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FROM VIDEOTEX TO HYBRID TELEVISION: A HISTORICAL PERSPECTIVE ON INTERACTIVITY IN EUROPEAN BROADCASTING

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Abstract: This paper analyses the concept of interactivity considering the interactive and digital television experiences that became widespread in Europe during the 1980s and 1990s. The concept of interactivity, and television itself, channelled advances in digital technology as they were adapted for domestic use, conceptualising interactive television as a new media rather than an evolution of conventional television.
Thus, we examine the development of European standards for the creation of interactive television services. First, we review the main European videotex initiatives, and then we analyse the most recent open standards in a context characterised by a high degree of technological convergence.

Keywords: connected television, digital television, hybrid television, interactive television, interactivity

1 Introduction

The conceptualisation of interactivity in European television cannot be understood merely as a scholarly debate; it is a clash of industrial visions between the broadcasting, telecommunications, and emerging IT sectors. It is essential to recognize that interactivity is not a monolithic term, but a multi-dimensional concept also shaped by the goals of the sectors involved in it.

The concept of interactivity gained special relevance with the rise of digital technologies and the Internet, particularly during the 1980s and 1990s (despite numerous analogue-based initiatives in the 1970s), the ability to interact with or through television was an option explored as early as the first regular television broadcasts.

Interactive television was conceptualised in accordance with studies on new media as a new communication medium rather than a mere evolution of technology towards a convergent scenario. The new media concept served to describe the nature of the context in which new communication media developed.[1] The analysis of new media is approached from a perspective of mutual relationship between established and emerging audiovisual forms, examining their transformations and the processes involved. Thus, new media refers not so much to entirely new media but to a

scenario of interrelation among existing media, from which new models would emerge. In this sense, interactive television was seen as the next step in the evolution of the media ecosystem.

In the 1960s and 1970s, particularly in the US, experiments were conducted with videoconferencing systems (such as AT&T's picture telephone), tele-education, or telemedicine (through cable television operators), concepts more closely related to telecommunications services. During the 1980s, a significant number of experiments with videotext technology led to the expansion of the services and business activities of telecommunications and media companies, thereby familiarising households with new computer-like technologies.

It was during this decade that cable emerged as the most suitable technology for the development of interactive television. Major cable and telecommunications companies raced to develop digital and interactive media, particularly in the context of entertainment offerings.[2]

However, in the 1990s, interactive television, as conceived in the 1980s, repeatedly proved economically unviable and, perhaps, culturally and socially premature. By the mid-1990s, the success of the internet had led to a demand for convergence between interactive television experiences and the internet. This resulted in a substantial alteration to its conceptualisation, as well as the services and content offered.

This was the case with WebTV in the US, which aimed to provide a more affordable alternative to computers, both economically and in terms of usability and accessibility, by using the television as the access medium.

As van Dijk and de Vos observed,[3] there was a clear divide: television producers generally define interactive television (iTV) as an extension of traditional broadcasting. In contrast, internet producers envision a great network where the user is an active participant in a communicative, multi-directional exchange. These divergent visions directly influenced the negotiation of technical standards, which were often shaped by national interests and political dimensions rather than sheer technical superiority.

In the digital era, the struggle shifted to middleware standards. While the Multimedia Home Platform (MHP) was promoted as an open European standard to ensure interoperability, it faced significant divergence for reasons of technical convenience and national market needs.

In most cases, the resources invested in technology development and marketing far exceeded those allocated to the creation of compelling content and services for the public. Consequently, speculation about the business potential of these technologies, along with the fascination for technology as a symbol of development and innovation in the involved countries and companies, drove the value of anything labelled as interactive.

2 State of the Art

Carey[4] offers, from a broad perspective of the concept of interactivity, a review of numerous interactive television initiatives dating back to the 1950s. Interactivity, as defined by Carey, does not imply a special consideration of technology. Under this perspective, television programmes such as *Winky Dink and You* (a 1950s production aired on CBS) are considered precursors of interactive television due to the fact that viewer actions, while not affecting the show's progression, generate engagement in the unfolding events.[5] Applying this broad interpretation of interactivity, this CBS show achieved notable success among children by allowing them to interact with the show using transparent sheets placed over the TV screen to draw and participate in the show's events. This phenomenon aligns with the definition of parasocial interaction proposed by Horton and Wohl[6], which describes the connection that can be established between a television programme and its audience without the presence of a direct communication channel.

