Usage patterns of a sports related second screen application

A QUALITATIVE CASE STUDY DURING LIVE SPORT GAMES

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Usage patterns of a sports related second screen application – A qualitative case study during live sport games

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ABSTRACT
The trend of interacting with a second screen while watching TV has evolved over the past years with the increased usage of smartphones and tablets. One program genre in which second screen usage is common is sports. The increasing second screen usage has made it challenging to keep viewers engaged in the content being shown on the TV. A possible solution to this problem is program-specific second screen applications that serve to complement the TV content and give an added value to the viewer.

This paper aims to identify usage patterns of a program-specific second screen application, used during broadcasts of live hockey games. The application consists of a feed that contains posts related to the game such as comments and videos posted by sport profiles and editors, and polls that the viewer can answer to see other viewers’ thoughts about different situations in the game. Moreover, the paper analyzes what factors affect the usage patterns and discusses how the findings could be used when developing and managing the content of a feed-based second screen application during a sports game. To identify the usage patterns of the application a triangulation approach was used. Five user observations, directly followed by complementing semi-structured interviews were conducted during five separate live hockey games broadcast on TV.

The results show that the usage patterns of the application are mainly affected by the excitement and the different parts of the broadcast (game time, studio analysis and commercial breaks), the different features of the application and the usage of other applications. Moreover, the results highlight the importance of feeling connected to other remote viewers of the game through the application when watching a game alone.

Author Keywords
Second screen; user observation; TV viewing; usage patterns; social connection;

INTRODUCTION
With the success of smartphones and tablets the TV is no longer the only screen being used by the viewer when watching a TV program. According to a survey by Nielsen Company (2014), 84% of U.S. smartphone and tablet owners use their smartphone or tablet as a second screen (a screen that is used simultaneously with the TV). However, statistics also show that the second screen is not necessarily used for things related to what is being shown on the TV. According to an extensive user study carried out by Google (2012), 78% of the simultaneous usage of two screens is what they refer to as “multi-tasking”, which means that each screen is used for a separate activity.

A challenge with this new, multi-tasking way of consuming broadcasted media (television) is to keep TV viewers engaged with the primary content on the TV rather than distracting them from it. One way to tackle this challenge is so called program-specific (directly connected to what is being shown on the TV) applications.

Sport is a popular TV program genre when it comes to developing program-specific second screen applications. Applications that are adding unique features related to the game are an example of such applications. The features can be to, for example, give the viewer relevant statistics about the game, let the viewer follow specific players from different camera angles or allow him/her to compete against other viewers by answering questions about the game. Using the second screen as a channel for discussing and seeing other viewers’ opinions about a game is also a popular kind of second screen interaction when it comes to sports. A study made by Geerts et al. (2008) shows that sport is one of the TV genres during which viewers talk most while watching which makes it a suitable genre for socially connecting second screen applications.

Swedish TV network TV4 is releasing a second screen application connected to their mobile-TV application TV4 Play for the finals in the Swedish Hockey League (SHL) and the 2015 Hockey World Championships. The application consists of a feed that includes statistics, game updates and personal comments posted by sports profiles and editors of the broadcast, as well as video clips related to the game that is currently airing on the TV. The feed also includes polls and questions about the game, with the possibility of seeing what other viewers have answered.

The purpose of this paper is to, through a qualitative user study, investigate and analyze the usage patterns of the above mentioned second screen application during all parts of a live sports broadcast (game time, studio analysis and
commercial factors that impact the usage. Finally, the paper discusses the results in the form of suggestions on what to consider when developing or managing the content of a feed-based second screen application used during a live sports game. The insights provided from this study can be useful for TV networks that are planning to implement or improve a second screen functionality for their sports broadcasts. The results are not only useful for TV networks, but could contribute to create a more general understanding of second screen usage during a live sports game.

RELATED RESEARCH
The concept of using a second screen in combination with the TV has been around for a long time. One of the earliest studies of this was conducted in 1996 by Robertson et al. (1996). In this study an application was developed for a real estate information service for showing videos and pictures about a real estate. The user could browse a floor map of a house on a second screen, which was a PDA (Personal Digital Assistant), and activate videos about each room, that were displayed on the TV, by selecting them using the floor map on the second screen.

