

# Second Screen Interactions for Automatically Web-enriched Broadcast Video

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**Abstract.** Including hypermedia in broadcast video combines content formatted for a lean-forward medium (the Web) with a lean-back one (TV) to form a hybrid medium. We identify four challenges for interacting with and experiencing this new medium. We discuss the role a second screen may play in addressing these challenges.

**Keywords:** Second screen; interactive TV; interface design; linked TV

## 1 Introduction

LinkedTV<sup>1</sup> is a European research project that explores how to integrate television content with Web content in meaningful ways through the use of semantic relations for automatically generating links. This paper is based on experiences gathered while developing this project. It reflects on challenges and opportunities related to the particular user experience that Web-enriched broadcast video enables, and on the design of a suitable user interface.

### 1.1 Web-enriched broadcast video as a hybrid medium

Television is sometimes referred to as a lean-back medium, because of the passive consumption that it favors. Web-based information exploration, on the other hand, is lean-forward, requiring active user interaction[1]. Including hyperlinks in broadcast video requires some degree of redesign to meet the demands of this new hybrid medium.

The added value of links is the smooth access to additional information associated to objects depicted within the video. The current TV interface, the remote control, has inadequate interactive capabilities for this additional functionality.

The usage of a second screen, such as a smartphone or a tablet, as a complement to the TV set could potentially alleviate some of the challenges with this hybrid medium.

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<sup>1</sup> [linkedtv.eu](http://linkedtv.eu)

## **2 Current use of second screens**

The use of mobile devices by viewers alongside TV is a typical behavior. In the Razorfish and Yahoo! study[2], mobile multitasking during TV watching is common practice among 80% of the 3000 participants. Web-enriched broadcast video can benefit from this familiarity by transforming the currently disconnected activities towards integrated interaction through the tight coupling between the second screen and the TV screen. The following paragraphs are dedicated to identifying four challenges for interacting with and experiencing Web-enriched broadcast video and explain how second screen applications could be helpful in dealing with those challenges.

## **3 Challenges of Web-enriched broadcast video and the role of second screens**

### **3.1 Tension between lean-forward vs. lean-back consumption**

Web-enriched broadcast video gives access to information from different sources rather than a single stream. The information available relates to the currently depicted objects in different ways and the user can choose which browsing route to follow. This enables users to influence the last step of the production chain (the presentation)[1]. However, this requires them to be actively involved as opposed to passively consume predetermined information. A tension may emerge between user's passive habits and the new medium's demands.

A second screen can facilitate the transition between passive and active engagement styles through separating information control and information presentation. By using the second screen for control and for displaying secondary information, the TV screen can continue to display the main broadcast. Furthermore, interaction can occur through a greater scope of interaction modes such as touch-based gestures or movement tracking by the second screen device's sensors.

### **3.2 Immersion**

In television, as in cinema, the immersion of the viewer in the narrative presented depends partly on the illusion of the fourth wall[3], which refers to the imaginary wall that divides the world of the audience from the world where the narrative takes place. Through the fourth wall, the viewer becomes a witness and feels present in the scene, as if looking through a window. This applies mainly to fictional programs and films, but also, to a lesser degree, to other kinds of broadcasts, such as sport events or reality TV shows. The illusion of the fourth wall is sustained by the full use of the TV frame. In Web-enriched broadcast video we need to denote which elements in the video

constitute links and then display information selected by the user. Current on-screen solutions for these requirements result in layouts that fragment the screen in such a way that the illusion of the fourth wall is inevitably lost.

A second screen can be used to retain the fourth wall illusion on the TV screen. The main screen can be mirrored on the second screen, where interactive elements can be added and highlighted[4]. Optionally, the second screen can be used to display only the additional information[5]. In both cases, the second screen would serve as a browsing tool and the television's frame's layout would remain unaltered, thus preserving its immersive effect.

### **3.3 Tension between multiple and single users**

The traditional lean-back way of watching TV is often a group activity, where the spectators' influence is reduced to choosing which channel to view. However, this can already pose problems among spectators who fight for the remote control. When the spectator becomes an active user there are more decisions to be made regarding the information presented on TV, which is likely to increase conflicts within the group.

The single user character of second screens makes them suitable for managing user's preferences: they can generate and display personalized versions of content while the main TV screen continues to present the shared experience. Problems emerge, however, if several second screens are used concurrently for control of the main screen. These problems may be solved at either a social level, relying on human social cooperation, or at a technological level, by enforcing some form of master controller, e.g. the first user to register.

### **3.4 Quality of automatically generated links and trustworthiness of sources**

Web-enriched broadcast video relies on automatic analysis and classification of objects depicted in video content to drive semantic linking of external information sources. This requires preprocessing with automated techniques (such as speech detection, speech transcription, named entity recognition and disambiguation, and semantic linking) that are partly based on probabilistic analysis and are fallible[6]. Automatically generated links may sometimes not be accurate and trustworthy, which may diminish the perceived quality of the user's experience.

Rather than demanding that all links be "perfect", an alternative is to allow users to give feedback on the link quality. For the viewer, it is easy to decide whether the additional information of the music clip "Thriller" should be linked to the singer or the British army officer named Michael Jackson. It is unlikely that an automated algorithm will select the most appropriate link for any specific uses. The second screen can enable users to provide this feedback, for example by giving a "thumbs up" when a link is relevant.

The data sources that can be used to enrich TV content vary in trustworthiness. While some information sources are curated by experts, other information is collected

by lay users with only superficial knowledge. To ensure the user can assess the presented information correctly, the level of trustworthiness can be indicated on the second screen.

## 4 New concerns

The use of second screens not only offers new opportunities; it also raises concerns that need further analysis and possible counter measures. Some of them are: 1. The cognitive workload may increase due to the need to view two screens simultaneously. 2. Unrelated tasks performed via the second screen (e.g. checking email) may distract the user. 3. By favoring personalized television viewing, the second screen may have an alienating effect and detract socially from the shared experience of watching TV.

## 5 Conclusion

The usage of second screens while watching TV is already common practice that Web-enriched broadcast video can benefit from. Second screens' design is well suited for active interaction, for example, they can take over the functions of browsing and control therefore facilitating the transition between passive and active engagement modes. The immersive effect of TV is preserved by displaying additional information on the second screen and by allowing the TV screen to display only the main broadcast. Through enabling personalized versions of the information, second screen usage solves some of the conflicts inherent to browsing information in a group. Finally, second screens can help assessing the information correctly by explicitly indicating the trustworthiness of the sources and offering the user a way to rate the quality of the links.

## References

1. Hanson G., Haridakis P.: YouTube Users Watching and Sharing the News: A Uses and Gratifications Approach, JEP, the journal of electronic publishing, 11,3, (2008)
2. Lockhorn, J.: Forget Mobile, Think Multiscreen in Razorfish Outlook Report vol. 10, 2011 <http://razorfishoutlook.razorfish.com/articles/forgetmobile.aspx#01>
3. Auer, P. J., Davis, D. M.: When Characters Speak Directly to Viewers: Breaking the Fourth Wall in Television, Journalism Quarterly, 68, 1/2 (1991), 165-171
4. See for example: Metamirror <http://www.designbynotion.com/metamirror-next-generation-tv/>
5. See for example: IntoNow <http://www.intonow.com/ci>
6. Rizzo, G., Troncy R.: NERD: Evaluating Named Entity Recognition Tools in the Web of Data, in (ISWC'11) Workshop on Web Scale Knowledge Extraction (WEKEX'11), Bonn, Germany, October 23-27, 2011.