Other interpretations of the concept, such as Jensen's,[7] emphasise on the need for physical interaction with the medium through an interface to achieve a personalised experience and interpersonal communication options.

For other authors, the attribute interactive implies user control over the flow of information and, consequently, technology that meets this requirement. Srivastava[8] articulated a specific demand for greater control over content. Gawlinski[9] conceptualised interactivity in mass media – such as print, radio, and television – through its association with interpersonal communication technologies, particularly the telephone. They proposed a dialogic ideal for interactive television, suggesting the necessity of a technical medium capable of enabling such communication. However, Gawlinski does not explicitly define this requirement, as he interprets interactivity as conceptually independent from technology – or at least from advanced technological developments.

From these broader conceptualizations, it can be inferred that the technological and convergent dimensions intensify the implications of an interactive medium. Terms such as 'conversation', 'collaboration', 'choice', and 'power' are frequently employed to denote freedom and agency within the constraints of an asynchronous medium. In this context, binge-watching may exemplify these implications – not only as a mode of media consumption, but also as a practice that empowers viewers and enhances their control, both of which are closely associated with the notion of interactivity.[10]

This perspective stands in contrast to the prevailing view within the media industry, where interactivity is understood as the exchange of information – or communication – between the user and the technological system. Here, media interactivity is conceived as a dialogue between natural and artificial systems, a conceptualization that challenges interpretations of interactivity as a purely human or socially grounded phenomenon.

From a technical standpoint, the contemporary communication process is characterised by the multidirectional flow of information, the collective selection of content, and the accelerated pace of communication. This model is strongly influenced by the internet and mobile devices, whose functionalities serve as catalysts for transformative changes in previously unidirectional models of media communication.[11]

Jensen[12] argues that interactivity has been one of the most enduring promises in the television industry since its inception. However, due to factors such as technological limitations, inadequate infrastructure, a shortage of suitable content, or insufficient audience demand, interactive television never fully came to fruition. Even today, within a highly interactive technological, social, and cultural environment – shaped by increasing convergence and widespread high-speed connectivity – television interactivity remains limited, predominantly restricted to video-on-demand services. Various initiatives explored during the 1980s and 1990s envisioned more diverse forms of viewer participation and interactivity that, while technically viable today, have not been integrated into everyday viewing practices.

León and García[13] offered a similar assessment, noting the lack of public interest in the interactive features initially promised by television services. They emphasized the absence of a killer application capable of normalizing certain forms of interactivity. This role was eventually fulfilled by video-on-demand platforms, following the rapid rise of services such as Netflix, which helped consolidate a dominant model of personalised and subscription-based television.[14]

Theorising interactivity remains a complex endeavor, largely due to the absence of a unified framework for understanding interactive models in television. Microsoft contributed to this discourse by proposing a classification based on relatively well-established concepts, including 'Enhanced Television', personalised television, internet-connected television (i.e., accessing the internet through a television set), and connected television.

By the late 1990s, the concept of connected television represented the general idea of interactivity in television – the full convergence of the internet and television[15]. Within this framework, Kraus[16] conceptualised the term interactive television (iTV) as a broad, umbrella category encompassing a diverse array of services. He acknowledged the initial

confusion between notions like *enhanced* and *interactive*, noting that although both involve similar elements – such as an interface or return channel – they differ in a fundamental way: interactive television allows users to influence the content or narrative to some extent, whereas enhanced television simply adds supplementary information, content, or functionalities without altering the structure or progression of the program itself.

According to Boellstorff and Soderman,[17] interactive television is best conceptualised as a participatory medium that resides at the nexus of computerization and technical communication networks. This definition moves beyond the television as a mere 'idiot box' to envision it as a two-way platform where the viewer actually plays and really participates through 'distanced interaction'. Crucially, this concept is built upon techniques of simultaneity, which utilize live broadcasts to bond audiences together, creating shared experiences that articulate the reality of an emerging networked society.

The arrival of digital television was seen as the definitive catalyst for digital convergence, a scenario where the television, the computer, and the telephone would finally merge.[18] However, viewed more than 30 years later, it is clear that the interactive television (iTV) of that era was a speculative bubble – a 'Holy Grail'[19] that professionals and companies pursued without finding a definitive business model or a clear social application.