Today second screens have many different fields of use. One popular way of using the second screen is as a channel to connect and interact with other distant TV viewers that are watching the same program. One example of this is social network related feeds as a second screen functionality, which has been explored in a study by Basapur et al. (2012). The study describes the development and field trial testing of a program-specific application called FanFeeds, which is a feed created based on the viewer’s social circle that is synchronized with a specific TV show or sports event. The findings of the study indicate that the feed allowed the users to connect better with their TV shows as well as each other. Another study related to the topic of using social networks as a second screen functionality has been made by Palviainen et al. (2013). The study claims that there is a large community that is discussing TV content in social networks before, during and after TV shows.

According to Cesar and Geerts (2011) there are four major categories of social activities when it comes to interaction between TV viewers in different locations:

1. **Content selection and sharing**: information by other peers is used for making decisions on what to watch
2. **Communication**: direct communication via chat, audio, or video
3. **Community building**: commenting about a television program with a large community
4. **Status update**: making available to others what you are currently watching

The application tested in this paper can be placed in the third category of social activities, **Community building**, which Cesar and Geerts (2011 p.349) explain as “the activity of sharing thoughts, comments, and impressions about television programs with a large community”. This does not necessarily mean that the application has to include the possibility to communicate directly with other viewers, but that the viewer in some way should be able to see other viewers’ shared impressions and thoughts about a TV program. The application explored in this paper offers this possibility through the personal posts from sports profiles and editors, and also through the polls and questions that show other viewers thoughts about the game.

Studies have found that sport is one of the most well suited TV genres for social interaction (Harboe 2008, Ducheneaut 2008). Studies in the field of HCI have discussed and evaluated socially connecting second screen applications designed for sports, some of which are described below.

Anstead et al. (2014) describe the development and evaluation of an application for “many-screen interaction” (a group of users watch a program together and use multiple second screens to interact with the program) during the 2012 Olympics. The application featured in the study is used to watch, share and control program highlights in a collocated group. The study indicates the importance of social engagement during a sports game and suggests how to share highlights with co-viewers during a sports event.

A paper by Centieiro (2013) about recreating the sport stadium atmosphere for TV viewers is another example of a social, sport-related second screen interaction. The paper presents two prototypes, WeApplaud and WeBet, which have been developed to increase the viewer’s feel of connection to other viewers. Besides presenting suggestions of ways to make the viewer connected to other viewers of the game by using the second screen to physically applaud your favorite team, or bet on if a goal is about to be scored, the findings of the paper bring up the importance of feeling connected to remote fans watching a sports broadcast.

The importance of feeling included and emotionally engaged when watching a sports game is discussed further by Centieiro et al. (2014) who have developed an application that lets viewers share emotions remotely during a sports game. The emotions are shared using an application called WeFeel which allows the viewer to share his/her feelings in real time using a set of predefined feelings together with a personal comment. The shared emotions are displayed on the TV screen of remote friends of the viewer that are connected to the application. The viewers that got the opportunity to test the application were highly positive to the concept of sharing emotions with other viewers remotely during a sports game.
The above mentioned studies highlight the importance of feeling connected to other viewers while watching sports and the applications evaluated in the studies can all be considered to be community building. While these studies study the usage of second screen applications during a short period of a sports broadcast, this study covers the usage during all parts of a live broadcast including game time, studio analysis and commercial breaks. Another factor that distinguishes this study from the above-mentioned studies is that it was conducted during five games broadcasted live, not during short recordings of games or highlights which were used in the other found studies. Moreover, the above-mentioned studies focus on testing and evaluating the functionality of sports related second screen applications. The focus of this study is more on finding general usage patterns of such an application that can be related to more than just the functionality of the application. The research question this paper aims to answer is: What are the usage patterns of a feed-based second screen application during a live sports game, and what factors impact the patterns?

METHOD
This section starts with a description of the tested application and then describes the research method of the study. After this follows a description about how the data from the study was analyzed and a section about the participants in the study.

The tested application
The application that was used during the study consists of a feed where posts directly related to a TV broadcast of a live hockey game are displayed. The posts come from editors and sport profiles and can be text based statistics or events from the game (such as injuries and goals), personal reflections about the game from sports profiles, video clips related to the game, or polls and questions about the game in which the viewer can also see how other viewers have answered. There is also a high score list, that is accessible when a game is being broadcasted, as the users of the application can collect points by answering polls and questions. Moreover, the application includes a secondary feed where only video clips are displayed and the possibility to share posts to Twitter or Facebook.

