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Interactive TV and group viewing

A qualitative study of companion apps and viewer engagement during group TV viewing

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ABSTRACT

Smart device applications that allow users to interact with a TV show in some way, so called companion apps, are increasingly common. In this paper, we study how the usage of such apps affect viewer engagement when used in groups of three or more people, a common TV viewing scenario.

To study these effects, an experiment was conducted, where two participant groups watched multiple clips from a show of their choice, with varying devices running companion apps present.

Qualitative analysis of data gathered during these viewings (video recordings, survey responses, and group interviews) show that the usage of companion apps increases viewer engagement in these scenarios by encouraging users to either work together or compete against each other, and that this effect seems to be more prominent among younger viewers.

Sammanfattning

Applikationer till smarta enheter som möjliggör för TV-tittare att interagera med TV-program de tittar på, så kallade kompanjon-appar, blir allt vanligare. I denna studie ämnar vi att undersöka hur användandet av sådana applikationer påverkar tittarnas engagemang i programmet vid TV-tittande i grupper om tre eller fler personer.

För att undersöka detta utfördes ett experiment där två deltagargrupper fick välja, och se på, tre klipp från ett TV-program, med olika smarta enheter med tillhörande kompanjonappar tillgängliga. Kvalitativ analys av data från sessionerna (videoinspelningar, enkätsvar och gruppintervjuer) tyder på att användadet av kompanjonappar ökar tittarnas engagemang genom att uppmuntra till samarbete eller tävling mellan deltagarna, samt att denna effekt verkar mer framträdande hos yngre TV-tittare.

KEYWORDS

second screen, companion app, TV, viewer engagement, SVT Duo, Interactive TV

1 INTRODUCTION

Smart device applications that allow the user to interact with a show they are watching on live TV or on-demand video services, so called companion apps, are increasingly common. With such apps users can, for example, play along with quiz shows, vote in televised contests, or guess the price of objects sold on auctioning shows. Previous studies[12][5][3] show that the usage of companion apps increase viewers' engagement in the show they are watching, which presents content producers with opportunities to gain a more engaged audience by developing companion apps for their shows. However, these studies have only been conducted using

lone viewers[12] [3] and/or couples[5]. Studies about interactive TV and viewer engagement with groups larger than two people did not use modern technology, thus not providing interactivity that falls under our definition of a companion app [8]; or focused on social interaction between viewers, rather than their engagement towards the show [11]. Therefore, a knowledge gap exists on how companion app usage affects viewer engagement in group TV viewing scenarios.

The purpose of this study is to fill this knowledge gap by investigating how viewer engagement in groups of three or more people is affected. The results of this study contributes to the larger field of interactive TV, and may be of interest for others studying companion apps and interactive TV, as well as media producers and distributors interested in having a more engaged audience. The question posed by this study is formulated as follows:

How do companion apps affect viewer engagement in viewing groups consisting of more than two people?

To investigate this, we designed an experiment meant to study viewer engagement with varying amounts of devices with companion apps, using the companion app Duo[9], developed by the Swedish public broadcaster SVT; gathering data through video recordings, surveys, and interviews. This data was analyzed qualitatively to find an answer to the research question.

This paper will be structured as follows:

First, we will go through previous research from ubiquitous computing to social TV and companion apps and their effects on viewers. Following this, a concrete description of the methods used in our study, a presentation of the results of said study; ending with a thematic analysis of these results, and discussion of the entire study.

2 THEORY AND RELATED WORK

This section will begin by discussing earlier work related to Multi-screen usage, followed by interactive TV, as well as companion apps and their effects on viewing scenarios.

2.1 Ubiquitous computing and multi-screen usage

In a 1991 article, Weiser discussed his vision of ubiquitous computing; he argued that computers would become so adapted to human usage, and so common, that we would use one or more constantly without giving it a second thought[13]. Today, we can see signs of this when watching TV; it is not uncommon to constantly be switching your attention between the TV and a smart device or laptop. These behavioral changes have led to further research in

multi-screen usage in conjunction with TV viewing.

In a 2012 article, Cuortois and D'heer [2] studied second screen and mixed media usage while watching TV among tablet owners. They found that while many users do use a smart device while watching TV, few use it to do anything related to what they are watching, the most relevant activity being messaging with other who may or may not be watching the same show. In line with what Weiser proposed, it seems that tablet usage in the living room has become ubiquitous.

2.2 Social TV

As a field of study, social TV is concerned with how TV watching and related activities affect social situations and behaviour. It is however important to note the distinction between social TV and social TV technologies, the latter described by Cesar and Geerts as "*allowing remote viewers to interact with each other via the television set, smartphones, tablets or the PC.[...]* Features include remote talking or chatting while watching television, commenting television content, content-aware buddy lists that show what a user is watching, and sharing and recommending video clips."

[1]. They categorize technologies based on "*social purpose: content selection and recommendation, communication, community building, and status update*"[1]. Notably, 'engagement' is absent from this list. The difference between social TV technologies and companion apps lies in physical space and interaction targets. While companion apps are focused on interaction between users in the same physical space, as well as between the user and the TV show, social TV technologies are meant to facilitate interaction between viewers in different locations, and does not include interaction with the TV show at all.