The literature of the period reveals a profound disjuncture between different industrial interests, each trying to define interactivity to suit its own goals. As van Dijk and de Vos[20] observed, television producers viewed interactivity through a 'transmission model', where the source remains in control. For them, interactivity was largely reactive, limited to choosing from menus or making simple transactions. Robin Mudge´s work at the BBC exemplified this 'protectionist' approach; projects like *Local Heroes* utilized a bookmark system specifically designed to 'protect the narrative structure of the television program'.[21] By moving interactive experiences to after the broadcast, broadcasters ensured that the 'active' viewer did not disrupt the traditional linear flow.

Conversely, those coming from the emerging IT sector envisioned a network of networks. Their vision was multilateral and aligned with academic definitions that emphasise a two-way TV or communication system where viewers could produce input and exchange information in real-time, essentially treating television as a flexible home terminal for networked services.[22] They criticized the 'couch potato' stereotype, hoping that interactive television would transform viewers into actual active participants.

For telecoms, interactivity was a matter of social learning and infrastructure utilisation. Their focus was on the return data path and the potential for complementary services such as e-commerce and home banking. They viewed interactive television as a gateway to the *information society,* focusing on the technical capacity of the line (telephone, satellites or ADSL) to handle data intensive applications.[23]

From a contemporary perspective, the Connected TV of today represents a partial crystallisation of these early dreams, but significant caveats. While we now possess the high-speed broadband Mudge envisioned, the interactivity on the television set remains largely reactive, dominated by Video-on-Demand (VOD) and algorithmic recommendations. The social-cultural system of users, as van Dijk and de Vos noted, still favours relatively passive viewing in the living room.

The high-level, active interactivity (human-to-human communication, content production) that 2001's internet producers sought has not flourished on the TV set. Instead, it has migrated to other media. Platforms like YouTube, Twitch, and smartphones have become the true realization of the network of networks, fulfilling the communicative and multilateral potential that early iTV promised but could not deliver within the constraints of the television interface.[24]

More recently, Lobato and Lotz[25] debated the appropriateness of the term *streaming wars* as a descriptor for a multifaceted phenomenon that involves a wide range of technologies, corporate actors, and global markets. They argue that this term serves as a contemporary manifestation – or crystallisation – of the vision of interactive television originally articulated in the 1980s and 1990s.

3 Objectives, Method and Sources

Initially, for the development of this research, it was crucial to establish a conceptual framework and clarify key terminological distinctions in order to identify relevant case studies. Beginning with the concept of interactivity, we encountered a wide range of related terms, each carrying different connotations – often expanding upon, complementing, or delimiting specific functionalities or technological attributes.

The primary objective, therefore, is to trace the historical precedents of what might be defined as interactive television within the European context, viewing this process not as a linear evolution but as a contested 'hunt for the Holy Grail', in terms of van Dijk and de Vos, among divergent industrial interests. Through bibliographic research, we examine the evolution of initiatives that could be categorized under this concept, which marked a notable technological advancement in comparison to the traditional television experience, specifically focusing on the pivotal role of technical standards as political and industrial instruments. This approach justifies the analysis of the standards as the primary site where unified European goals encountered significant national divergence. Technical standards such as those established by the CEPT or later the MHP represented attempts by industrial consortia to create a critical mass of users. However, these standards were often sites of intense political negotiation where national interests superseded technical unified goals. So, following the framework proposed by Stewart,[26] this research treats standards as poles of attraction – focal points where the divergent visions of the broadcasting, telecommunications, and IT sectors crystallized into specific protocols and infrastructures.

The selection of case studies – ranging from Minitel in France to MHEG-5 in the UK – is specifically intended to reveal these points of friction. These cases demonstrate how different industrial sectors configure the user to fit their existing business models.

Analysing both contemporary documentation and recent scholarly studies enables us to assess the various interpretations of interactive television that have emerged, as well as their materialisation in communication and entertainment technologies and services.

Our review encompasses both academic literature and technical documentation produced by standardisation bodies such as the International Organization for Standardisation (ISO), the European Telecommunications Standards Institute (ETSI), the International Telecommunication Union (ITU), and the Hybrid Broadcast Broadband TV (HbbTV) Consortium. This allows for a comprehensive technical and conceptual account of the projects under investigation. In addition, we have drawn upon journalistic sources to contextualize public perceptions of these emerging technologies and their communicative applications at the time of their introduction.