Study setup
A triangulation approach was used to qualitatively collect data about the different dimensions of the usage patterns of the application. A combination of user observations and semi-structured interviews was used to get a deeper understanding of the participants behaviors by combining the observed usage patterns with the participants own reflections about their usage of the application. More details about how the analysis of the data was done are described in the data analysis section below.

A total of five user studies were conducted during five separate hockey games, two in the finals of the Swedish Hockey League (SHL), and three in the group stage of the 2015 Hockey World Championships. A pilot test was conducted before the actual study to test the setup of the observation. Each observation took place in a furnished room (Figure 2) located in the TV4 main building in Stockholm.

Figure 2 - The setting of the user observations
Before the actual observation started, the participant got the opportunity to familiarize himself/herself with the application during the first period (out of three) of the game and the studio analysis in the intermission between the first and second period. During this phase the participant was present to help the participant with possible technical issues about the application and also to build a relaxed relation to the participant.

The observation took place during the second and third period, including the studio analysis between the periods and commercial breaks. During this phase the participant was left alone as the observer did not want to affect his/her usage of the application with his presence. Another reason for observing the participants when they were watching a game alone was that they all wrote in the screening questionnaire that they normally watch sports alone more often than they watch it with others.

The participant used his/her own second screen during the observation and was told to use it as he/she preferred and did not have to use the application at all if he/she did not want to. The observations were recorded using an application called “ilos screen recorder” to record the screen of the participant. A camera was also placed behind the participant to record the full setup as well as sending a live stream video feed to the observer’s computer.

Figure 1: Three screenshots from the application showing (1) a text based post about an event in the game and a video clip, (2) a question and (3) the video clip feed
Directly after the game had ended the participant was interviewed by the observer. The interviews had the purpose of complementing the data collected through the user observations by collecting data about the participant’s own perspective on his/her usage of the application, including reasons for using/not using the application, as well as the general impressions of the tested application. The questions were divided into four categories: (1) questions about the usage and features of the application, (2) general questions about how he/she normally use the second screen during sports, (3) game related questions to capture how the participants experienced the excitement and character of the game itself. (4) The interviews also included observation-specific questions that were directly related to the observed usage of the application.

Data analysis
During the observations the observer followed the live broadcast of the game simultaneously with the live stream of the participant and took notes about what was currently happening in the game every time the participant interacted with his/her phone. After each test session the recording of the participant’s screen was looked through in detail to see what the participant actually did with his/her phone when interacting with it. To get an overview of the distribution of the usage of the second screen, the number of interactions during the different parts of the observed games were counted and the time of each interaction was measured. Notes were also taken about what the participant was doing with his/her second screen during each interaction.

After the material from all five observations had been analyzed, the found results where grouped into three main categories based on the observed factors that made the participants use the application. The categories were: broadcast related usage patterns, feature related usage patterns and usage patterns related to the usage of other applications. In each of these three categories the most significant factors and features that affected the usage of the application were identified. The recorded interviews were transcribed and the answers were sorted in relation to the above-mentioned categories to complement the material from the observations and give a deeper understanding of the usage patterns of the application from the participants’ perspective.

Participants
Four participants were male and one was female. The age span was from 24 to 50 with an average age of 32. The participants will be referred to as “P1”, “P2”, “P3”, “P4” and “P5” based on the chronological order of the five observations. Participants for the study were recruited from a beta testing group for the mobile-TV application “TV4 Play” provided by Swedish TV network TV4 as well as from the official Facebook group of the Swedish national hockey team. A screening questionnaire was sent to the groups to find participants within the target group of the application. The main criteria for the selected participants were that they should have a general interest in watching sports on TV, as well as being frequent second screen users during sport games. They also had to be located in Stockholm since that was where the study took place.

RESULTS
The results from the study will be presented in two main sections. The first section presents the observed usage of each participant individually. The second section summarizes the observed similarities and differences in the usage patterns which are categorized based on the factors that impacted the usage of the application, mentioned in the data analysis section.