Ducheneaut et al. [4] studied social behaviour while watching TV, and proposed a possible design for a social TV system to encourage more sociability in front of the screen. Like Cesar and Geerts, they focused on digital technologies to facilitate interaction between viewers in different locations, rather than investigating how it affected viewers in the same room.

2.3 Companion apps and their effects

Numerous studies have been conducted on companion apps and their effects on users. In this section, we will present and discuss previous research, based on different themes found throughout those studies. These themes are: Social effects of companion apps, viewer engagement and distraction, and user opinion.

2.3.1 Social effects of companion apps. Several studies have examined the social effects of companion apps on viewers. Geerts and Vanattenhoven studied how usage of companion apps affected social interaction among viewers in the same physical space. They used two different types of shows, a TV drama and a live music competition, and found that viewers generally appreciated the interactive elements introduced by the apps, and that apps that incorporated some forms of competition were more compelling than others [11]. They end their study by presenting design guidelines to encourage social interaction among users, as well as noting that "*care needs to be taken when introducing competitive elements into an application and when choosing a suitable TV genre*"[11].

Continuing on this note concerning genre, Wilson[14] studied companion apps with varying viewer demographics, group constellations, and shows. She found that any effects of companion app usage are more notable among younger viewers (teenagers and students), and –like Geerts and Vanattenhoven— found that some genres of TV are more suited for companion apps than others. More specifically, she found that quiz shows benefit the most from added interactivity, since they are "*The instances where audience activity and industry aims are most likely to cohere(..)" and that companion app usage "Deepen levels of connection and immersion for viewers while generating valuable data for broadcasters and program makers*". These findings coincide with those of Ducheneaut et al., who found that shows that leave conversational gaps encourage viewers to interact with the apps as well as with each other[4].

2.3.2 Viewer engagement and distraction. Aside from studying social effects, a number of studies have investigated how usage of companion apps affect users' engagement in the show they are watching.

Von Grothusen and Igelström, building on the work of Vanattenhoven and Geerts, as well as Ducheneaut et. al, studied how the design of a companion app affects viewer engagement, and also proposed a design framework to promote engagement[12]. By conducting interviews with developers as well as user experience tests with solo viewers, they found that users were more engaged in the programme they were watching when using the companion apps, but that social TV functionalities of the app tested were unsatisfactory, with participants unsurprisingly preferring real-life social interaction to the digital options provided by the applications[12]. Sperring and Strandvall also studied how a precursor to companion app technology affected viewer engagement in a quiz show broadcasted on Finnish television. They found that "*viewers' behavior during the show and involvement in the game varied depending on whether they participated with friends or alone*"[8] and that "*the interactivity added value to the viewing experience and made it more exciting, involving the audience*." Finally they state that the interactivity "*stole time*" from the video content, becoming a distraction at times [8].

Continuing on the theme of companion apps and distraction, Dowell et al. studied how using a companion app in conjunction with educational shows affected understanding and retention of the material presented. Conducting two experiments, one comparing 'passive' viewing with companion app usage, and the other comparing results between an interactive version of their companion app and a non-interactive one. They found that "*the companion app improved participants' understanding and recall of the programme*" but "*Increasing interaction with the app disrupted understanding of the television programme and visual attention*"[3]. Their results show that while companion apps can have positive effects, too much interactivity can instead lead to users becoming distracted.

2.3.3 User opinion. The study mentioned in section 2.1, by Courtois and D'Heer, also surveyed participants on their opinion of companion apps, and found that most respondents found messaging or discussion features (which would be classified as social TV functionality) unnecessary, preferring to use other more established channels such as Facebook and Twitter to discuss the content

with others[2]. However, most responded positively towards using companion apps that provided the opportunity to interact with television content, much like participants in several previously mentioned studies[8][3][12][11], but did not know such apps existed. They write: "As such, it seems that at the moment, the potential of second screen apps is heavily underutilized. Although people might be aware of their existence, they might need to be remembered[sic] by the primary screen in case the program they are watching is supported on secondary devices. In addition, benefits and added value might also be unclear"[2], implying that the biggest hurdle for adaptation of companion apps is a lack of awareness among possible users.

2.4 Summary

To summarize the work presented in this section, multiple studies have confirmed that usage of companion apps increases social interaction between collocated viewers, as well as engagement in the show being watched. However, the latter statement has only been noted among solo viewers or couples. Thus, a knowledge gap exists on how companion apps affect viewer engagement in groups of three or more people. Our aim is, as stated in the introduction, to fill this knowledge gap by conducting an experiment described in the following section.

3 METHOD

In this section, we will describe the experiment that was conducted to test how companion apps affect viewer engagement in group scenarios along with motivations for the choices made when constructing the experiment.

3.1 Duo

Duo[9] is a companion app developed by SVT Interaktiv, the interactive department at the Swedish public service television broadcaster Sveriges Television[10]. The app supports a wide variety of programmes that are broadcast by SVT. Duo, as well as SVT Play, SVT's on-demand streaming service, is available for free to everyone in Sweden; this eliminates any need to plan the study around airing times, since Duo works with on-demand video as well as live broadcasts (some shows might have reduced functionality when watching on demand). However, not all shows supported by Duo are available through SVT Play at all times due to copyright restrictions which limits the amount of shows the participants could choose from. Despite this, we chose Duo for this study since it has a large user base, with over 100 000 downloads on Android alone [6], and is free to use. Despite its limitations, the fact that Duo works with on-demand video available to everyone in Sweden free of charge made the study easier to coordinate.