4 Videotex Systems in the 1970s

The term videotex gained prominence in the mid-1970s to describe information systems that, via dedicated terminals or personal computers, enabled bidirectional online access to textual and graphic content. Videotex was part of a new family of telecommunications systems driven by advances in microelectronics and its convergence with computing technologies. According to the International Telegraph and Telephone Consultative Committee, as cited by Mayntz and Schneider,[27] videotex was characterised by: (1) the transmission of alphanumeric and graphic information; (2) the storage of such information in databases; (3) its transmission between the database and the end user through a telecommunications network; (4) access via a television, monitor, or specialized display device; (5) user-controlled (directly or indirectly) access; (6) provision of tools enabling users to modify or generate information within the database; and (7) functionalities allowing information providers to create and manage databases, including user-specific options.

Videotex did not represent a novel technology per se, but rather a recombination and redirection of existing technologies. These systems, categorised as public telecommunications services,[28] operated via telephone lines or other cable technologies and targeted a broad user base – from business and professional sectors to domestic users. They were designed to be accessible to individuals with little or no experience in interactive or digital technologies. Their fundamental purpose was to deliver a wide array of information and services from multiple providers.[29]

Telecommunications companies, media organisations, and related industries viewed videotex services as a key driver in the development of the emerging information society. However, it was particularly within Europe that governments incorporated videotex into their forward-looking industrial policies. These systems were conceived from the outset for nationwide implementation, capitalizing on state monopolies over telephone networks[30]. Despite these ambitions, by the mid-1990s, most videotex services had been discontinued or were widely regarded as economic failures.

In Europe, the European Conference of Postal and Telecommunications Administrations (CEPT) was responsible for establishing technical regulations for videotex operation. Three mutually incompatible standards were adopted – CEPT 1, CEPT 2, and CEPT 3 – which differed primarily in their graphic and colour handling capabilities. CEPT 2 was the weakest in this regard, but paradoxically the fastest in data transmission. This characteristic contributed to the widespread adoption of videotex in France, the country that implemented this standard.

One of the earliest services – although not strictly 'interactive television' by the criteria later defined in the 1990s – was introduced in 1974 by the United Kingdom Post Office under the generic name Viewdata. This service later became known as videotex and was officially launched in 1979 by Prestel, a subsidiary of British Telecom[31]. Notably, Schlesinger was highly critical of the development of teletext and videotex under free-market principles – aligned with the political orientation of leaders such as Thatcher in the UK and Reagan in the US – despite the fact that public corporations were their primary promoters.

Video 1. Launch video explaining what Prestel consists of. Source: YouTube.

Users could access the system via their own computers, but Prestel was notable as the first commercial technology to integrate two major household communication media – telephone and television – through a modem connected to the latter.[32] This system enabled bidirectional communication, allowing users to send messages or requests to operators via a return channel. This feature distinguished it from traditional teletext systems, which began to gain popularity in 1974 with the UK launch of Ceefax. Although Prestel was based on the technical standard developed for Ceefax, the latter originated from experiments by BBC engineers aimed at developing a subtitle system.[33]

However, several limitations hindered its domestic success. These included the poor quality of contemporary televisions for displaying text, installation difficulties related to the positioning of the telephone socket in relation to the TV, and a complex pricing model based on the number and type of accessed pages.[34] Although Prestel saw moderate adoption among businesses, it ultimately failed to gain traction among British households. This situation was further exacerbated by increased competition following the liberalization of the UK telecommunications sector starting in 1981.

In late 1979, the Directorate General of Telecommunications (then operating under the name France Télécom) initiated trials for France's first videotex service. Known as Télétel – popularly referred to by the name of its access terminals, Minitel—it represented a key step in the realization of France's new industrial policies. These policies initially focused on expanding the national telephone network, which still had limited penetration in the early 1970s. The overarching objective was to position France competitively in the global telecommunications and computing sectors, particularly against growing American dominance. Hardware manufacturers and telecommunications companies rapidly mobilized to design and produce Minitel terminals, fostering strong market competition and a vibrant emerging sector for digital technologies.

This convergence of telecommunications and computing, together with the expansion of telephone infrastructure and the goal of investment recovery, popularized the concept of Télématique.[35] The term encompassed the ambition to build a national information and communication network, promoted and financially supported by the state as a guarantor of economic, technological, cultural, and social development – a key pillar for Western countries entering the information age.