Observed usage patterns for each participant
Participant 1
P1’s usage during game time was similar during both observed periods. P1 checked the feed briefly but frequently (every 2-3 minutes) for new posts during game time. His usage patterns during game time did not change noticeably except for when specific events such as an injury or a goal happened. Then P1 instantly picked up his phone to check for posts related to the event. This was in line with the participant’s own perception of his usage: “The application is suitable to use when a specific event such as a goal or injury occurs. I instantly want to see posts related to the event pop up in the feed”. He also explained in the interview that he found the application least suitable during game time as he was focusing more on the TV then than during studio talk and commercial breaks. In the commercial break in the middle of the period P1 used the application differently than during game time when he, instead of just checking the feed for new posts, looked further down the feed at older posts as well, and used the application for a longer period of time.

During the studio analysis in the intermission P1 used the application twice, similarly as during game time, checking the application briefly for new posts and voted in a poll. During the rest of the intermission P1 was watching the studio analysis on the TV.

Throughout most of the third period P1 used the application similarly as during the second period, except for that he also watched a video clip showing an injury. However, after the commercial break two thirds into the period his usage decreased. P1 explained that “towards the end of the last period the game was really exciting as both teams fought hard and it was an even game. During that period most of my focus was on the TV”.

P1 hardly used his second screen for anything other than the tested application, except for when he took a short phone call and sent one SMS during the game.

Participant 2
P2 only used the application once during game time, in the middle of the third period. He checked all new posts in the
feed briefly and then switched to another application unrelated to the game. P2 used his phone unrelated to the game most of all participants. He explained in the interview that he usually use non-sport related applications on his second screen when he is normally watching sports. He also explained that the excitement of the game made him use his phone less overall during game time. “the game was insanely exciting which meant that my focus was on the TV during game time”.

During the studio analysis and commercial breaks in the intermission between the periods, P2 used his phone constantly. Just as during game time he mostly used it for other things than the application, such as answering emails, visiting social networks and browsing the web. He used the application twice during the studio analysis. The first time he scrolled through the feed and read most of the posts until he was interrupted by a “new mail” notification. The second time he watched a video clip showing highlights from previous games in the finals series of SHL.

Overall, P2 used the application least of all observed participants. However, he used his phone most of all participants for things unrelated to the game. Most of his usage of both the tested application and other applications was during the studio analysis and commercial breaks between the two periods.

**Participant 3**

P3 used the application sparingly during game time. His first interaction with the application was about five minutes into the second period when he read through all new posts in the feed and voted in a poll. A few minutes later one of the teams scored and P3 picked up his phone to check another sports related application called “Sportbladet” (also used by P4 and P5) that includes a live feed containing posts and comments by other viewers, which was not a feature in the tested application.

During the commercial breaks in the game P3 normally checked all new posts in the application, and then went over to the other application described above. He continued using it throughout the commercials and also when the game started again. Continuing using the application after a commercial break was a common pattern for P3 who described that “I mostly use my phone during commercial breaks but I often continue to use it when the game starts again. Today I even missed a goal when I was focusing on the app after a commercial break!”. Most of P3’s usage during game time was in connection with commercial breaks.

During the studio analysis P3 used the application a couple of times as well as other applications, “it was enough to check the application once or twice during the commercial breaks and the studio analysis to stay updated with the app.

Just like the second period, the third period was really exciting for the participant as the team he was cheering for (Sweden) was in the lead with 4-3, “overall, the game was really fun to watch since it was exciting and full of action and goals all the time, it was a shame that Sweden didn’t manage to win”. P3 checked the feed twice, very briefly, during game time in the third period. Worth mentioning is that both these interactions with the application were connected to commercial breaks.

**Participant 4**

P4’s usage of the application differed from the other participants in that during the second period she had the application open for long periods of time during which she did not actively interact with the application but only glanced at it once in a while to see if any new posts had appeared. This inactive usage could be seen about half of the total time of the second period. As P4 had the application open most of the time during the second period she did not need to actively interact with it to look for new posts. However, if a question or poll appeared she instantly answered it.

During the third period she did not use the application inactively as described above. Instead she used it quite similarly to P1 as she frequently interacted with the application for brief moments to check the feed for new updates. P4 explicitly mentioned that she was mostly looking for polls and questions, rather than new statistics and videos, when she was checking the feed, and answered them as soon as she found them. She liked the polls and questions a lot as they “offered an opportunity to see other viewers’ opinions and knowledge about the game which made me feel connected to other viewers of the game”. Moreover, P4 explained that she valued the feeling of being connected to other viewers, to see their opinions and reactions to events during the game, especially if she is watching a game alone.