3.2 Experiment

To study how companion apps affect viewer engagement in groups larger than two people, an experiment was conducted with two participant groups; the first being a group friends between the ages of 23 and 25, and the second being a family of four between the ages of 15 and 48.

The experiment groups were given a choice between one of three shows that were available for on-demand viewing at the time of

the experiment, whose format and interaction had been deemed suitable for the test. The possible choices were:

Mästarnas mästare, (translation: *Best of the best*) a game show where famous former professional athletes compete in various physical challenges; the viewer can interact with the show by guessing the results of each challenge.

Antikrundan, the Swedish version of the British programme *antiques roadshow*, an infotainment show consisting of experts estimating the values of antiques brought in by guests. The interactive element allows the viewer to guess the value of items shown on the TV, with the goal of getting as close to the expert valuation as possible.

Tror du jag ljuger, the Swedish version of the British panel show *Would I lie to you?*, a comedy game show where guests try to figure out if another is lying or not about a statement read from a card. The viewers could use the Duo app to play along, guessing if the guest is lying or telling the truth.

The family chose to watch clips from *Tror du jag ljuger*, while the friend group chose to watch *Antikrundan*.



Figure 1: Screenshot from Duo when used with *Antikrundan*. The user pushes the slider from left to right to guess the value of the antique displayed in the picture.

Figure 2: Screenshot from Duo when used with *Tror du jag ljuger?* the user pushes the slider to the left if they think the guest is telling the truth, and to the right if they believe the guest is lying.

Once we knew what programmes the two groups had chosen, we selected three 5-minute clips from each show that had at least one

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interactive element in the application related to it. While the interactions with the app only takes a few seconds, they do not exist in a vacuum, and the context provided by watching the related clip in its entirety is necessary to ensure that the experiment simulates viewing a show and not just a clip.

The experiment was divided into three parts, with each part consisting of the participants viewing one of the clips from the of the show of their choice. During each part the participants used varying amounts of smart devices. During the viewing of the first clip, usage of smart devices was strictly prohibited; for the second clip, one smart device running the Duo app was provided, and for the third viewing, each participant used their own personal smart device with the Duo app. During the second and third viewings, there were no restrictions on smart device usage.

These viewing sessions were recorded, with the purpose of studying the video at a later date to analyze participants' body language and behaviour while watching the clips.



Figure 3: An example of a screenshot from one of the video recordings, faces blurred for privacy.

3.2.1 Viewing environment. When the smart devices were allowed, the participants were instructed to use them as they normally would –this includes using other apps than Duo— to ensure that the companion app would be introduced into a normal viewing environment, a very important factor for experiments of this kind, according to several studies[8][4]. For the same reason, the experiment was conducted in an environment where the participants usually watched TV, such as the living rooms of the participants, since taking them out of that environment might affect their viewing behaviour during the experiment. We discuss this further in section 5.4.1.

3.2.2 Survey. Between clips, the participants filled out a survey, asking them to rate their own engagement in the clip, explain why they chose the rating they did in 500 characters or less, and doing the same for the engagement of the group as a whole. If one or more smart devices had been used during the viewing, the survey also asked if the participants believed that using the companion app had

affected their engagement, and to motivate their answer; this was done to make sure that any effects that were not visible to the camera or brought up in the interview were not missed. The purpose of the survey was to make sure every participant's input was received, regardless of how much they actively participated in the following interview, as well as finding any discrepancies between individual opinions and the collective opinions mentioned in the interview.

3.2.3 Semi-structured interview . When all three clips had been viewed, a semi-structured group interview was conducted, with the aim of getting the participants to discuss how they experienced their own engagement in the clips viewed, and the engagement of the group as a whole. The following questions were posed during the interview:

- Did you feel any difference between the three different types of watching television?
- Which one was the best? One shared, one each or none?
- Were the cellphones/iPad distracting?
- Did you ever use an app other than Duo during the clips?
- Did you feel like there was a difference between your engagement and the group's engagement?
- Why did you choose the programme you chose?
- Do you have any further comments you would like to add?

3.3 Analysis

All gathered data (audio and video recordings, survey responses) was reviewed by the authors a few days after each viewing session. Survey responses were grouped for readability, video recordings were viewed, and the interviews were transcribed. We then proceeded to do a qualitative thematic analysis of this data, gathering relevant quotes and observations related to the study.

3.4 Limitations

A number of limitations were imposed on the study, the primary one being to only use one companion app, Duo. This decision was made due to the fact that investigating every companion app currently available would simply be too big a study to be feasible, and that using multiple apps might confuse participants due to differences between user interfaces and functionality.

Choosing to only use one companion app naturally also reduced the number of shows available for the participants to choose from. At the time of the study, five shows compatible with Duo were available on SVT play, three of which were deemed suitable for the experiment. These shows are described in section 3.2. Due to copyright issues, not all Duo-compatible shows are available at the same time, meaning that we were limited to whichever shows happened to be available on SVT play at the time of the study.