Political changes following the election of President François Mitterrand did not significantly alter the strategic direction or discourse surrounding Télématique. By the early 1990s, Télétel and related services – such as the electronic telephone directory – had experienced rapid expansion and widespread adoption. One major contributing factor was the free distribution of first-generation Minitel terminals. By the end of 1992, more than six million terminals had been distributed throughout France, with significant penetration in workplaces.[36]

As with most transformative technologies, Télétel became a focal point for political and social debates regarding the challenges posed by digital innovation. These included resistance from traditional sectors, such as the press, which strongly opposed the availability of classified ads through Télétel – threatening a crucial revenue stream. Public concerns also centred on issues of privacy, personal data management, inappropriate content, state control of information, and disputes over patents and technical standards.

Télétel's success, however, was not solely due to the distribution of free terminals. Equally important was the government's development of a technical standard that enabled simple and affordable network access for independent service providers. This facilitated a diverse ecosystem of services, enhancing Télétel's appeal in both business and domestic contexts. The underlying network architecture enabled service decentralisation – unlike the British and German models – allowing private companies to operate services while the Directorate General of Telecommunications limited its role to network management, except for the centralised electronic telephone directory. This decentralised approach enabled the rise of popular messaging services (messageries), further accelerating household adoption. Facing saturation in the domestic market, the Intelmatique division was established in 1989 to promote the international expansion of Télétel technologies and services.

Video 2. Promotional video for the Minitel. Source: YouTube.

Télétel's adaptability to technical challenges and user needs led many to believe that videotex would be the foundational technology of the emerging information society. However, in retrospect, these systems are more accurately viewed as precursors to the Internet rather than as early forms of interactive television.

All these initiatives were marked by strong state support for the development of telecommunications and information society policies, despite the absence of substantial 'real' demand, particularly within households. The relative success of Télétel, compared to the failures in the UK and Germany, can largely be attributed to France's ability to create demand and mobilize national efforts in a country still lagging in telecommunications and information infrastructure.[37]

In September 1983 – following development efforts that began in 1977 – Christian Schwarz-Schilling, then Minister of the Deutsche Bundespost (Federal Post Office of Germany), officially launched Bildschirmtext (BTX) during a press conference at the International Radio Exhibition in Berlin by pressing a symbolic red button. This late entry into the videotex landscape allowed Germany to adopt more sophisticated access terminals. However, this technological ambition also introduced greater complexity, leading to increased costs and reduced ease of use. Like the UK, Germany relied on televisions for home access and delegated terminal development to the fragmented consumer electronics industry, which hampered economies of scale and affordability. By contrast, France exercised greater control by assigning terminal production to three companies: Telic-Alcatel, Matra, and Radiotechnique.[38] The contract for Germany's network infrastructure was awarded to the American corporation IBM.

Image 1. On September 1, 1983, Federal Postal Minister Dr. Christian Schwarz-Schilling opened the BTX service at the IFA in Berlin with a symbolic push of a red button. Source: Museumsstiftung Post und Telekommunikation.

In Spain, Telefónica was tasked with developing the videotex network known as Ibertex.[39] [40] Its rollout coincided with the growing adoption of personal computers and the emergence of the Internet, rendering the technology somewhat outdated from the outset.[41] Although initial tests were conducted during major events such as the 1982 FIFA World Cup and the 1983 municipal elections, Ibertex only achieved moderate adoption in the late 1980s and early 1990s, particularly among public administrations for communication and information dissemination purposes.

Following a model similar to that of France, Telefónica developed and managed the network infrastructure (Iberpac), while liberalizing service and content provision. By the 1990s, access to Ibertex had become highly diversified, available through dedicated terminals (akin to Minitel), or via television and personal computers using modems and specific software.

By the mid-1990s, videotex systems proved inadequate for increasingly data-intensive applications. Their low speed and text-only format made them obsolete in the face of the growing multimedia culture.

5 Multimedia Home Platform (MHP): Interactivity in Digital Terrestrial Television (DTT)

Beginning in 1997, the Digital Video Broadcasting (DVB) consortium defined the Multimedia Home Platform (MHP) as a specification for the development of interactive applications for digital television broadcasts, particularly those delivered via terrestrial platforms[42]. This initiative emerged in a context where proprietary solutions dominated the nascent market for digital and interactive television. At the turn of the century, middleware platforms such as OpenTV (Sky Digital), Mediahighway (Canal+), and Microsoft TV represented the predominant technologies, especially in the satellite broadcasting sector.

