

Jumping between Devices and Services: Towards an Integrated Concept for Social TV

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ABSTRACT

Television and video belong to the most important media in domestic environments. Nowadays, television means more than the classic reception at the TV set, it also provides new manifold opportunities for on-demand media consumption. The technical infrastructure grows extremely fast whereby an increasing number of options of how to use rich media are being offered. Functionalities from the Internet, such as e.g. communication, sharing and other information services enrich the TV experience. The convergence of media is not only visible in broader functional sets at one device, e.g. broadcast and online access at Media Center systems, but is also reflected in the interconnectedness of the device itself. In order to understand the design dimensions for further SocialTV applications, we conducted different kinds of empirical work including a diary study, interviews and creative workshops. Results indicate that several forms of parallel and convergent media usage have already been established. We identified flexible changes between devices and services related to TV and video content (cross-media jumps). We also discussed several mockups for integrated, cross-platform Social TV applications. It turned out that the identified needs relate to both a better interconnection between devices and services.

Categories and Subject Descriptors

H5.m Information Interfaces and Presentation: Miscellaneous.

General Terms

Design, Human Factors

Keywords

Social TV, Social Media, Living Lab, Participatory Design, Diary Study

1. INTRODUCTION

Watching TV is one of the most central pastime activities in domestic environments. Traditionally scheduled via broadcast,

new technologies and devices trigger off a fast and easy access to related rich-media content. Video on demand services have become more important within the last years [30]. By receiving audiovisual content from the Internet or recording TV shows to personal video recorders (PVR), users can decide themselves what they would like to watch and more importantly when. While new technologies allow for more flexible and personalized forms of media consumptions, it could be argued that the social character of TV has been decreased, as there is not the same reference to talk about anymore. However, despite having the chance to choose the watching content individually, users still orient themselves by the watching behavior of others, e.g. by watching recorded content the same day when it is broadcasted on television or by sharing contents with friends and then talking about it [3].

Several solutions such as Google TV, Boxee and Miso combine TV and the web, by offering integrated social services. Various techniques and functionalities enable the user to share content and communicate with others over distance. As one of the key aspects, research around Social TV explores the social character of television concerning specific details. Related work started to focus on exploring the design space of the TV, e.g. by integrating an online channel for communication via text chat [1]. Other directions explored pros and cons of text and audio chat [18], the influence of the program genre [13] and the use of additional personal devices [9]. As television and media contents can be delivered to several platforms, such as the PC, mobile devices and the TV, the design space is huge. Therefore, current work has a strong focus on bridging aspects between several devices [9,23,28].

In reference to such device-bridging approaches that are characterized by more integrated services, many questions regarding valuable and useful concepts in an interconnected Social TV environment stay unanswered. From an empirical point of view, it is important to understand the current practice of multi-device media usage within domestic contexts. From a technological point view, we would need to identify the way in which new integrated concepts should be designed in order to offer additional value to the users.

In this work, we will describe our integrated research concept to understand the practice of parallel and convergent media usage in domestic environments. For this reason, we set up a Living Lab with 27 participants from 16 households as a means of promoting participative user integration as well as to conduct long-term evaluation studies. As a first step, we accomplished a field study

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EuroITV'11, June 29 – July 1, 2011, Lisbon, Portugal.

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featuring a media diary in order to explore the every day media usage of our participants. As a second step, we organized creative workshops where we jointly discussed integrated social media concepts. Afterwards, we discussed the results of the studies and concluded with possible implications for the design of new integrated social media concepts.

2. RELATED WORK

In HCI research, the home environment has grown into major point of interest and focus. Home media, such as TV, Internet, music, and mobile devices, have received considerable attention in each area. However, only few attempts have been made for treating interactive home services and devices as an integrated concept. O'Brien et al. have pointed out that "sharing at home is a cooperative activity. [...] Household technologies simply need to fit into this pattern of activity" [29]. This signals both the importance of integrated home technologies and the consideration of social patterns of use.

