-up language.

It must be stressed here that the processes, required to generate the complete framework of additional specifications, standards and guidelines described, are unlikely to be completely finalised all before July 2004. The reason for this is the nature and complexity of some of these processes. The result may therefore be that certain elements can contribute to increased interoperability sooner than others.

5.4 Further recommendations

It is obvious that speed is required, both from a market as from a regulatory process. For this reason, different items should best be worked on in parallel, by different consortia, trade organisations and standardisation bodies. As the goal however is a coherent set of standards, specifications and guidelines, coordination is essential. This leads to the following recommendations:

1. Activities related to the specification and standardisation of presentation engines, on a European level are carried out by several European projects and associations; looking at the ongoing processes, DVB will have to play a major role here, but also EICTA, IEC/CENELEC, ITU and ETSI. As obviously more than one organisation is involved, it is recommended that standardisation activities be coordinated by the JTC Broadcast.
2. IEC/CENELEC and EICTA are playing a central role in defining baseline receiver specifications for digital interactive television. In view of ongoing activities it is recommended that the work be coordinated by IEC/CENELEC although it is recognised that much of the work will actually have to take place through EICTA.
3. It is recommended that EICTA coordinates with DigiTAG, and if necessary with other trade organisations and industry forums, to ensure that the required input is received on the use of SI, to include the necessary additions to, or guidelines for,

⁸⁰ However, it should be understood that the use of multiple presentation engines in the same market establishes essentially the same burden on the transmission side as legacy systems do, even though interoperability on the receiver level could be guaranteed in case all these presentation engines are downloadable.

⁸¹ I.e. EN 62216-1:2002 (IEC 62216-1) (currently under review) and the NorDig specifications (see also section 3.2).

the use of the currently existing specification into the baseline receiver specification work as described above or, if required, into other relevant work items.

4. With respect to authoring guidelines and formats, it is recommended that DVB coordinate this work item as it has been started up here and the organisation can benefit from work ongoing or already finalised on related specifications. It should however be ensured that the work gets sufficient priority.
5. It is recommended that overall coordination be taken care of under the umbrella of the JTC Broadcast. However, as several stakeholders are not (or cannot be) represented in this committee, a small number of representatives from consumer organisations, Member States or other relevant stakeholders should be invited to be observers in a sub-group, which would take the responsibility of coordinating between the work items (for example: the decision to specify one or more presentation engine(s) may have consequences for the number of baseline specifications), of safeguarding coherence and stability of the complete set of standards, specifications and guidelines, of monitoring progress and viability of specific work items in view of the availability of the deliverables (also see section 4.1), and if necessary of defining alternatives in case certain work items cannot be accomplished.
6. Although it is recognised that it will be difficult to produce tangible results before July 2004, it is recommended that an overall time schedule for the delivery of the required standards, specifications and guidelines, that is sufficiently in sync with the objectives of the regulatory framework be defined, as part of the responsibility of the above mentioned coordinating group.

5.5 Risks

The strategy proposed in this report aims to define a framework of specifications, standards and guidelines around the API platform, addressing the current economic situation, the different commercial and technical starting points of stakeholders, as well as the objectives of the regulator. When implemented, it will ultimately result in a situation where horizontally organised broadcast chains can coexist with vertical ones; parallel to that, consumers will be able to purchase digital interactive receivers in retail and in addition can get access – if required under specific commercial conditions – to interactive content broadcast via vertical as well as horizontal chains (see also figure 4). It should however be stressed that the strategy is not without risk and bears no absolute guarantee for success:

- ?? The timeframe within which sufficient levels of interoperability must be demonstrable – or at the least able to be ensured – is extremely tight, and some essential specifications or standards may not be finalised in time.
- ?? Although the strategy should generate a coherent set of specifications that technically cannot be applied without blocking market development, it does not generate similar incentives for all relevant stakeholders to migrate to a common platform within the same period of time. Standardisation in itself may not have the same economic relevance for all stakeholders in all markets and may therefore not automatically generate the desired results across all markets although in itself sufficiently addressing all these markets.
- ?? The strategy does not address migration from legacy platforms to a common platform using the plug-in mechanism provided by MHP (see also section 2.3), as this remains the domain of those companies holding the IPR to those legacy systems. Consequently this means that as far as legacy receiver populations are concerned, interoperability levels beyond those generated through multiple platform authoring, rely on individual stakeholders' commercial decisions.
- ?? This report has not dealt with the issue of conditional access that was highlighted by some stakeholders still as a potential (additional) barrier to increased interoperability on the level of digital interactive services. It is recommended that the issue be addressed whether the currently available concepts and solutions to enable interoperability at the CA level are sufficient to ensure this interoperability.