4 RESULTS

In this section, we will go through the results of the experiment, based on the different methods of data gathering used; we will start with the video recording, then move on to the survey responses,

before finishing with the focus group interviews.¹

Age	Code	Gender	Type of smartphone
15	FA1	Female	Android
15	FA2	Male	Android
48	FA3	Male	IOS
46	FA4	Female	Android

Table 1: Participant coding for members of the family group

Age	Code	Gender	Type of smartphone
23	FR1	Male	Android
23	FR2	Male	Android
23	FR3	Male	Android
25	FR4	Female	Android

Table 2: Participant coding for members of the friend group

4.1 Video recordings

When analyzing the video recordings of the viewing sessions, we focused on the physical and social behaviours of the participants, such as how they sat and moved while watching the clips, and the discussions that took place during the viewings. We saw noticeable differences between all three clips in both categories.

4.1.1 Clip 1 - No smart devices. For the first clip, when the participants were not allowed to use any kind of smart device while watching, we observed what seemed to be disinterest and/or boredom from all of the participants in both groups. All participants sat in a very relaxed way, not seeming to really focus on the programme. The family seemed to be more interested in each other—and the snacks on the table—than the show on the TV. The discussion that took place during the viewing supports this, as it was mostly unrelated to the programme. There were situations where the studio audience in the show laughed at a joke, followed by one or more participants reacting to this laughter by asking what had occurred in the show—best exemplified by FA2 asking “*wait, what did he just say?*” when the studio audience laughed at a joke—indicating that they were not focusing on the show enough to actually follow along.

The group of friends had very similar behaviour when viewing the first clip. The relaxed posture and dull tone was prevalent during the viewing of the first clip. The friends rarely shared any conversation and the few things that were said were short quips that elicited no response and did not spark conversation, such as: “*Look at his glasses*” or “*That looks like Öland!*”.



Figure 4: Screenshot from video recording of the friend group during the first viewing: note the relaxed posture of the three left-most participants.

4.1.2 Clip 2 - One shared device. During the viewing of the second clip, where one smart device running the companion app was used, the participants’ behaviour changed notably. The family huddled closer together to make sure everyone saw what was happening in the app, leaning forward towards the TV, indicating a greater focus on trying to hear what was being said on the show. The discussion became livelier, but it seemed to be more concerned with the person talking on the TV than the objective of the interactive element, which was to correctly guess whether the person on the TV was lying or not. Worth noting is that while the discussion increased, interaction with the smart device was very low for the family; since they all agreed, they made their choice early on in the clip, and then discussed multiple reasons why they believed they had made the correct choice.

When analyzing the behaviour of the group of friends during their viewing of the second clip it is quite clear that the level of engagement increased when introducing one shared application. All participants took turns looking at the app and reading the prompt that appeared regarding the antique that was displayed. However, the biggest change in engagement was observed when it was time for the participants to value the antiques by interacting with the app.

Much discussion arose regarding the value of the items and the arguments laid out by the participants in this discussion very clearly came from attentive viewing of the programme, whether it was something the antique experts had mentioned or something the participants themselves had noticed about the quality of the item, such as FR4 exclaiming “*but it’s cracked!*” in response to FR2 guessing a high value for the item on the TV, indicating that they had paid close attention to what was being said and shown on the TV.

4.1.3 Clip 3 - One device each. For the final viewing, each participant used one smart device each, playing along with the show using the companion app. While the members of both groups returned to separate parts of the viewing space, their body language suggested much higher focus on what was happening on the TV screen than

¹ All quotes by participants have been translated from Swedish to English by the authors.

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Figure 5: Screenshot from video recording of the friend group during the second viewing: note that all participants are focused on the tablet running Duo.



Figure 7: Screenshot from video recording of the friend group during the third viewing: Note the participant raising his hands in frustration, as well as the left-most participant about to leave the chair out of excitement.



Figure 6: Screenshot from video recording of the family during the second viewing: note how all participants are sitting close to each other, and the tablet laying on the table (not seen in frame).



Figure 8: Screenshot from video recording of the family group during the third viewing. Note that all participants are either looking at their smartphone or the TV.

during the viewing of the first clip, with all participants mostly looking at the TV. All participants kept their smart devices close, in an attempt to prevent the others from seeing their answers, suggesting an air of competition in the room. The discussion was more focused on the objective of the game, as the family members tried to find possible flaws in the story being told that might indicate that the person on the TV was lying. When the correct answer was shown on the TV screen, they all reacted more intensely than during the other viewings, for example by slapping their knee or putting their hands on their face to show frustration in being wrong, or cheering when guessing correctly. The behaviour of the friends was very similar with arms being thrown up out of frustration, leaps of joy (see figure 7), and some participants taunting others for being more wrong than them. The discussion that followed the reveal of the correct answer was more active than the one that followed the other clips, with participants from both groups explaining their reasoning to each other and arguing over the answers.

4.2 Survey responses

Like the video recordings, there are noticeable differences between survey responses depending on the amount of smart devices used during the viewings.