2.1 TV-centric systems

The traditional television used to be the core of the home environment. However, conditions have changed with the digitalization of media and the convergence of devices. Media convergence enhances the traditional TV with new functionalities and thus creates a novel form of hybrid usage scenarios. The work from Barkhuus and Brown [3] and Brown and Barkhuus [6] identified TV watching as a TV-lifecycle, which will inevitably involve other devices and services at home. They investigated the changing practice of watching television among early adopters of personal hard-disk video recorders and video on demand (VOD) services. They found that watching TV involves an active process of selecting content from the TV guide, playing back such content from a stored collection, fast-forwarding and pausing during playback. The TV lifecycle also includes collecting an archive of shows, and sharing and discussing those with others. Studies from Bernhaupt et al. [4], Obrist et al. [26] and Tseklevs et al. [33] report on ethnographic insights related to the role of TV and other types of media in daily life. Bernhaupt et al. [4] identified trends regarding personalization, privacy and communication. TV watching was identified as a main activity that participants liked to share with others. Tseklevs et al. [33] also highlight the meaning of the TV set as a shared display for collaborative access to different kinds of content. Based on their pre-study, they developed a mobile application that provides the participant with the possibility to choose different media on the personal device and display them at the TV set. Any options for sharing photos and videos this way were appreciated by the users.

The unified-EPG [28] is a good example for the combination of PC and TV to handle the ever-increasing amount of media content. The result of the in-situ evaluation showed that the participants liked the idea of the Unified EPG, as it combines different media sources (TV, PC, radio, external hard disk, etc.) and offers an easy and unified access to content on the TV. In order to handle the huge amount of multimedia content the participants appreciated the unified access on PC and TV. The PC was favored over other devices for organizing the content, as it is more comfortable than on the TV. Another study showed that using the handheld device as a second screen in an interactive TV environment enriches the TV watching experience [9]. In particular, the second display for previewing and viewing contents and for accessing enriched information was the most valued

usage. Huang et al. [18] empirically explored the activity of chatting while watching. They found that the concrete realization of a supporting tool for communication has a huge influence on the user acceptance. In their study, participants preferred text chat rather than voice chat because of its less interrupting character. Geerts et al. [13] report insights on how the program genre of a TV show has influence on the communication behavior of the users. They found that discussion and recommendation are closely related to the genre, while e.g., news and soaps stimulate discussion during the TV watching, and movies and documentations stimulate the discussion afterwards.

2.2 Cross media systems in general

Other works discussed the integration of various devices more generally. Rodden et al. [32] focused on the interplay between interactive services/devices in the households and they built a jigsaw-like toolkit for the users to configure the services in the ubiquitous home by connecting components and thus composing various arrangements through couplings of pieces. An IPTV platform developed by Obrist et al. [27] supports local communities. Rhub, a group-socializing tool developed by Heyer et al. [17] enables cross-channel communication by transferring text-messages to several applications on mobile and the web. Participants from their study used the tool mostly for ad-hoc coordination rather than chats. Prata et al. [30] presented an approach to generate cross-media dynamic learning contexts from iTV and made it accessible from several types of devices. Kane et al. [20] explored cross-device web usage on PCs and mobile devices – a more integrated approach that has potential to improve the usability of the mobile web. Pipet [24] is a cross-device photo-sharing tool that enables a physical interaction style.

Considering the diverse directions, it becomes evident that the design of integrated social media applications is related to a bright design space. The goal of our research is to gather evidence about user requirements and preferences for an integrated social media system to be applied in future design and development. In such an understanding, the TV is still a central part of the domestic infrastructure, but is smoothly transformed into a more general, unified and easy to access media center, enriched with several options for social use. While the exploration of user requirements for such integrated systems is not trivial, we make strong value of empirical methods. In order to cooperate with potential users for an extended period, we set-up a Living Lab with 16 households. Within this work, we present result towards a more flexible SocialTV infrastructure and more integrated social services.