Moreover, P4, just like P3, used other sports related applications (one was the same as the one P3 used, “Sportbladet”). P4 mentioned that she missed the opportunity to comment and see other viewers’ comments about the game, and also the possibility to chat with others in the tested application. However, she did not see this as a major problem as that was what she did in the other applications she used during the game. P4 saw the application, with its polls and question, as a good complement to the applications she normally used while watching sports. This was clear during the observation as she often started out using the tested application and then directly switched to another application and vice versa.

P4 described the game as “painful to watch since it turned out much more even than expected. It was relieving that Sweden finally managed to win, I didn’t expect to be this nervous” and explained that when she gets nervous she uses her phone more to get her thoughts away from the game. This could be observed as her usage of the phone was at least as intense during the last five minutes of the game as it had been during less exciting periods, as opposed
to the other participants who used the application less during critical moments of the game.

**Participant 5**
During game time P5 generally used the application once or twice each period scrolling through the feed, specifically looking for new polls and questions to answer. P5 shared the behavior of using one application and then switching over to another application with P4. P5’s usage of other applications than the tested one was also quite similar to P4’s. P5 used the phone to chat with his friends, check Twitter feeds related to the game and check the “Sportbladet” application that both P3 and P4 used.

P5 used the application for longer periods in connection to the commercial breaks during game time, similarly to P3. During those periods he did not only look for new questions but also read the posts and statistics in the feed. In the interview P5 explained that he found the application suitable to use when specific events, such as goals or penalties had occurred, as those resulted in reactions and comments from the experts.

Moreover, P5 used the application and his phone mostly during commercial breaks and the studio analysis, just as most of the participants did. “I instantly picked up my phone when there was a break in the game and used the tested application, as well as other applications, during almost the entire break”.

**Summarizing categorization of usage patterns**
This section summarizes the identified usage patterns and also presents observed factors that impacted the participants’ usage of the application. The patterns will be presented in three main categories based on the factors that impacted the usage patterns: broadcast related usage patterns, feature related usage patterns and usage patterns in relation to the usage of other applications.

**Broadcast related usage patterns**
**Game time:** Two main usage patterns were observed during game time. (1) The first pattern observed was the pattern of P1 and P4 who regularly, 6-10 times per period, checked the application very briefly for new posts and polls to stay updated with the feed. Worth mentioning is that P4 took the need to stay updated even further as she during most of the second period had the application open, not actively interacting with it, but glancing at it about every minute to see if anything new had appeared. (2) The second observed usage pattern was to use the application sparingly, 2-4 times per period, during game time. But instead of only looking at the top posts the participants scrolled through most of the feed, and generally spent more time in the application during each interaction. This pattern was observed for P3 and P5. P3 explained that he found it enough to check the feed once or twice each period combined with also checking it during commercial breaks and studio analysis, to stay updated with the content of the application.

**Studio analysis:** The participants used the application similarly during the studio analysis as they had done during game time. P4 stopped using the application inactively during the studio analysis and used the application similarly to P1, checking the feed briefly at regular intervals. However, something that differed between game time and studio analysis was the usage of other applications than the tested one, which was significantly higher for all participants (except for P1 who hardly used any other application at all) during studio analysis than game time. The overall increased usage of the phone, combined with the participants’ answers from the interviews, indicates that less attention was paid to the content on the TV during studio analysis than during game time.

**Commercial breaks:** All participants but P2 found the application most suitable to use to “kill time during commercial breaks” as P3 expressed it. While all participants used their phones during most of the commercial breaks, they did not necessarily use the application. Only P3 used the tested application during every single commercial break. An interesting observation regarding commercial breaks was that the average time spent in the application per interaction was the longest out of the three observed parts of the broadcast. This indicates that the participants checked the feed more thoroughly when using the application during commercials.

While the fact that the participants preferred using their phone during commercial breaks might be obvious, it is not as obvious that they would continue using the phone after the break into game time. This usage pattern was observed for three out of five participants. Interestingly they commonly used their phones for longer periods of time during the periods directly after a commercial break than they normally did during game time that was not connected to the commercial breaks. A possible reason for this usage pattern could be the fact that the participants mainly used their phones during the commercials rather than looking at the TV, as opposed to game time when their attention was mainly on the TV. When the game started again after the break their main attention was still on their phone and it took them some time to change focus back to the TV again.