The first question of the survey asked participants to rate their own perceived engagement in the clip on a scale from one to five, and the responses show that the scores generally increased with the amount of smart devices. For the family, the average rating for the first clip was 3.25, with 3 being the median rating; when only one smart device was allowed, the average rating rose to 4.25, and the median to 4. The average engagement rating for the final clip was 4.5, and the median 5. The results were the same for the question asking participants to rate the engagement of the group as a whole. The median ratings were equal between the groups, but the averages differed; the friend group had a lower average for the second viewing (4), but a higher one for the third viewing (5). See figures 9 and 10.

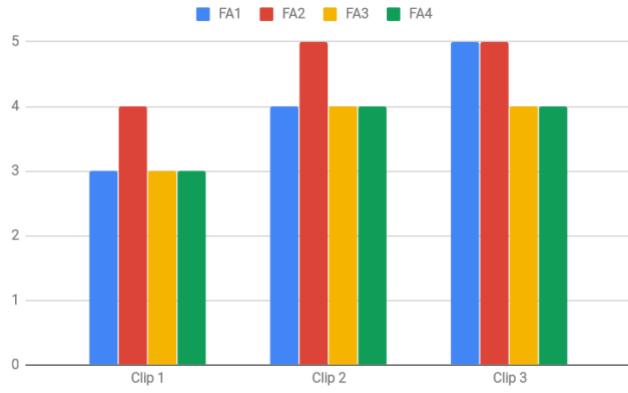


Figure 9: Ratings of individual engagement by members of the family group

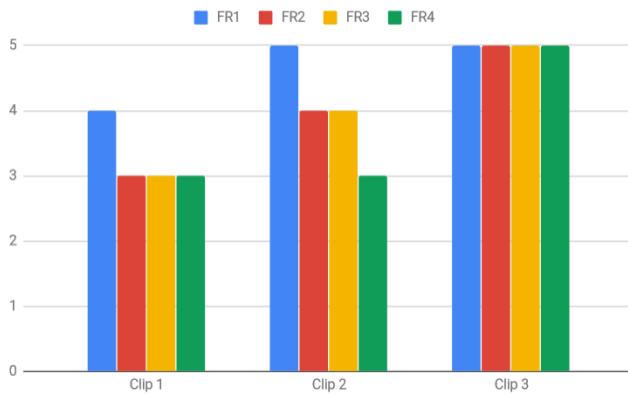


Figure 10: Ratings of individual engagement by members of the friend group

The responses to the questions asking participants to elaborate on why they rated their own and the group's engagement the way they did provide some further insight. A 15 year old member of the participating family noted that the clips viewed while using the companion app felt more engaging, responding "*I was more invested in what was happening on the TV screen, since I wanted to 'win' by getting the right answer*" (FA1), while one of the friends noted "*I was more interested in what the value [of the antique] would be now that it became like a quiz*" (FR2). After the session where each viewer used their own device, participants noted that they felt a need to focus even more on the task at hand; one participant wrote that "*The programme was even more interesting, since I wanted to be the one with the right answer, winning over the others. When playing together on one device, it is easy to lose focus, since you can coast along with the others. When deciding on your own, it is more important to pay attention*" (FA1). There was a clear consensus between the friends' survey responses that a spirit of competition as a consequence of multiple apps increased their engagement to the show, FR4 writing: "*I think the engagement was due to everyone wanting to win*". All but two participants gave their own engagement the highest

possible rating after the third viewing. These participants were older than the others, and while we see a linear increase in engagement for the younger viewers (between 15 and 25 years of age), the ratings stayed the same between clips 2 and 3 for the middle-aged viewers (46 and 48 years of age respectively).

After sessions that included usage of the companion app, participants were asked if they believed that using the Duo app affected their engagement in the clip they were viewing; after the session with only one device, one participant answered no to this question, writing "*I can guess [the answer] without using the app*" (FA4). Further critique came from FR4 who despite stating that the application improved engagement wrote "*Knowing that you can take part and guess and that there is something to look at becomes both a distraction and something that engages you*". However, most participants responded positively, citing added incentive to pay attention to the show while playing along in the app, since they were expected to provide an answer together. In contrast, no critiques were found in the responses sent in after the final session, when each participant used their own smart device, indicating that this setup was more engaging. The family member who did not see any added value with using Duo during the second session now wrote that they "*felt a requirement to provide a (personal) answer using the app, which made my watching more engaged*" (FA4). Another member of the family claimed that the interactive element added by the companion app made the experience more engaging, since "*pressing buttons is fun, and requires focusing on the show and the phone*" (FA1). A member of the friend group wrote: "*(...) the app as a tool works very well as a way to integrate yourself with the program*" (FR1).

Finally, participants were asked if they would continue using companion apps after the study, and to explain why. All participants responded that they would keep using the app, claiming that it was fun to play along, and that the competition that arose when playing with individual devices made the viewing experience more engaging. Another family member reasoned that "*since I am on my phone while watching TV either way, it would be more fun to use the app on it*" (FA1). The friends showed a very positive attitude towards the application, one of them stating "*(...) it becomes more social and interesting. It felt like I listened more and learned more*" (FR4).