As with the evolution of other transmission standards, the development of open solutions for digital and interactive services aligned with the specifications issued by regional regulatory bodies and previously established standards for signal transmission. Although MHP was published as a standard by the European Telecommunications Standards Institute (ETSI) in 2000, its deployment in Europe did not commence until 2001, when Finland became the first country to implement the middleware for interactive television services. By that time, however, other markets – most notably the United Kingdom – had already adopted alternative standards. One such example is MHEG (specifically its MHEG-5 version), developed since 1995 by the Multimedia and Hypermedia Experts Group at the request of the International Organization for Standardisation (ISO). MHEG-5 aimed to establish a method for storing, exchanging, and rendering multimedia applications.[43] This standard gained wide acceptance in the UK through platforms such as Freeview and Freesat, and was also adopted in countries like New Zealand and Australia to support interactive services via digital terrestrial television (DTT). MHEG-5 was explicitly designed for compatibility with low-cost, easily manufactured set-top boxes.

The development of MHP, like other public and open solutions, emerged as a response to the fragmentation of the proprietary middleware market and the corresponding challenges of interoperability and high development costs for application providers. MHP also sought to mitigate the effects of vertical integration among operators that controlled their own closed middleware ecosystems. The final version of the standard, published in 2005, incorporated full support for internet connectivity. It integrated widely used programming languages such as Java and HTML and introduced the Global Executable MHP (GEM) specification, which enabled the application of MHP's application programming interfaces (APIs) in networks that did not adopt DVB standards.[44] For DVB, ensuring standardized internet access via television had always been a central objective in defining MHP. This objective aligned with the dominant conceptualizations of interactive television in the late 1990s, which led to the specification of the DVB-HTML language, based on XML, to standardize the representation of web content on MHP-compatible hardware.[45]

Extensively used by European satellite broadcasters, the DVB consortium also developed a specification for transporting Internet Protocol (IP) data packets via MPEG-2 encoded signals. Known as Multiprotocol Encapsulation (MPE), this standard enables, for example, a digital satellite television provider to transmit internet-related data—such as web content—over television signals, thereby integrating internet and broadcast infrastructures[46]. This can be regarded as a precursor to connected television, insofar as it facilitated the convergence of digital television and internet data flows. However, the technological realization of connected television ultimately diverged, taking the form of physical connections between televisions and the internet via Ethernet cables or Wi-Fi adapters. Moreover, the concept of connected television entails broader device interconnectivity beyond internet access alone.

Even so, MPE may be considered an early iteration of connected television. Its functionalities were later consolidated with the emergence of Internet Protocol Television (IPTV), albeit through a reverse model. Whereas MPE introduced internet traffic into digital television infrastructures, IPTV distributes television content over the internet using dedicated network resources designed to guarantee quality of service (QoS). Notably, the development and commercialization of IPTV have been spearheaded by telecommunications companies, highlighting the increasing convergence between broadcasting and telecommunications sectors.

Video 3. Television commercial for the IPTV service of the Spanish telecommunications company Telefónica (currently Movistar). Source: YouTube.

6 Evolution of Open Standards in a Context of Technological Integration: the Hybrid Broadcast Broadband Consortium (HBBTV)

In the contemporary context, where televisions may be considered as computers, the concept of connected television does not represent a fully convergent technology, given that the interfaces for receiving broadcast signals and accessing internet-distributed applications remain functionally separate. In practical terms, when a user connects to an application, the broadcast signal is interrupted, and vice versa. This technological limitation prompted the emergence of a new generation of open middleware solutions aimed at integrating and synchronizing broadcast television signals with complementary information and services transmitted via broadband. This development marks the natural progression of digital television toward truly hybrid systems, combining broadcast transmission with broadband connectivity, while still accommodating independent internet-only services.

These systems are referred to as Integrated Broadcast Broadband (IBB) systems. Their general technical specifications were outlined by the International Telecommunication Union (ITU) in its ITU-T J.205 document,[47] which defines the requirements for the development of integrated applications for digital television services.