3. SOCIALMEDIA PROJECT

The term 'social media' has become very popular within the last few years. In the context of Web 2.0, Kaplan and Haenlein define social media as "a group of Internet-based applications that build on the ideological and technological foundations of Web 2.0, and that allow the creation and exchange of User Generated Content" [21]. Even if this definition is commonly accepted, social media should be considered from a broader understanding of content that includes user-generated as well as professional-generated content on which social options can reference, e.g. in form of comments, ratings or chats.

Based on this assumption, with the SocialMedia project we want to develop a cross-platform framework to foster and integrate communication between different domain-specific functionalities.

Generating and sharing content in different media environments and between different devices should become much more user friendly with the help of technology support. The central issues in the research project SocialMedia are:

- From the user's point of view, which kinds of cross-platform usage, media convergence and communication options are useful?
- Which tools, concepts and usage scenarios can support the user's needs?
- How do new concepts affect the social behavior, e.g. on social networks?

To answer these research questions, two pre-requisites should be met: On the one hand, the development of a concept to integrate usages of various existing media (integrated approach). On the other hand, user requirements should be acquired and evaluated in real situations and in a practice-oriented way.

4. LIVING LAB CONCEPT

In the design and evaluation process of new technological artifacts the participation of users and the feedback process between users and developers has an increasingly important impact on building usable, acceptable and innovative applications and services. The novel concept of Living Labs makes use of these characteristics and can be basically understood as an environment that integrates users, technology and business in an open innovative development process, which takes the real usage contexts into account [2,25]. Følstad analyzed several Living Labs in the context of ICT-innovation and defined nine general characteristics of the heterogeneous implementation of such a concept [11]. The most relevant and strongest characteristics are the support of the co-creation research and development processes by involving users at an early stage into innovation processes for "sensing, prototyping, validating and refining complex solutions in multiple and evolving real life contexts" [10]. The fact that users can actively contribute in research and development activities sets the Living Lab concept apart from others. Living Labs offer the possibility of capturing user experiences and gaining relevant information from everyday practices as well as routines to create new ideas together with the stakeholders. The long-term cooperation between the stakeholders helps with evaluating prototypes in real usage contexts over longtime periods. These general characteristics help to increase the validity of research results and enhance the development process. In this regard, empirical methods have been applied to explore user behavior and media usage in order to identify significant requirements. The context of everyday practices and routines implies a paradigm change on how to think about the development and design cycle. Especially domains like the user homes, pastime activities and other highly rated privacy contexts are qualified for such a concept.

Living Labs have been applied in domestic as well as in professional contexts. A large literature review and previous studies show that the concept is utilized heterogeneously and in different modes and on different levels. Especially labs dealing with the development of Home-IT, communication or entertainment technologies adopt the characteristics of real life contexts in two different ways [16]. On the one hand, Living Labs use an artificial environment, e.g. test centers, in which a standardized living room is simulated. The PlaceLab of the MIT for example uses such a controlled environment structure [19]. It

offers multi-observation possibilities, which supplies predominantly quantitative and well comparable data. Empirical studies can be organized with a large number of participants, but they are limited by short-term evaluation. On the other hand, Living Labs use real life test beds with different types of households. Researchers from the project 'iiTV@Home: Field trial in Salzburg' chose such a concept to gain a deeper understanding of practice, context and social dimensions in households [26]. This non-artificial lab structure offers long-term evaluation in situ, which allows for a deeper insight into specific environments. Both directions mentioned have pros and cons. Non-artificial labs are often limited to a minor number of participants, because of a higher time and work exposure in the field.

To address the project goal, we chose a multidimensional Living Lab concept, which combines different structures to take advantage of various lab concepts. Our lab is named 'SocialMedia Experience and Design Lab (SMEDL)', because user experience and the design of new technological concepts in the field of home entertainment are strongly related with each other. The lab can be described as an infrastructure with real households supporting empirical studies and integrating potential users in the design process in the long run. A close cooperation with users helps identifying user-driven innovations, e.g. for collecting new ideas. It also facilitates evaluation processes in order to gather feedback for early design mockups. Running prototypes can also be tested in practice in order to gain (in-situ) feedback direct from the field.