4.3 Group interviews

After all three viewing sessions were completed, a semi-structured group interview was conducted with the participants. Questions that were asked to both groups included if they felt any differences between the three clip viewings, and which of the three scenarios they preferred, if they found the smart devices distracting during the sessions, if they used any app other than Duo on their phones during the viewings with smart devices, and if they believed there were any discrepancies between their own engagement in the sessions and that of the group as a whole.

4.3.1 Distractions. The family answered that they did not find the smart devices distracting during the viewing, claiming that the amount of interaction required to play along was low enough to keep their primary focus on the TV screen.

The group of friends all agreed that the app was not a distraction when they all had their own devices, but that it was somewhat

distracting when sharing a device; FR3 pointing out that "*Yeah, it probably would have worked better if we were all squeezed into the couch*". Furthermore, FR1 claimed that it was hard to say whether using the app would be distracting or not, since things that did not occur during the session that potentially could have, such as notifications, saying "*if someone were to call me while I was using the app, I would of course answer, and be distracted*". Another friend then interjected, saying that "*you would have answered regardless if you were using the app or not*" (FR2), which FR3 agreed with.

4.3.2 Engagement. Both groups were asked about their engagement in the show during the different clips, with the general consensus being that all participants were the most engaged in the show during the final clip, when everyone used their own smart device. However, there were disagreements about the engagement during the second clip, when only one smart device was used. While most participants agreed that they felt more engaged in the show during this viewing than during the first, each group had one disagreeing participant. FR4 stated that "*I lost interest when everyone played on the same, I just: 'whatever, they can keep it over there, I'll just watch the programme instead*", while the rest of the group claimed that their engagement was higher when sharing one smart device, FR2 saying: "(...) when we were sharing one device we discussed: '*it comes from this year, from this place, but [the antique] is ugly as hell*'". FA2 expressed annoyance at the group while viewing the second clip, since he felt that their discussion made it harder to hear the TV. When asked which type of show they believed the concept of companion apps would work well with, the family agreed that quiz shows seemed to be perfect for this form of interactivity. One member said that the feeling of confirmation she experienced when guessing the correct answer during the session would be even greater with quiz shows, since "*it's more impressive to know something than to guess correctly*". In a response to this question FR2 said that "*[Antikrundan] is such a fucking boring programme, but I realized afterwards that it was a good thing to choose since it is not the world's funniest show, which is why the app can help and give it a bit more excitement*".

One member of the friend group argued that when going from using no applications to everyone having one each the discussion went from more about what was seen on the screen (such as people's glasses, eyebrows etc.) to what was actually relevant to the show, the antiques and their value. "*If you have [one app] each you get more focused on Antikrundan as a programme (...)*"(FR1).

5 DISCUSSION

In this section, we will present several reoccurring themes found in the results of the experiment, and provide explanations for these based on analysis of data gathered during the study, as well as previous research in the field.

5.1 Perceived engagement

5.1.1 Demographic differences in engagement. When looking at the results, it is clear that viewers' engagement in the show they are watching increases when companion apps are introduced to the viewing scenario; there are however some interesting observations to be made. One such observation is a discrepancy between

survey responses rating individual engagement between clips. All but two participants rated their individual engagement during the final viewing as 5, the highest possible choice. Those that did not are more than 20 years older than the others (48 and 46 years old respectively), and can be classified as digital immigrants[7]. Unlike the younger participants, they have not grown up with digital technology and smart devices. Neither were they adolescent when this kind of devices first arrived. To them, smartphones are not as ubiquitous as they are for the younger participants, making the usage of a smart device while watching TV feel less natural to them. In contrast one of the youngest participants, a digital native [7], mentioned that they are "*always on their phone anyway*" (FA1), showing that smart device usage is deeply ingrained in their daily life, which is typical among digital natives. Furthermore, these findings of different effects on people of different age is in accordance to the findings of Wilson[14].

It is also worth noting that while we presented the participant's gender, as well as what type of operating system their smartphone uses in tables 1 and 2 we did not find any difference in results regarding either of these two factors.

5.1.2 Entertainment value of the shows. Another thing to note is the perceived entertainment value of the shows themselves by participants; it seems that neither of the two groups chose a show based on which was their favourite, but rather which show they thought they would dislike the least. This was indicated by FR2 claiming that the reason for the companion app having such notable effects when used was *antikrundan* being boring, as quoted in section 4.3.2. If the participants had the opportunity to choose a show that they liked before using Duo with it, the effects of companion app usage might not have been as drastic. There are both positives and negatives to this; drastic effects are easier to observe during studies like this one, but it might not reflect reality well. It is unlikely that most people would decide to watch a show they have no interest in and find boring together with others; it is more plausible that a compromise would be reached between group members to watch something everyone finds at least somewhat enjoyable.

5.1.3 Optimal shows. During the interview, participants discussed whether some types of shows would be more or less suitable for use with companion apps, and in both groups, participants believed that quiz shows would be the most suitable; this seems to be in line with results from previous studies [14][8] that claim the same thing. According to Wilson, this could be due to the fact that quiz shows have natural 'conversational gaps' when participants in the show are thinking about what to answer; this leaves a natural time slot for viewers to check their phones and try to find the answer themselves. In contrast, the shows used in this study did not really have any gaps like this, which might have made the conditions for the companion app suboptimal. The effects might have been even more pronounced with a more suitable show.