**Specific events:** The impact of specific events, such as goals, penalties or injuries, on the usage of the application was most clearly observed in the usage of P1. Every time an injury or goal occurred he instantly checked the feed for updates about the event. P4 was also observed using her phone connected to specific events, especially goals. However, she commonly used another application that contained comments from other viewers watching the game, or chatted with a friend about the occurred event.

Even though only P1 and P4 instantly picked up their phone after specific events, all participants but P3 mentioned the
opportunity of going back in the feed to read expert comments and thoughts about specific events as a reason for using the application. P3, on the other hand indicated that “posts about that just repeats events that have already happened is not that interesting, I want content that adds an additional value to the game. There is enough analysis of the events on the TV”.

Excitement of the game: Something that affected the participants’ usage of the application was the impact of critical periods of the game. All observed games were overall very exciting according to the interview answers from the participants. However, the level of excitement varied during the game and so did the usage of the application. It was observed that the usage of the application during exciting parts of the game where a lot was happening was lower than during less exciting parts of the game. This was very clear during the last five minutes of the games as the participants barely used the application at all during this period. All participants showed this usage patterns except for P4 who, as mentioned before, explicitly said that she uses her phone more during critical moments of the game, especially when she is nervous. The decrease in usage during the final exciting minutes of the game indicates that the application is used less during exiting periods of the game as usage of the application.

Feature related usage patterns
Polls and questions: P4 and P5 explicitly mentioned the polls and questions as their main reason for using the application. As finding new polls was done by searching the feed for them, the participants had to glance at all posts they scrolled through to check if they were polls or not. This resulted in an increase in the overall usage of the application as searching for polls made them read some of the posts as well. P4 asked for a filter that only showed the polls and questions which indicates that she wanted to be able to find the polls without having to scroll through all the other content. If such a filter had existed, her overall usage time of the application would probably have been lower.

It was not only P4 and P5 who enjoyed the polls. Both P1 and P2 mentioned them as an interesting, interactive element to see other viewers’ opinions. However, P3 found the questions “unnecessary unless I’m on top of the high score list”. Despite this P3 still, just like all other participants, answered almost all the polls that he found in the feed during the period of observation.

Exclusive statistics and personal comments: The participants enjoyed the exclusive statistics and personal posts by famous sport experts in the feed. Those gave an added value to the viewing experience as they were unique for the application, just like the polls and questions. Some participants also mentioned that the personal comments increased the feel of inclusion that is normally there when watching a game together with others, but not when watching a game alone. P2 said that “I pretty often watch sports alone, and then it is nice to have an application that “talks” to me about the game. It is almost like a replacement for the conversations I have about the game while watching sports together with friends.” The importance of getting an added value to the sports broadcast, either through exclusive content or the connection to other viewers of the game, was mentioned by all participants as one of the main reasons for using the application.

Usage patterns related to usage of other applications
The fact that three out of five participants used other sports related applications as a complement to the tested application led to a decrease in the usage of the tested application. As the other applications included functionalities not offered by the tested application it can be assumed that they sometimes replaced the tested application, at least when it came to seeing and discussing other viewers’ reactions to the game.

Moreover, the total usage of other applications was longer than the total usage of the tested application for all participants but P1, who hardly used any other application. P2 did not use his phone for anything related to the game except for when he was using the tested application. Instead he was doing other things on his phone, such as surfing the web, sending emails and checking his Facebook feed. However, the type of other applications used was quite similar for P3, P4 and P5, who only used their phones for game related things, such as checking live feeds, chatting with others about the game or reading tweets from persons related to the game. Something interesting is that all these applications included some kind of possibility to communicate with other viewers and offered the possibility to see other peoples’ reactions about the game and discuss them further.

DISCUSSION
The purpose of the study was to identify usage patterns of a feed-based second screen application during a live sports game, and the factors behind them to contribute with a more general understanding of how program-specific second screen applications are used during all parts of a live sports broadcast. The results identified a number of usage patterns and factors that impacted them, which will be discussed in the following section in the form of suggestions on what to consider when developing and managing the content of a feed-based second screen application for sports. Moreover, the section includes a discussion about the method, as well as recommendations for future research on the topic.