Glossary of terms & abbreviations

API	Application Programming Interface; software platform in a digital interactive receiver, interfacing between broadcasted applications and the receiver's resources. An API encompasses an execution engine, responsible for the actual interfacing and may also encompass a separate presentation engine, responsible for displaying interactive content on a screen. This latter functionality may also be integrated into the API.
ARIB	Association of Radio Industries and Businesses; Japanese R&D institution developing standards promoting the use of radio technology.
ATSC	Advanced Television Systems Committee; US based international organisation developing voluntary standards for the used in advanced television systems.
CableLabs	Institution of joint American Cable operators for the research, specification and testing of CATV technology and equipment.
CE	Consumer Electronics.
CEN	European Committee for Standardisation.
CENELEC	European Committee for Electrotechnical Standardisation.
CSA	Conseil Supérieur de l'Audiovisuel; French regulatory authority for the media.
Delivery platform	Terrestrial, cable, satellite or DSL infrastructure applied to transport digital interactive television services.
DigiTAG	Digital Terrestrial Television Action Group.
DTG	Digital Television Group, United Kingdom.
DTT	Digital Terrestrial Television.
DVB	European Initiative for Digital Video Broadcasting; industry consortium uniting broadcasters, hard & software manufacturers, network operators and regulators across Europe, developing specifications supporting the commercial development of digital television.
EBU	European Broadcasting Union.
Enhanced broadcast	That type of digital interactive service that relies on 'local' interactivity and hence does not require the use of an active return channel.
Enhanced broadcast profile	That version or profile of an API that supports the functional requirements of enhanced broadcast content & applications.
ETSI	European Telecommunications Standardisation Institute.
EICTA	European Information, Communications and Consumer Electronics Technology Industry Association.
Framework Directive	Set of directives published by the EU in April 2002, encompassing a common regulatory framework for electronic communication networks and services.
Horizontal market	Situation where equipment for the reception of digital interactive television is based upon technology that is available to all relevant stakeholders under similar and non-discriminatory conditions; there is no specific market player that determines broadcasters', operators' or other entities' access to the technology, while consumers purchase digital interactive equipment in a competitive retail market, supplied by

	manufacturers that also have access to the relevant technology under similar and non-discriminatory conditions. ⁸²
IEC	International Electrotechnical Commission.
Interactive broadcast	That type of digital interactive service requiring an active return channel in order for all its features to function properly.
Interactive profile	That version or profile of an API supporting the functional requirements of interactive broadcast content & applications.
Interactive television	Applications offering the user access to additional content and services, either or not related to a broadcast program, by means of interaction through a user interface communicating with a receiver or, by means of a return channel, with a device elsewhere. ⁸³
Internet Access	That type of interactive service allowing the consumer to interact with content and services from the Internet.
Internet Access Profile	That version or profile of an API supporting the functional requirements related to Internet Access.
IPR	Intellectual Property Rights, or patents related to components contained in a hardware or software specification or product.
ISO	International Organisation for Standardisation.
ITU	International Telecommunication Union.
JTC Broadcast	CENELEC/EBU/ETSI Joint Technical Committee for broadcast related standardisation.
Legacy platform	API platform (either proprietary or not) currently in use in one or more of the digital TV markets across Europe.
MHP	Multimedia Home Platform; Application Programming Interface specified by DVB and adopted by ETSI as Technical Specifications; MHP is available in a 1.0.2 version supporting the enhanced and interactive broadcast profiles, and in a 1.1 version supporting the Internet Access profile as well.
OJ	Official Journal of the European Communities.
Presentation engine	Software platform, also referred to as browser, that can be implemented as a plug-in module on top of an API, or on a stand-alone basis (i.e. without the support of an API) displaying interactive content on a screen; if the platform is used on a stand-alone basis, additional features may sometimes be added to enable interfacing with a limited number of resources in the receiver.
SI	Service Information; data required in digital broadcast and digital interactive broadcast to supply a receiver as well as applications

⁸² For an additional perspective on the definition of a horizontal market see also: Study on Interoperability, Service Diversity and Business Models in Digital Broadcasting Markets, OXERA, February 2003.

⁸³ Although this definition formally does not exclude analogue interactive television, it should be understood that within the scope of this report, only digital interactive television is concerned; therefore concepts that apply interfaces for interactive purposes such as a (mobile) phone or a PC are not considered in the context of this report either.

Vertical market

running on a receiver with information they need to function properly.

Situation where equipment for the reception of digital interactive television is based upon technology of which parts are controlled by a specific stakeholder in a specific market, which – either or not within a relevant regulatory framework – decides on other stakeholders' access to that technology.

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ANNEX 2 to the letter

The following document is not intergral part of the mandate M/331

Position of the Federal Republic of Germany on the document COCOM03-26

Standardisation mandate to CEN, CENELEC and ETSI in support of digital TV and interactive services

Open and uniform API- and CA systems will secure the development towards more competition. Thus, Germany expressly supports all activities leading to the use of open and uniform standards for APIs.

Germany is of the view that the following basic requirements have to be fulfilled: All consumers must have the possibility to access from their terminal all services offered and they must have the choice from which provider to receive the offers. There may be no technical barriers for access to any service and for the use of any application. Any provider of programs and services must have fair access without discrimination to transmission services with his own encryption procedures, must have the possibility to use his own navigators and must have fair access without discrimination to basic navigators. There must exist common technical solutions to receive Free TV and Pay TV. Proprietary systems may not be operated permanently.

These basic requirements are fulfilled by the standards Multimedia Home Platform (MHP) and Common Interface (CI) adopted by ETSI. This means that an open interactive digital platform for digital TV- and interactive services already exists.

A new mandate must take this into account and may not put at risk the degree of standardisation already achieved. A new mandate for standardisation could contribute to amend and accomplish the standards already adopted by ETSI which would facilitate the application of the standards by market participants. This should be expressed more clearly in the mandate, according to our view.

The so-called procedure of „Re-Authoring“, i.e. the simultaneous use of different and more or less compatible systems, results in our view in unnecessary complications which could even result in restrictions of equal opportunity, non-discrimination access for consumers to certain programs and services. Furthermore, „Re-Authoring“ causes higher cost since it is necessary to create gateways between different systems. And „Re-Authoring“ would require program providers to adapt programs to different systems which would give rise to increases in costs at least. These principles should also be addressed when giving the mandate.