5.1.4 Social setting as a factor. We theorize that the social setting of the experiments enhanced the effects of the companion app; perhaps participants felt more engaged when there were others in the room that they could compete or cooperate with than they would have when using the app in a solo viewing situation? Though we

cannot claim such a thing based on the results of this study, we believe that it might be interesting to investigate in the future, since such knowledge can be useful for developers of companion apps when discussing how to develop their product further.

We also noticed that the social setting lowered engagement in one situation. When the friend group were sharing one device during the second viewing, FR4 sat far away from the rest of the group, which they claimed made them feel excluded, leading to lower engagement and mentioning in the group interview that "*I don't even remember that clip*". Our belief is that this shows how the 'amplification' provided by the social scenario works both ways, and that the highs seem to become higher, while the lows become lower. This claim can be backed up by the work of Sperring and Strandvall, who wrote that "*viewers' behavior during the show and involvement in the game varied depending on whether they participated with friends or alone*"[8].

5.2 Perceived distraction

Going into the study we suspected that the introduction of smart devices to the viewing scenario would act as a distraction, making participants pay less attention to the programme shown, lowering their engagement. This could be seen as a problem as it would go against the purpose of the app that aims to heighten engagement. This suspicion was supported by Dowell's findings that companion apps with high amounts of interactivity can have a negative effect on the viewer's abilities to retain information presented on the show that they are watching[3], as well as Sperring and Strandvall's statement that interactivity "*stole time*" from the show on the TV[8]. However, in the interviews that followed the experiments, none of the participants responded that they found the smart devices distracting, due to their low level of interactivity, one participant even stating: "*it should have been more [interactive]*"(FA1). The only moment of distraction brought up occurred when the friend group were sharing one smart device, which was caused by things other than the application itself, such as poor seating arrangements or one of the participants' dog making noise trying to get their attention.

The fact that the smart devices were not considered a distraction could once again be an effect of the age of the participants used in the study. With the today's youth being more accustomed to the type of technology used in the study is a likely contributing factor to the low level of distraction perceived. This is backed up by a response from FA1 during the interview, who said that "*I'm on my phone anyway while watching TV*" which can be seen as being in line with Prensky's[7] study on digital natives along with Weiser's[13] prediction of a future where computers are so ubiquitous that humans interact on an almost unconscious level.

5.2.1 Usage of other apps. Notably, none of the participants used any applications other than Duo during the third viewing, despite being told to use their devices as they normally would during the session. There is no telling whether this was due to the participants not wanting to leave the companion app out of fear of losing the competition that arose, or if the participants did not dare to leave the app due to participating in a study. In the interview, one

member of the family group said "*I need to be prepared if I hear something and need to change my answer, or I will not be able to do it in time. So you stayed in the app and kept focus*" (FA1) and one of the friends making a similar statement: "*You get more focus, both for the show and the app when playing individually*" (FR1). This shows that the competition between participants was the reason no one left the companion app. The situation might have been different if any of the participants had been contacted during the viewing session, leaving Duo to answer. FR1 pointed this out during the group interview, saying "*if someone were to call me while I was using the app, I would of course answer, and be distracted*".

5.3 User opinion and awareness

During the group interviews, participants were asked for their opinion of using companion apps as a complement to normal TV watching. All participants were positive to this, and said that they would continue using Duo in the future when watching compatible shows. However, none of the participants expressed a prior interest in trying such apps, or did not know about their existence at all FA3 said that he "*did not know that this was a thing*" before being told about the study, while others had vague knowledge of the existence of Duo, but had never thought about trying it. FA2 said that "*I have seen ads for it, but I did not understand what it was about, they just tell me to 'try the Duo app'*". These results match those of Courtois and D'Heer, which implies that in the 7 years that passed between their study and ours, awareness of companion apps and interactive TV has not improved. The biggest hurdle for greater adoption is still lack of knowledge among possible users.

5.4 Profits and ethics

In the introduction, we mentioned that companion apps may be a tool for content producers and broadcasters looking to gain a more engaged audience. Here we will discuss this topic further, as well as ethical complications.

As stated earlier, the results show that companion app usage among viewers leads to higher engagement. An engaged user is more likely to keep watching a show throughout the entire episode, as well as throughout and across seasons. This is of course desirable for producers as a way to prevent viewer drop-off through the life of a show. It is also positive for broadcasters, as steady (and maybe even increasing, as word spreads) viewership can be used to negotiate more favourable advertising deals, which leads to higher revenues. Here a discussion arises on the purpose of companion apps: are they a tool to make TV more engaging for audiences, or are they just another way to expose people to advertisements?

In a public service company, this is a non-issue, since these companies are not financed by advertising revenues (SVT does not broadcast any ads); when the broadcaster is commercial however, users need to keep this question in mind. While opinions differ concerning ethics and advertising, and while we do not believe that we are in any position to say what is right and wrong concerning companion apps and commercial interests, we do believe that increasing users' enjoyment and engagement should be the primary concern when developing and publishing companion apps.

