

# Future Media: The Role of HCI in Broadcast

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**Abstract.** Media is changing. The internet has transformed not only the way we communicate, but also the way we ingest media such as TV and radio. This extended abstract describes how technology is currently fuelling change in TV broadcasting and outlines how technologists and content providers will need to adapt to this. We focus on multiscreen experiences, discussing the work in the area and describing its progress and its shortcomings. We then propose a design space for second screen content from a HCI perspective, and discuss some of our progress.

## 1 Introduction

Multi-screen TV experiences are becoming increasingly prevalent whether the broadcasting corporations instigate it or not. We often browse the web for related content on our secondary devices when watching TV, for example, Googling an actor we recognise in a show when we cannot place him. Moreover, the content we browse is not necessarily related to the content we are viewing on the TV. As discussed by Rooksby et al. [13], the relationship between the two devices becomes a web of related, semi-related, and non-related content; often driven by external factors, such as the social fabric of domestic life.

Such interactions have led to media companies developing second screen content that ties in with the show itself. This has been termed *companion content*, and can range from the mundane, such as adverts [5], to providing content that attempts to portray an entirely new experience in which the companion content and the show bind together to create a totally new media entity [3]. Regardless of the application, it is clear that the content, both televisual and on the second screen, should bind together into a seamless and complementary experience.

## 2 Technology and Media

Twenty years ago, when asked to describe TV, most people would report it as an experience in which they receive a show through their TV set in their house. This show, broadcast at a specific time, would consist of an audiovisual experience that would be the same for each viewer. Now, the viewing experience is quite different. The idea of waiting for our favourite show to come on can

often feel a little archaic. As discussed by Vinayagamoorthy et al. [14], the use of IP (Internet Protocol) to send media to our devices has allowed us to view and engage with TV, whenever, wherever, and however we want.

## 2.1 Object Based Broadcasting

In traditional broadcasting, a TV show is made in the studio – the video, audio, and additional media assets are gathered, and then mixed together as a finalised show and broadcast. Object-based broadcasting, however, does not do this. Each piece of media is gathered as before, but is instead sent individually via IP (Figure 1). This leads to some interesting possibilities for the end user as it can, according to some metadata, be reassembled according to the user’s requirements, as described in more depth on the BBC blog [4].

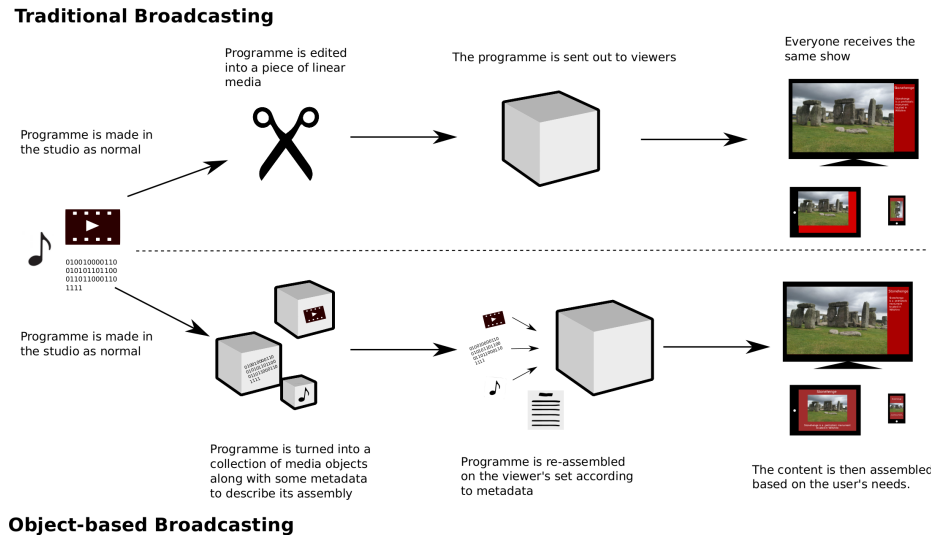


Fig. 1: Object-based broadcasting paradigm, adapted from [4].

Traditional media does not often fit our requirements ideally. When we view media it can be on an array of platforms and scenarios – from mobile devices with tinny headphones on the bus, to home cinemas with 7.1 surround sound. By providing content individually, with associated metadata, it is possible to adapt it to our systems. Not only can content adapt to our devices, but it can also adapt to us and our needs. Moreover, it is possible to use such technologies to embellish the TV experience, for example adapting the audio to a football match to the side of our choice [9], or by providing responsive [6] renditions of stories – intermixing a story with details about the listener, by getting information from their social media feeds, or by analysing the user’s browser data [2, 16].