The importance of social engagement and connection to other viewers
The importance of sharing and seeing other viewers’ emotions and comments about a game, when watching a sports event, is addressed in related research. This study has found that feeling socially connected to a game does not necessarily need to contain the possibility to communicate with other viewers. It can be enough with an indication of
other viewers’ feelings and opinions about the game that in the application used in this study are expressed through the polls and questions as well as the personal comments from sport profiles. The fact that the participants appreciated these features most, combined with the fact that a majority of the participants mostly used other applications with the functionality of communicating about the game with others, indicates that feeling connected to other viewers of the game is really important for viewers of a sports game.

This could be related to the findings of the study Centieiro (2013) which also shows that it is possible to make a viewer feel socially connected to other viewers of a game without having to actively communicate with them. In that study the social connection is done through virtual applauds and placing bets on the game. Moreover, the results of this paper confirms that the tested application belongs in the community building category in the categorization by Cesar and Geerts (2011), as the findings of the user study show that the application contributes to make the user a part of a large community that comments and shares impressions about a TV program.

The fact that the second screen overall was used more during studio analysis and remarkably more during commercials can also be related to a social viewing behavior. Since the studio analysis and commercial breaks usually do not include any new events that are affecting the game, they are commonly the parts of a sports game where viewers have time to interact with each other to discuss the events of the game more thoroughly, as they require less focus than actual game time. This showed in the observations as the participants commonly used other applications more during these parts of the game and they were mainly used to communicate with other viewers of the game. As the observations in this study were conducted in a setting where the viewer watched the game alone, he/she might have used the application as a replacement for the social connection offered when watching the game together with other people.

Despite the fact that the application made the participants feel connected to other viewers of the game, a majority of them still used other applications to communicate and discuss the game with other viewers. Hence, I suggest to in addition to the polls and questions and comments from sport profiles include the possibility for users of the application to create their own posts and also the possibility to comment on the posts posted by viewers and sport profiles.

**Different content is suitable for different parts of the game**

The observed usage patterns are also useful when managing the content of a feed based application. It is important to consider when to publish what kind of content to reach as many viewers as possible. Below I suggest that different kinds of content are suitable during different parts of the game.

The amount of content published during game time should be fairly low overall, especially in periods of the game where a lot is happening that requires much attention from the viewer. As the viewers’ attention is most likely on the TV rather than on their phones during these periods it is important to consider that the viewers are, if checking the feed at all, looking at it very briefly. Hence, I suggest that only short posts and opinions about the current situation in the game, which does not require too much attention, should be published during these periods of the game. Some examples could be a short personal comment by a sports profile about the current situation in the game, or a poll asking which team will score the next goal to give an indication of other viewers’ thoughts about the outcome of the game. However, during less exciting parts of the game, content that requires more attention such as video clips or a deeper analysis of the game, could be published as the participants spend more time with their second screen during those periods.

During the commercial breaks and studio analysis content that triggers discussions and social engagement should be published. As mentioned in the previous section these are the periods of the broadcast during which the participants mostly used their second screens to discuss the game with other viewers. Hence, I suggest that longer posts and video clips summarizing the most interesting and controversial events from the game so far, and also comments from experts that trigger discussions, should be published during these periods.

**Publish content that complements the TV broadcast of the game, not repeats it**

The tested application included a wide range of content including text based game updates, video clips, comments by famous sport profiles, and polls and questions. On a more general level it is important to consider that one of the main purposes of a program-specific second screen application is to work as a complement to the content on the TV, as mentioned in the introduction. Posts repeating what just happened in the game, like the text based game updated, are not suitable for such applications. More important are the posts presenting content that complements the TV broadcast, such as statistics about players and teams, personal reflections from sport profiles, videos showing the goals from unique camera angles etc. Hence, my last suggestion is to focus mainly on including this kind of content as it will make the feed less cluttered and also more relevant for the viewer as it gives an added value to him/her that would not have been possible to offer without the second screen.

**Summary of suggestions**

Bellow I have summarized the discussed suggestions on what to consider when developing or managing the content.
of a feed-based second screen application used during a live sports game:

1. Include the possibility for viewers to make their own posts and also to comment and discuss already existing posts.

2. Vary the content and amount of new posts in the feed, based on the different parts of the broadcast and the characteristics of the game.
   a. Publish less content during more exciting parts of the game, and vice versa.
   b. Publish more extensive content that triggers discussion during studio talk and commercial breaks.