SMEDL consists of different environments, which help to collect qualitative as well as quantitative data. One of them is SMEDL.Stat, a stationary controlled test bed (see Figure 1) that reproduces a standard living room at our university and is used e.g. for short time evaluation within first user tests. With this structure we can measure user feedback on a very exact level in order to gain data in controlled settings. A real world test bed (SMEDL.Local) including several households in an urban region of Siegen, Germany characterizes the most important part of the lab [15] (see Figure 2). The setting is used for long-term evaluation studies and continuous user participation. Households are equipped with new technology (media center system, high-definition TV and Smartphone), which are to be integrated into daily behaviors. Within the local lab we can explore the integration of new technological artifacts, the media usage and its changes over a longer period of time by gathering qualitative as well as quantitative data. In the long run, we also want to involve users from online communities. This way we can gather ideas and test concepts with a larger number of test persons.

To win participants for SMEDL.Local, we started a call for applications via local newspapers and radio. In a first round we selected 8 households with 15 participants (6 male, 9 female). As a basis of the selection process, we conducted semi-structured telephone interviews with every household to find out more about the structure of the household, socio-demographical facts, education, income, media usage, technical skills regarding their experience in dealing with media center systems and Smartphones, existing technical equipment and the motivation for their participation.



Figure 1. SMEDL.Stat – Stationary lab



Figure 2. SMEDL.Local – Watching TV in a household

In a second step, we asked our selected participants to recruit other interested households within their local social network, so that SMEDL.Local consisted of both participants that knew each other and those who did not. The reason for this is that we were interested to see how users intercommunicate about their media usage and how new integrated social media concepts support the establishment of new contacts. In the second application round, we selected 8 additional households (8 male, 4 female). The final structure of SMEDL.Local consisted of 27 participants (14 male, 13 female) divided into 4 single households without children, 2 single with children, 5 couples without children and 5 couples with children.

5. METHODOLOGY, APPROACH & RESULTS

Within the first phase of our project we started our empirical work focusing on exploring and understanding the current media usage in domestic environments. The advantage of SMEDL.Local lies within a profound understanding of household structures and their media behavior to identify requirements for new integrated social media concepts. We chose several methods to reach that goal. In a first step, we accomplished a diary study featuring a media diary in order to explore the participants' daily media usage without technical or personnel interventions. Based on the results of the study, we created several concepts for a new integrated social media application for TV and Smartphone. Afterwards, we discussed the concepts in two different workshops together with the participants of SMEDL.Local. Both studies took place before we equipped the households with media center systems, high definition TVs and Smartphones.

5.1 Diary Study

Diary studies are a common approach in HCI for exploring the context in question through the participants themselves [7]. Another approach to help participants with self-reflection is called Cultural Probes [12]. Several studies used this approach for different reasons and in different contexts [4,5]. In comparison to diary studies, Probes are well-designed artifacts that stimulate feedback in a more open and creative manner. While both approaches have their strengths – more structured feedback in diaries [14] and more open feedback in Probes – we made value from both. We focused our design at the media diaries, but also included a camera and bundled everything in a nice box. With this documentation material, we enabled participants to reflect on their media usage on all available devices with a strong focus on social aspects. Below, we describe the approach and the results of a three-week field study within the local lab.

5.1.1 Approach

To understand the daily media usage of our participants and to increase their understanding for our research activities we designed diaries and passed them on to the household for a three-week self-documentation. The boxes contained one media diary for each participant in the household, a digital camera, a privacy policy, a stand-up display to remind participants of the documentation and some sweets for motivation (see Figure 3).

The diary represents the most important part in the box. It contains semi-structured pages on which the participants are told to document every single media usage with the following information:

- date and time of usage
- number of involved persons
- kind of media (TV, video, Internet, cinema, other) and parallel usage with other media
- content of media
- motivation for media usage
- intercommunication with others about the content

Furthermore, we included several special pages to understand more about the participants' regional, national and international social networks, pastime activities and additional insights on how they live. With the camera participants could document a certain situation of their media usage to give us more visual insights. The diary study was also useful to establish a trustful relationship between participants and researchers. After the three-week self-documentation process, we collected the boxes and conducted additional interviews with each participant in the household to reflect the current media usage as for the relevance of specific media (TV, PC/Internet, mobile phone) and the diary study itself.



