

# Enhancing Watching Experience of Football Matches on TV via Modes of Interaction and Types of Visualisation of Match-Related Information on Second Screen

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## ABSTRACT

This paper presents a summary of a doctoral research that is into enhancing user experience of watching football matches on TV through *second screen*. The focus of investigation, in this regard, is on the modes of interaction and types of visualisation of match-related information on second screen. The process started with a literature review. It is found out that user behaviour of accessing to non-TV-provided match-related information on second screen during the activity of watching football matches on TV were not researched in detail. In addition, early studies overlooked the ways of user interaction and the types of visualisation of match-related information on second screen that could enhance the watching experience. In order to identify the behavioural details, an online questionnaire and interviews were conducted. Moreover, a half-day workshop was organised to generate ideas and second screen prototypes for convenient user interaction and visualisation of information. The results opened up new directions that were beyond the study. For the next stages, identifying archetypes of match-related information and another literature review regarding to information visualisation and modes of interaction in mobile context are planned prior to evaluation of paper and realistic prototypes. The research is expected to create guidelines for researching and designing second screen experiences in this particular domain and generate clues for broader contexts such as sports in general.

## Author Keywords

Football; second screen; user experience; interaction design; information visualisation; prototyping; TV.

## ACM Classification Keywords

H.5.1. Information Interfaces and Presentation: Multimedia Information Systems - Evaluation/methodology; H.5.2. Information Interfaces and Presentation: User Interfaces - Interaction styles, Prototyping. H.5.m Information Interfaces and presentation (e.g., HCI): Miscellaneous.

## INTRODUCTION

The Internet and mobile technologies, have transformed practices of information retrieval into *anytime anywhere* basis [4]. An increasing number of people are able to reach vast volumes of football-related content on the web through their mobile devices at their homes, workplaces and when

they are on the move. Other than that, people have the opportunity to access to considerably higher amount of information with more filtering options as well as more frequent updates compared to traditional print and broadcasting media such as newspapers, analogue TVs and radios could offer. As a result of this, *second screen*, which is defined as “a mobile device used while watching television, especially to access supplementary content or applications” has emerged to the current scene of watching football on TV [8].

The motivation of the research is to enhance the watching experience of football matches by increasing user perception of matches through information retrieval without putting overwhelming cognitive load on them.

This paper is organised in five stages including the introduction. The aims and objectives of this research are summarised in the next section. Third part of the paper is concerned with the gaps in literature how data was generated for the research through the online questionnaire, interviews and the workshop. This part also presents brief results of data generation. Moreover, it gives information regarding the remaining work that is defining archetypes of match-related information, revisiting existing research in information visualisation and evaluation of second screen prototypes. The contribution briefly frames how this research can contribute to academia and non-academia through setting guidelines for designing second screen experiences. The conclusion summarises the work done and remaining tasks to be completed in the PhD as well as future research directions beyond the PhD research.

## AIMS AND OBJECTIVES

The aim of this PhD research is to find out the kinds of visualisations of match-related information on second screen and types of physical interactions with second screen that can enhance people’s watching experience of football matches on TV. In this context, *match-related information* could be described as past & present in-game statistics of players & teams as well as opinions of people regarding to matches, teams and players on the web such as social media platforms.

In this context, the research seeks answers for the following main question:

*How can user experience of watching football matches on TV be enhanced by user access to match-related information on second screen?*

The questions below set the scope of the main research question:

- 1) *Which modes of user interaction with second screen for accessing match-related information enhance the user experience of watching football matches on TV?*
- 2) *What kinds of visualisation of match-related information on second screen enhance the user experience of watching football matches on TV in specific time periods of watching activity?*
- 3) *For which time periods of watching activity and types of information do certain modes of interaction and types of visualisation enhance the experience?*

The objectives that were addressed in my PhD research have been the following:

- 1) Review of existing work regarding people's consumption of football and information visualisation in mobile context.
- 2) Identification of people's behaviour in terms of accessing match-related information.
- 3) Description of different types of second screen users (personas) based on their preferences on types of match-related information and defining ideal second screen experiences of each persona.
- 4) Understanding how different modes of interaction and types of visualisation of match-related information on second screen affect the watching experience.
- 5) Creation of design guidelines for interactions and visualisations of match-related information on second screen that will augment the watching experience of football matches on TV.