5.5 Method discussion

5.5.1 Viewing environment. When designing the experiment, many factors had to be taken into consideration. The viewing environment was considered a crucial factor in the study, as conducting this sort of study outside of the participant's living room introduces a factor of uncertainty. Taking the participants out of their normal TV viewing environment might affect their behaviour, thus not giving an accurate impression of how they normally watch TV and interact with each other and the companion app(s). The importance of the normal viewing environment is brought up by several previous studies, such as the one by Sperring and Strandvall, Duchenaut, as well as Vanattenhoven and Geerts.[8][4][11] Due to this, we decided to conduct the experiments in the participants' living rooms. While this led to more natural interactions between participants, it could also have been the cause of some of the discrepancies found in the results. As noted in section 5.1.4, FR4 felt excluded from the group during the second viewing, and hypothesised that it might have been due to how the group were seated. Since we wanted the usage environment of the app to be as natural as possible, we decided to let participants sit how they wanted, which led to this result. The lesson learned is that the most natural setting might not be the one that is optimal for the companion app.

5.5.2 Participants and participant demographic. The second consideration was participant selection - a group of participants that do not know each other previously will most likely not interact with each other as comfortably as a group consisting of long-time friends, or members of the same family. Because of this, we chose to enlist our own friends and family to participate in the study, in the hope that their interaction would be more natural than that of a group of randomly selected participants with no or very limited previous interaction. We had the opportunity to instead use randomly selected students at KTH as participants, but we chose not to, because of issues that may arise with participants who are unfamiliar with each other. There would be no guarantee that the participating students would know each other beforehand, which would lead to an unnatural viewing environment, something that Sperring and Strandvall discouraged [8]. This does not mean that such a study would not be interesting, as it could possibly be very interesting to see how companion apps would affect such a group. However, the focus of such a study would probably be the how social interaction between participants is affected, rather than their engagement in the show. While interesting, it is outside the scope of this study.

We opted to use two different group constellations (i.e one friend group and one family) since we wanted breadth rather than depth. If we had chosen to only use friend groups or families, we would have missed a common viewing scenario. Due to limitations in time and amount of available participants, we could only use one family and one group of friends. The results would of course have been different if we had used different participants, since all groups have different dynamics. This was mentioned by FR4 in the group interview, who said "*We are too competitive, sorry*" when discussing how the companion app led to competition among the members of the friend group. A larger and more diverse participant pool might have been desirable, but was not available due to time constraints, as well as our access to established groups being limited.

Continuing on the theme of participant demographics; we opted to use the groups we did for different reasons: the primary reasoning was that we believe that a group of friends or family members are the most common constellations in group TV viewing scenarios. Furthermore, the friend group was in the age range most susceptible to companion apps according to Wilson[14]; we reasoned that it would be easier to observe the effects of the companion apps on such a group than another which is not as susceptible. While these choices made the experiment easier to conduct, it also led to very clustered participant demographics in regards to their age which, as discussed in a prior section, could affect the results. Another point of discussion is the age of the members of the friend group. They were all between the ages of 23 and 25, and all were digital natives; it is highly probable that our results would have been different if we had used a group of friends where all of the members were digital immigrants. Our assumption is that those results would have been more in line with those of the older members of the family rather than the younger ones.

5.5.3 Familiarity with participants. To make the study easier to arrange, we opted to use our own family and friends as participants in the experiment. By doing this, there is of course a risk for bias among participants, as they might want to present the results they thought we were looking for. This risk is of course existent in all studies, but we believe it is greater when using friends and family in a study. To mitigate this risk, we chose to not inform the participants about the purpose of the study, so as to make them confused about what answers would be 'correct'. Participants were only told that they would be watching TV together, and did not know that they would be using companion apps during the experiment.

5.6 Future research

Based on the results of our study, we believe that there are several topics worth investigating in further studies. We theorize that the social setting in which the experiment was conducted might have amplified the effect of the companion apps, but cannot claim anything with confidence. We hope that this will be investigated in the future, as the results would provide further insight in the social and engagement effects of companion apps. Furthermore, we have only studied how companion app usage affects viewers' engagement towards the show they are watching, and not how these apps affect the social dynamic in the viewing groups. Since our results, as well as those from previous research, point towards social dynamics and user engagement being correlated, we argue that insight into how social dynamics are affected is needed for deeper knowledge of how user engagement changes. As with all qualitative studies, a similar study could be realized in the future with larger amounts of participants to support or deny the claims presented in this study quantitative methods.

6 CONCLUSION

The purpose of this study was to examine how companion apps affect viewer engagement in viewing groups consisting of more than two people. Based on the results of the conducted study, we have found that companion apps do increase viewer engagement in group viewing scenarios, by encouraging users to cooperate or compete with each other. This effect is more noticeable among younger

viewers in their teens or twenties, than among middle-aged viewers, possibly due to the usage of smartphones in conjunction with consumption of other media is more ubiquitous among younger people.

Using companion apps to compete seems to raise engagement more than cooperation, and we theorize that the social setting of the study amplified the effects of the companion app, both negative and positive ones.

We also found that all participants reacted positively to using companion apps as a complement to watching TV, but few knew about their existence before participating in the study. Thus, the greatest hurdle to a wider userbase for companion app producers is awareness among possible users.

This study contributes knowledge about companion apps and how they affect viewer engagement in group viewing scenarios, and offers possible avenues of further study on the subject.

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