Figure 3. SocialMedia documentation box

Overall, we received 26 duly completed diaries (14 male, 12 female) from the 27 participants of SMEDL.Local with a number of 669 entries in total. One female person was absent during the study and could not take part.

5.1.2 Results: Cross-Media Usage

In the following chapter, we will summarize the most important findings of the diary study and the additional interviews. Many entries within the diaries relate to daily routines and group activities. We also identified a trend that watching television is supplemented by other activities, in particular, by the usage of other media. We found that the participants in our test bed use

television and Internet based applications (e.g. web browsing, e-mail, instant messaging, social communities and video on demand services) on different devices simultaneously. One of our participants compared this with a ritual: “The one hand turns on the television while the other hand turns on my laptop. [...] Starting Outlook [e-mail client], checking e-mails and then flipping through TV channels to see if anything is interesting for me.” (m27, *higher technical expertise, single without children*). We found that TV and Internet are interwoven in their usage, especially for (1) searching for information, (2) staying in contact with friends or colleagues and (3) the selection of devices for media consumption.

Information Search

A main aspect for the simultaneous usage of the Internet is to search for information. Two of the participants provided us with examples where their TV consumption made them want to search for information on the Internet during or after a television show (m36, *higher technical expertise, couple with children*) & (m42, *lower technical expertise, single household without children*). The laptop, as a secondary device, is normally used for that activity. In one household, where an Internet-capable media center system was already available, participants regularly switched between TV and Internet on the TV screen, especially during the commercial breaks. As a reason, the request for additional information was mentioned (m30, *higher technical expertise, couple without children*). In contrast to him, his fiancée also used the Internet for information access but preferred to use the laptop. She said that the media center system was too inconvenient for her, because of the multiple input devices. In this context, she addressed that a single, universal remote control would be helpful (f35, *minor technical expertise, couple without children*). In another case the Smartphone was used to check e-mails, the weather forecast (non-TV related) and information related to the video content (m36, *higher technical expertise, couple without children*). Another participant, who also used the Smartphone simultaneously with his TV consumption, was not satisfied with the size of the Smartphone’s screen and wanted to have an iPad for such needs. (m33, *higher technical expertise, single household without children*). He would also be interested in an integrated solution on TV screen, which does not destroy the character of the entertainment. Even participants with no technical experience in media center systems and Smartphones asked for more integrated concepts “to get value of some ‘idle times’ [...] so that I do not have to stand up and switch on the PC when I’m interested in something” (f45, *minor technical expertise, single household without children*).

Social Interactions

Participants used different communication services to stay in contact with friends. Intercommunication about television and video content happens via telephone, face-to-face and via instant messaging. One participant used to talk about TV series with his cousin via phone, and sometimes met to watch together (m37, *higher technical expertise, couple without children*). The exchange via social networks is too impersonal for some of the participants because the buddy list includes friends and also other persons. That is why they would not post every kind of activity to every one of them and likewise they are not interested in reading posts from others (m35, *minor technical expertise, single household without children*). The interest in synchronous communication varies from person to person. One of the

participants gave us an example where a friend called him via phone during a motorsport show. For him it was more of a disruption “Damn it! Now I can’t watch relaxed any more” (m42, *minor technical expertise, couple with children*). In contrast to this, a younger participant described a completely different behavior. She often talked asynchronously about the TV content with friends on the phone and face-to-face at school on the next day. During commercial breaks she used to chat with friends about the TV content if her chat partner watches the same show, otherwise they converse about other topics (f17, *minor technical expertise, daughter of couple with children*). The integration of a video camera into the TV for placing video chats is also mentioned as an interesting feature, however, not during watching TV or other video content (m37, *higher technical expertise, couple with children*).