In June 2010, the European Telecommunications Standards Institute (ETSI) approved the Hybrid Broadcast Broadband Television (HbbTV) standard, formalized under specification TS 102 796 version 1.1.1, as a solution compatible with DVB transmission networks.[48] A key principle guiding the development of HbbTV was its interoperability with existing and widely adopted technologies, such as HTML, W3C web standards, the Open IPTV Forum, and DVB standards, rather than the creation of entirely new frameworks. The second version of HbbTV was released in 2016 and included significant updates, notably the implementation of HTML5 and the development of a communication interface enabling synchronized application usage between televisions and secondary devices – for instance, allowing a video signal with simultaneous sign language interpretation to be delivered to mobile devices. All

open IBB systems adopted HTML5 for application development, thereby facilitating third-party services and marking a departure from earlier models such as MHP, in which broadcasters controlled the provision of interactive applications. This shift introduced an application ecosystem more akin to that of smartphones.

In June 2020, ETSI approved specification TS 103 736-1 V1.1.1, which enabled the broadband delivery of personalised advertising using designated servers and a system known as HbbTV Digital Ad Substitution (DAS). This technology allows the broadcast signal to be temporarily replaced with targeted advertisements, automatically resuming the original content after the advertisement concludes.[49]

Nevertheless, as Da Silva Klehm et al. note,[50] despite the social nature of connected television, IBB systems still lack advanced recommendation algorithms capable of delivering truly personalised viewing experiences. In this regard, open standards remain behind proprietary platforms such as Google's Android TV or Amazon's Fire TV.

In Spain, the HbbTV-based service LOVEStv was launched in 2018 as a joint venture among the country's principal free-to-air broadcasters – Atresmedia, Mediaset España, and RTVE – with Cellnex acting as the technology provider. The initiative arose in response to increasing competitive pressure from over-the-top (OTT) services, both in terms of technology and content. Conceived to enhance the traditional television experience, LOVEStv complements the core linear broadcasting services of its members. This public-private partnership created a shared technological infrastructure, analogous to initiatives like Hulu in the US (jointly developed by NBC/Comcast, Disney, and Fox), which was intended to counter the growing dominance of platforms such as YouTube.[51] In this sense, the platform functions similarly to satellite television systems in the 1990s (e.g., Canal Satélite Digital and Vía Digital in Spain), serving as carriers for multiple broadcast services.

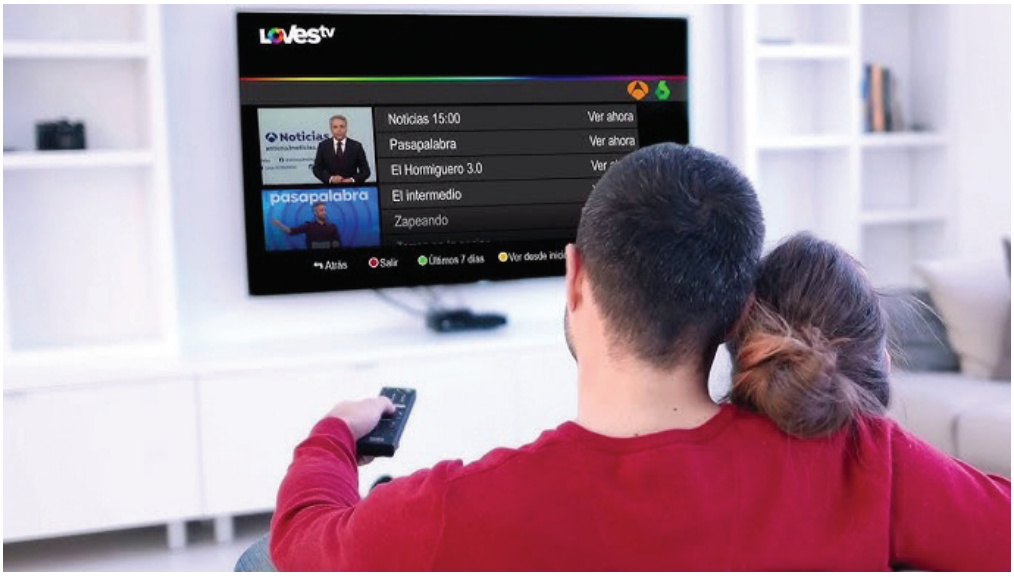
Video 4. Hulu commercial from 2008. Source: YouTube.