## **RESEARCH DESIGN**

The following methods were aimed for identifying gaps and generating data in my PhD study: Literature review, online questionnaire, interviews and prototype evaluation.

### **Literature Review**

The literature review initially aimed to identify the factors that shape the consumption of football. Fandom was considered as one of key elements in this regard. Therefore, the origins and levels of football fandom as well as how individuals practice it were summarised. Secondly, changes in economics of the game were stated. Then, effects of economical changes in football on audience's spatial experiences of football consumption such as the rise of pubs as alternative venues for spectating matches were looked into.

Media of football consumption was another important topic in the review. Analogue TV, Internet and new media were explained how individuals consume football on them as well as how their experience differed on each of them.

Subsequently, the emergence of second screen and how it contributed to people's TV watching experience were covered. The coverage on second screen has indicated two important findings: First one was the advantage of second screen over traditional remote control and iTVs in terms of usability [2]. The other was second screen's role on enriching watching experiences of sports events on TV by providing viewer content-related information and opportunity to socialise with others [4, 5, 9].

The evaluation of few existing web and mobile applications was the next point of review. By referring to the principles of information visualisation, visual communication design and user reviews, five live coverage apps were analysed with regards to types of football-related information, the levels of personalisation and the ways of visualisations of information they offer. However, user reviews were not clear whether users reviewed them in the context of second screen. On top of that, without user testing, the analysis of the apps was not sufficient enough.

Although previous research summarised how people generally benefitted from second screen, they lacked details regarding people's behaviour of accessing and interacting with football-related information on second screen. Specifically, there has not been enough work that investigated the types of match-related information that viewers seek on second screen and how this activity contributed to their experience. Moreover, time, reasons and frequency of engaging in seeking match-related information on second screen whilst watching football matches on TV were not analysed thoroughly before. Furthermore, the literature did not inform us regarding the convenient modes of interaction and types of visualisation of match-related information that could enrich second screen experience of watching football matches on TV although plenty of work produced general guidelines in visualising information on mobile devices as well as visualising sports data for experts [1, 3, 10].

### **Online Questionnaire & Interviews**

Due to its practical advantages [6, 7], an online questionnaire was conducted to gain insight regarding whether, how, when, why, how often people seek non-broadcast-provided match-related information during their act of watching football matches on TV. The other aim of the questionnaire was to understand how this sort of activity augmented people's watching experiences of football matches on TV. 70 people around the world participated to the study. The questionnaire was open for a month. It has accommodated a variety of questions: A trichotomous question, four multiple-choice questions that allowed participants to choose more than one answer, one multiple-choice question that restricted them to select only one reply, one semantic differential scale and two open-ended questions.

In order to probe deeper in this regard, semi-structured interviews were conducted with 12 participants. The

interviews were performed in-person with 6 people, via phone with one person and email with 5 people. During interviews, each participant was asked 13 questions. The interview questions held many similarities with the questions that were asked in online questionnaire; however, unlike the questionnaire, all interview questions were open-ended.

The compiled data out of the questionnaire and interviews produced the first academic publication [12]. The questionnaire highlighted that significant percentage of respondents (46%) declared that they looked for match-related information on additional media whilst they were watching football matches on TV. Secondly, it indicated that people, who were among 46%, mainly utilised apps on their smartphones and laptops to look for more than one kind of match-related information (4 on average) during the pauses in games. A considerable number of participants of the questionnaire and interviews commented that second screen increased their perception of matches. Some indicated that second screen was a means to socialise with others. Three different needs were stated by interviewees in terms of their ideal second screen experiences: Tailored social media feeds, various stats, all-in-one (social media feed, stats and replays).

### **Workshop**

To explore potential solutions that could enhance user experience of watching football matches on TV via second screen, a half-day workshop was organised. 6 people participated. Four of them were students (2 PhD, 1 undergraduate, 1 masters level) and the other two were a research technologist in BBC and a senior academic. Their background related to interactive TV, interaction design and football were unknown. Before the start of sessions, they were given a short introduction regarding second screen. The workshop was held in three sessions. First and second were dedicated to ideation and last one was for prototyping. Time allocation for group work was 20 minutes for ideation and 40 minutes for prototyping. After each session, each of them was given 5 minutes to present their work.