Source of Content

TV is only one of the used entertainment and information sources. Video content is also often watched on laptop or PC, because of a greater choice of content and the flexible consumption time. In general, we identified a trend towards an integrated usage behavior which is well described in the following statement: “In the past it [television] was very important, because it was one of the main media, and I created my media consumption along the television schedule. [...] now I make my similar media consumption more on-demand and I am not subordinated to the restrictions of television.” (m35, *minor technical expertise, single household without children*). Watching content in a non-linear way is also an important factor for others. One of the participants, for example, watches on-demand content from hard disc or DVD to uncouple from the given TV schedule (m33, *higher technical expertise, single household without children*). The on-demand character also enables persons to get ad-hoc access to a wide range of music: “with friends [I] was listening to YouTube music on a party. Because there was no music equipment, we played music for the party via laptop [...] It was quite funny because of [...] the different tastes [of the attending persons]. Then on the next day I bought an album from a band that I had not known before” (m35, *minor technical expertise, single household without children*).

The Internet is an important source of audio and video content. One of the participants regularly watches videos on the laptop, because English-language content is very important for her but barely available on German television (f37, *minor technical expertise, single with children*). However, watching videos on laptop/PC is not always the best choice. One participant summed up his preference for the output device in relation to the content: “when the aesthetic of a movie is important for me then I do not want to watch it on the screen [of the laptop/PC] but on the TV. When focusing on consumption in general, then the computer is sufficient. The advantage of the PC is the multi-functionality, for doing something [other on- and off-line activities] simultaneously, e.g. music and series” (m35, *minor technical expertise, single household without children*). Within the diaries we identified several entries that refer to the simultaneous usage of different video sources (e.g. on TV and PC). Even if several kinds of media are running simultaneously, only one has the focus of the user. A typical example here is the media behavior of a boy who played online games, chatted with buddies per voice chat and watched cartoons on TV simultaneously (m14, *minor technical expertise, son of single with children*).

The diary study provided insights into how participants use media on different devices and in different contexts. It became clear that TV and Internet are strongly interwoven, even for households without media-center systems. Laptop and Smartphones are used in simultaneously or later on in reference to TV content or to inform or consume media on demand. Because of different reasons, the participants ‘jump’ between different sources of content. Such jumps took place at one device, e.g. switching between broadcast and online mode on a media center system, and between different devices as well. The reason for a jump also can be motivated by the need for social exchange, e.g. to communicate about a TV show. The media content was mentioned to be a relevant topic in phone calls and chats with friends. Results of that pre-study clearly indicated that further solutions need to bridge the gap between all available devices, rather than providing an all-in one solution. Every device has different strengths, e.g. in size of display, flexibility of use, input capabilities, personal or public use etc., so integrated solutions need to make value of all these options. As a result, several integrated social media concepts were realized with paper mock-ups and PowerPoint slides. As a next step, we discussed the approaches together with the households.

5.2 Creative Workshops

After the diary study, we accomplished two workshops with the participants of SMEDL.Local. We focused on first reflections related to new social media concepts that bridge the gap between TV, PCs and Smartphones. Within the workshops we first discussed concepts that were developed from the diary entries and interviews. The concepts were clustered in different functionalities along the following dimensions:

- **Social Networks:** intercommunication about audio-visual content, awareness about the status of friends, community building
- **Additional information:** integrated channels for collecting additional information about the watched content
- **Recommendation:** give and receive information about interesting content
- **Personalization:** define which device specific content, additional information and messages should be displayed, customize remote control

The discussion was semi-structured along those topics. Both workshops were recorded on video and audio for the subsequent analysis.

5.2.1 Approach

The first workshop addressed participants with higher technical skills. We invited 8 attendees (5 male, 3 female) from 6 households. The workshop consisted of two parts. We started with a brainstorming session along the previously mentioned dimensions where the participants had the opportunity to describe how they use existing social media concepts, what usage problems they have and how new concepts should be designed in the future. We split the group in two moderated subgroups and provided paper and pens for the participants to visualize their ideas and thoughts (see Figure 4). In the second part of the first workshop, we discussed the concepts we developed subsequently to the diary study, which we presented as paper mock-ups and PowerPoint slides (see Figure 5). We asked the participants to explain the

assumed functionalities of the presented concepts and then discussed them critically. We retained the same group constellation as in the first part of the workshop.