However, the advantages of digital terrestrial television (DTT) – such as enhanced image quality and thematic channels – have gradually lost relevance compared to OTT services, which offer video-on-demand, cross-device access, and greater content variety, particularly in serialized fiction and film. OTT operators have evolved beyond mere distribution platforms to become producers of premium content and strategic actors throughout the audiovisual value chain. In response, traditional broadcasters see HbbTV as an opportunity to regain market competitiveness, particularly through new forms of advertising that enable enhanced audience segmentation and personalised campaigns, following the example of certain German broadcasters.[52]

A parallel initiative in the United Kingdom emerged in 2008 with the development of YouView – originally known as the Canvas project – driven exclusively by the BBC. This project was launched as a collective response by major UK broadcasters to the rising consumption of online video and the deployment of IPTV services by telecommunications companies.[53] Prior to the formal establishment of the HbbTV consortium, YouView represented one of the first attempts to develop hybrid systems that integrated digital terrestrial broadcasting (via Freeview) with internet-distributed content, such as BBC iPlayer, accessed through a set-top box. The objective was to establish a standard that would facilitate the creation of a horizontal market for connected television devices in the UK.

These developments exemplify a broader strategic trend in the traditional television sector, characterised by the phenomenon of coopetition – a hybrid model in which competing broadcasters collaborate in certain domains, such as the development and distribution of HbbTV platforms, while continuing to compete in others. In this context, LOVEStv serves as a shared HbbTV platform for free-to-air broadcasters, even as these entities maintain their competitive positions within the linear broadcasting market. Coopetition, understood as a strategic alliance among rivals, has become increasingly relevant in digital markets and in the media sector during processes of technological transition.[54]

However, such collaborative ventures have not escaped regulatory scrutiny. In Germany, initiatives such as Amazonas (launched in 2011 by RTL and ProSiebenSat.1) and Germany's Gold (launched in 2013 by ZDF and ARD) were prohibited by the German Bundeskartellamt. The main concern in the case of Amazonas was that the platform would entrench the dominant position of the participating broadcasters in the advertising market, which they collectively controlled to a significant extent. Similarly, in the United Kingdom, the Competition Commission blocked an earlier joint venture in 2008, known as Project Kangaroo, promoted by BBC Worldwide, ITV, and Channel 4. The Commission concluded that this project would have substantially reduced competition in the emerging video-on-demand sector, as the stakeholders controlled a significant share of content production.[55]



Video 5. "Connect to the television of the future" campaign by LovesTV Spain. Source: YouTube.

7 Conclusion

The complexity involved in defining the concept of interactivity stems from the intersection of three distinct dimensions: technology, communication, and user experience. One of the foundational principles of interactive television was its convergence with other forms of communication, particularly the telephone and the internet. During the 1990s, interactive television was envisioned as a medium that would enable direct audience participation – an active and dialogic experience in which viewers' actions could generate a tangible communicative impact. Nevertheless, historical evidence suggests that transitions to new information, communication, and entertainment technologies rarely involve the replacement of existing media. Instead, they tend to result in processes of superposition, wherein new technologies complement rather than eliminate older ones. It can be argued that a technological system can only be successful when it is introduced on a large scale and remains user-friendly; technical standards tried to make this scale possible.

In the present context, the scope of interactivity remains limited when assessed against the original principles associated with the concept. The initial enthusiasm surrounding digital technologies, especially during the early stages of the digital economy, can be understood as part of a broader speculative bubble. The model of interactive television conceived in the 1980s and 1990s has, over time, been reduced to functionalities primarily associated with video-on-demand services and content consumption practices typified by binge-watching. This evolution does not imply a trivial transformation; rather, the advent of streaming platforms represents one of the most disruptive developments in the audiovisual sector in recent decades. However, in terms of interactivity, it is apparent that users continue to assign differentiated roles to the various screens that make up the domestic media ecosystem. Despite the minimal technological distinctions between devices, the television continues to be associated with a more passive mode of consumption compared to other digital media.

Consequently, the notion of interactivity has been reframed to emphasize user control and agency, particularly as exercised through streaming platforms. The capacity to select content freely and to regulate one's own patterns of audiovisual consumption may be interpreted as the contemporary manifestation of interactivity in the context of television.

Ultimately, the quest for interactive television revealed that technological convergence does not equal social convergence. The interactive television of the late 90s was a necessary experiment that proved the living room screen would remain a space for narrative and enhanced consumption, while true participation would find its home in the increasingly personal and mobile screens of the digital age. European interactive television reveals that technical standards are also political instruments. The move toward integrated systems such as HbbTV represents a contemporary coopetition strategy where broadcasters collaborate on shared technical infrastructures to survive the competitive pressure from global OTT platforms.

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Biography

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