At each session, each group was given a specific brief that included a user persona and a certain type of match-related information. For ideation sessions, they were expected to create scenarios that had the following features: A time period of second screen interaction, a type of interaction and visualisation of match-related information. First group focused on 'Stats Lover' who is mainly interested in checking match-related statistical information on second screen while watching football matches on TV. Second group's persona was 'Social Media Follower' who is mainly interested in checking match-related information (comments of other people and news) via social media on second screen during the activity of watching.

The assigned personas were fixed to groups for the whole workshop. The personas were defined based on the ideal second screen experiences described by people on

interviews in the previous section. Time of watching matches on TV included periods of 'just before kick-off', 'during match' and 'just after final whistle'. The time periods were specified based on moments of 'in-play' and 'off-play'.

In the first and second session they worked on their respective briefs with a slight change in social settings. For the briefs at the first stage, the social setting was 'alone at home' whereas it was 'With friends at pub' for the briefs at the second stage. Two different social setting were applied because it was a point of concern whether altering social environment would result in different propositions. In fact, both groups claimed that people might have fewer tendencies to use second screen while they were with their friends at pub. Some interesting suggestions at the end of ideations were as follows: First one was display of instant information about a player on second screen after taking a snapshot of him on TV via camera of the mobile device. The other was augmented player jerseys that send second screens statistics of players such as fatigue.

For the last brief, participants were asked to create second screen prototypes on paper templates based on user personas they were assigned in previous sessions. The summary of results could be as follows: A modular tablet interface where people could check comments that were connected to a certain type of statistics, a second screen application that brings random match-related information when second screen is shaken and a social network feed that allowed users to have filters such as 'home fans', 'away fans', 'followers' and 'friends'.

The workshop briefs seemed to be too open for participants that their focus occasionally diverted the modes of interaction and visualisation of match-related information.

### **Prototype Evaluation**

Final phase of data generation will be the evaluation of low and high-fidelity prototypes with users. Low-fidelity prototypes are "limited function, limited interaction ...efforts ...constructed for illustrating concepts..." whereas high-fidelity ones are fully interactive products that make users feel as if they operate on a real product [11].

Modes of interaction and types of match-related information visualisation will be tested separately. For instance, two modes of interaction will be tested comparatively; that is to say, a user will be assigned to complete a task by using only a certain type of interaction e.g. tapping. After that, she will complete a similar task with another mode of interaction such as swiping. This sort of comparative evaluation will take place in two different time settings, 'in-play' and 'off-play'. Thus, a certain interaction mode will be evaluated twice. Visualisations will be evaluated in the same comparative style.

Data analysis will be performed in qualitative and quantitative basis since participants will be observed, asked open-ended and semantic differential scale questions.

It should be noted that prior to prototype tests, archetypes of match-related information have to be identified. In addition to this, previous work regarding guidelines of information visualisation in mobile context needs to be reviewed. Early research on interaction design also needs to be reviewed to justify why certain modes of interaction are going to be preferred for evaluation.

### CONTRIBUTION

The study has targeted providing results that may improve watching experiences of football through enhancing perception and ease of use on second screen. Such study that involves research on second screen, interaction design and information visualisation is unique. It may provide insight regarding not just for researchers who may conduct studies that investigate second screen experiences for other sports events but also for people outside of academia who put effort for designing second screen applications for various sports. In the wider sense the results might also be utilised as a reference to future studies that investigate ways of improving home entertainment on TV via second screen through setting guidelines regarding ways of interaction and information visualisation.

### CONCLUSION

The PhD has been focusing on improving audience experience of viewing football matches on TV by studying the modes of user interaction and types of visualisation of match-related information on second screen.

The following work has been completed so far: A literature review, an online questionnaire, interviews and a workshop. Literature review was mainly based on how people consume football and the factors such as fandom, space and media that affect their experience. Moreover, previous research regarding information visualisation was covered. Via online questionnaire and interviews, people's behaviour of accessing information on second screen and how they wanted to experience their activity of watching matches with second screen were identified. The output of the workshop did not directly help to make progress but it has opened up new directions to explore beyond the frame of the research. Part of the remaining work is defining match-related information archetypes since there are too many types of match-related information to study. Furthermore, revisiting specific literature about information visualisation and modes of interaction in mobile scene and evaluating prototypes with users in a simulated environment have to be completed.

Further research could involve the investigation of effects of serendipitous information retrieval on second screen on watching experience of football on TV. Another interesting research direction could be studying the impact of information visualisation on augmented reality, which functions as second screen, on viewing experience of football on TV.

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