Figure 4. Creative workshop Part 1



Figure 5. Creative workshop Part 2

The second workshop addressed participants with middle and lower technical skills (i.e. little or non-existing experience with media center systems or Smartphones). 10 participants (5 male, 5 female) from six households took part. Because of the participants’ missing experience, we omitted the brainstorming part and instead gave a short hands-on demonstration of current Smartphone and media center technologies. Afterwards, we split the participants into 3 groups and then put the mock-ups and PowerPoint slides of our concepts forward for discussion.

5.2.2 Results: Concept Reflections

In this chapter, we will describe interesting results from the creative workshops. We classified the results into two major categories: *integrated information & communication* and *integrated concepts & devices* regarding a device-independent content access.

Integrated Concepts & Devices

During the workshops, we identified several cross-platform issues we have to deal with. The following statement from one of the participants characterizes that circumstance quite well: “too many [different] standards and offers [of content providers][...] I’m confused about that [...] it would be desirable if there would be an understandable concept with access to any digital content [source]” (e.g. YouTube, Netflix, VoD products of TV broadcasters). As a solution the participant asked for “a platform that is the same on all devices [...] like a kind of standard [...] so that there is a feeling like at home” (*m36, higher technical expertise, couple with children*).

Within the workshops we identified strong demands for an integration of different devices that are available at home (e.g. TV, laptop, PC, tablet PC and Smartphone). Some of the participants would like to have additional information about the TV content or communication tools on their Smartphones or tablet PCs. Another participant, already familiar in retrieving related content information with a Smartphone, asked for a more integrated solution that can show this information also on the TV screen (*m36, higher technical expertise, couple without children*). Another participant would like to have the information on TV and mobile device simultaneously (*w37, minor technical expertise, single with children*). During the discussion, the broad consent was found that such a decision should be made flexible and individual. The same issue occurred in discussing communication concepts because it is relevant to decide on your own if personal messages are displayed on the TV screen while watching TV with others (*m36, higher technical expertise, couple without children*).

One of the groups started sketching a model and ended up with a solution where event notifications play an important role. While notifications about incoming messages should be received on the mobile device, the decision about where the content should be displayed (TV or Mobile) should be flexibly configured (see Figure 6).



Figure 6. Integrated notification process (based on the sketch from the workshop)

Another important aspect is the role of the mobile device as a remote control. Independent of the level of their technical expertise, the participants would like to use their Smartphone as a remote control device for the TV. However, some of the participants were uncertain about this concept because of the small keys and the missing haptic feedback. They would prefer a physical keyboard instead. Another reason against using the Smartphone as a remote control for the TV is, that mobile phones are normally personal devices that are not shared with others. However, the TV, especially in the living room, is used by every family member and that also applies to the remote control (*w41, minor technical expertise, single with children*) & (*m49, minor technical expertise, couple with children*). Despite those concerns the Smartphone offers a good choice for more flexibility and a better customizability and can be used as a control device (e.g. to trigger on the recording functionality of the media center system) as well as an output device (e.g. to watch video content on the way home) (*m36, higher technical expertise, couple with children*).

Integrated Information & Communication

Two participants who knew each other mentioned that media content is always a main topic when calling each other. They use the phone to talk about new movies and TV-series: “Mostly we talk on such things on the phone [...] actually it is always a media topic. For example, a movie that one has recently seen” (*m37, higher technical expertise, couple without children*). In this context the workshop’s participants brought up some ideas for a better integration of their used social networks. The buddy list as well as other social network services should be displayed on any device in the same manner as known from the PC (*m36, higher technical expertise, couple with children*). One participant explicitly requested a functionality to see which video content other friends are watching at the moment. He wants to be able to switch to the same content and chat with the friends while watching TV together (*m37, higher technical expertise, couple*

without children). This topic triggered off a critical discussion because the participants only want to involve a small subset of their entire buddy list: „[...] what I watch on TV [I only want to show] to persons that I know very well” (*m36, higher technical expertise, couple with children*). In this context it could be interesting to build specific groups to which friends can be assigned since not all friends are interested in the same series for example (*m37, higher technical expertise, couple without children*). One of the participants noted to involve “[...] other persons [within the social network] who have the same interests and perhaps watch the same series and then talk about it” (*m36, higher technical expertise, couple with children*).