## 2.2 Second Screen Experiences

It is evident from work such as [7] that there is a growing trend in using a second screen as a means of interacting with the TV – systems such as the Universal Control API [1] allow for the user to interact with the TV over the home network. This offers a fully configurable remote for interactive content, yielding new possibilities for interaction and empowering the physically disabled with more adaptable user interfaces. As well as catering for the needs of the differently abled, it is also possible to cater for those who surround them by use of object-based broadcasting and dual-screen experiences. A father, who is hard of hearing, need not affect the viewing experience of the family. Additional content such as subtitles, or signing, can be provided on a secondary device without interfering with the family’s viewing experience. Also, the BBC have worked on providing ‘play along’ games for shows such as the Antique Roadshow [15]. In this experience the user is asked to guess the price of a specific object on a secondary device as they watch the show, connecting the two using audio watermarking [10]. This app gained positive feedback, with older viewers in particular embracing the interactive experience.

The pairing of a secondary device and a TV allows for companion content to be provided on the secondary device – content that supplements or embellishes the content on the TV can be provided at specific, or user dictated, moments in the show to enhance the overall televisual viewing experience. In 2010 the BBC undertook some trials of providing supplementary content to a broadcast of the nature show “Autumnwatch”. Additional content, such as facts about the animals in the show, was provided throughout the programme on the users’ secondary devices in real time [8]. In addition to this trial of 300 people, extensive work was done into investigating gaze across two screens in such an experience [3]. Significantly, they found that users’ pay considerably more attention to the motion-rich TV than the secondary device.

## 2.3 Design Space

The literature suggests a gap in knowledge in the area of designing user experiences for such scenarios. Though extensive work has been done on potentially interruptive content in task-based environments (a thorough literature review of which is given in [11]), little work has investigated this in a media-based context. With the exception of [12], which studies the implications of integrating an instant messaging service into a TV, the academic literature seems to fall short, especially with regards to second screen experiences. Many questions remain unanswered in this area, and to optimise the broadcasting experience we believe that the following areas should be focused on:

**How the user is alerted to content** – How we alert users to the new content is important for mediating attention between the devices. The alert can be subdivided into modalities, such as auditory, visual, or haptic. Moreover, it can be presented on either device. As discussed earlier, Brown et al. [3] found

that the users focused strongly on the primary screen, which may lead them to miss companion content through change blindness. Ultimately, we believe that the most important thing to consider here is that there is a tradeoff between how well alerted to content the user is, and how immersed they remain in the experience as a whole.

**Context of use** – If we know the context in which the user is viewing the media we can provide content in an appropriate manner. For example, we may provide different types of media in different ways for a user on the train on their phone, compared to someone at home on their sofa, watching TV with companion content on a secondary device.

**Timing** – The time in which content is introduced is important. As discussed in [8] the users preferred new content to arrive on the secondary device in moments of low activity on the primary device. This should be further explored.

**Type of media** – If provided incorrectly the actual content itself will be an interruption. The amount, and the granularity, of content provided in a secondary channel should depend on the timing and the context.

**Interaction** – The level in which the user is expected to interact with the system is important, and the design of the technologies and the content should reflect this. We need to design systems that are not only intuitive, but allow the user to interact while remaining engaged in a TV show.

In summary, there is still a significant amount of research to be done, and technologies developed in the HCI side of this area. It is clear from the literature that this use case is a relatively untouched scenario. We need to explore each of the aforementioned areas and design new methods for providing a way to blend content seamlessly into the currently displayed materials to create a coherent experience.

### 3 Current Progress

We are currently investigating how we best design technology to make the companion content experience more involving for users. To this end we are currently furthering the work of Brown et al. [3] by investigating methods for mediating the attention of users between devices in a typical second screen use case. Our first study shows some strong results that inform the design of such scenarios for technologists and broadcasters alike. In addition to this we have also completed a study into gestural interaction for task-driven scenarios, with an aim to compare the findings to interaction in a typical media-based use case. Future work will involve working on designing new technologies to improve companion content experiences from a technological and broadcasting perspective.

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