3. The posts in the feed should mainly contain content that complements and create an added value to the broadcast and not content that just repeats the events in the game.

Method discussion
Overall I find the method suitable for the purpose of this study. However, there are some factors that should be mentioned that could have affected the results of this study.

The location of the study was chosen because of its relaxed atmosphere and feel of being in a living room. As mentioned before, the observer was present during the first part of the game to create a relaxed viewing environment by chatting with the participant and offering him/her coffee and cookies. Making the observations in the homes of the participant was another option which perhaps would have resulted in a more natural environment for him/her. However, as the observer had never met the participants, doing the observation in their homes could make them, as well as the observer, feel uncomfortable. Another reason for doing the study in a laboratory environment was that all participants would be in the same situation and environment while being observed.

However, the fact that the observations were not conducted in the participants’ homes may have impacted the usage of the application. For example the participants could have been affected by the fact that they could not leave the room as freely as if they had been watching the game at home. Perhaps they would have left the TV during some less exciting parts of the game or during the commercials and/or the studio analysis, and hence would have used the second screen less.

The recording of the screens is another aspect that could have affected the usage of the second screen as the participants knew that everything they did on the screen was recorded. They were told to use the phone as they would normally do during a sports game but they might have skipped doing personal things because of the recording of the screen. However, as the focus of the observations was mainly on the usage of the application this may not have affected the results very much.

Something that could have increased the usage of the application is the fact that the participants had never used the application before. The purpose of the familiarization phase was to lower the learning threshold and the impact of novelty as much as possible before the actual observations took place. Despite this the participants may have been somewhat affected by the curiosity of testing a new application.

In an ideal situation the number of participants would be higher and they would be observed in identical rooms during the same live broadcast, with the exact same preparations. Such a setup would decrease the impact of outer factors on the usage patterns and make it easier to find and compare the similarities and differences in usage of the application, and what factors that affected the usage. However, due to limited resources and difficulties in finding participants such a setup was not possible.

Future work
Future research could use the methodology and results from this study as a foundation when studying similar applications. Preferably the participants in the study should get the opportunity to familiarize themselves thoroughly with the application before the actual test session. Moreover, the observation should cover a full broadcast of a game, including the pre-game studio analysis, all three periods and the studio analysis after the game, to increase the possibility of identifying usage patterns of the application. Doing the observations in the homes of the participants is something else to consider for future research on the topic.

While this study observed viewers who were watching a hockey game alone, future studies could investigate the usage patterns of similar second screen applications when watching a game together with one or more people. Moreover, this paper used a qualitative approach to identify usage patterns of the application. Studying the usage patterns from a quantitative perspective could be interesting for future research on the topic. Another factor to explore could be if the usage patterns of a similar application are different for other sports than ice hockey.

CONCLUSION
This paper suggests that the usage patterns of a feed-based second screen application used during a live sports broadcast can be placed in three categories: (1) broadcast related, (2) feature related and (3) related to the usage of other applications. The most significant broadcast related usage patterns are the differences in usage between the different parts (game time, studio analysis and commercial breaks), and the impact of the excitement of the game. The
observed usage was overall shorter and less frequent during game time than during studio analysis and commercial breaks. Similar patterns were observed when comparing exciting parts of the game with less exciting parts. During the most exciting parts of the game the application was barely used at all, and vice versa. These patterns indicate that different content is suitable to publish in the application during different parts of the game as well as based on the excitement of the game.

The importance of feeling connected to other viewers when watching a sports game alone was another finding of this paper. This could be seen in the feature related usage patterns as the mostly appreciated features of the application where the polls, questions and personal comments from sports profiles. These features were mainly appreciated because they offered an added value to the TV broadcast by offering the opportunity to see other viewers’ opinions about the game. The importance of feeling connected to other viewers could also be seen in the usage of other applications as they were mainly used to communicate about the game with other viewers. The usage patterns described above show that there are more ways to meet the viewers need to feel connected to other viewers when watching a sports game than just offering the possibility to directly communicate with them.

ACKNOWLEDGEMENTS
I would like to thank TV4-gruppen and particularly my supervisor Liselott Brunnberg for the support and resources given to this thesis project.

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