A further relevant topic within the workshops was any kind of recommendation for media content. Certain participants recommend TV series and YouTube clips to friends (e.g. *m36, higher technical expertise, couple without children*). Especially TV series in the English language, available only on the Internet, are shared and recommended between certain participants who know each other. While recommendations to others are mostly given in person (e.g. on the phone), online forums are used to search for hints from others: “[...] what do others say about that TV-series [...] does not always fit but very often” (*f34, minor technical expertise, couple without children*). An integrated rating process should allow to distinguish between ratings from private and global communities because on the one hand the referrals of friends are higher rated as they are personally known, and on the other hand the global community provides a larger quantity of recommendations and reflects a broader opinion. One participant also suggested giving automatic recommendations based on his individual viewing patterns, on the viewing patterns of his friends as well as on public TV ratings (*m36, higher technical expertise, couple without children*). The discussion about how to give and read recommendations showed again that users should decide on their own, whether that information will be displayed on TV, Smartphone or other devices.

In the workshop we also discussed a better integration of additional web-based services for retrieving additional content information. One of the participants mentioned that he would like to decide on his own, from which sources he obtains such additional and detailed information about the watched content (*m36, higher technical expertise, couple with children*). Another attendee said that it would be interesting if content related information is provided automatically without entering an additional search string: “I don’t have to search for it [the current TV/video content] on Amazon again, but reaching the corresponding page directly” (*f41, minor technical expertise, single with children*). For several participants also context information is of interest that is related to the current scene of a movie, e.g. current song of the soundtrack, actors in view or brands of involved items. Relevant information services that should be integrated are Wikipedia, Google Maps, iTunes, communities like Facebook or Twitter and fan-pages of actors.

6. DISCUSSION AND IMPLICATIONS FOR DESIGN

In the first part of our pre-study, we explored the current media usage among several devices in order to understand the established habits. The results show that even if used on different devices, various online and offline media are used simultaneously or in reference to each other. We identified a behavior that we call

‘cross-media jumps’. Such jumps occur at one device, e.g. when users of a media center system switch between broadcast and online mode, and also between different devices, e.g. when a laptop is used simultaneously. Jumps between the available media are motivated by different reasons. For example, if the media from one channel is too boring, an incoming message or phone call attracts the user or the watched content prompts him to search for additional context information on the Internet. Based on those findings several mockups were created, that support such jumps in a smooth and more integrated manner, e.g. by offering an ad-hoc chat room related to the TV show at the Mobile.

Before presenting mockups, we started the creative workshops in a very open and creative manner. Here we identified needs towards an integrated and TV centered media platform that is accessible on several devices and individually configurable. The requirements for a universal access on different devices underline earlier results from Obrist et al. [28] and Tseklevs et al. [33]. Content need to be shared and accessed between personal and shared devices. By focusing on the social aspects, we also identified demands regarding a more integrated solution. A flexible overall platform as described by Cesar et al. [8] and Martin and Holtzman [23] seems to be a good starting point for exploring more specific aspects in detail. In one case, a participant wanted to have messages displayed at the TV, while the partner replied with doubts and asked for personal output that would not distract the TV reception. The preference for a favored solution is not triggered off by personal needs only, but is even influenced by the social dimension of TV as a central shared display in the home. Within our study, we identified several subtopics that are of importance, including private vs. shared notification mechanisms, context-based recommendations, flexible and personalized decisions about the devices for content input and output as well as related service & source integration. Further systems should be designed as flexible as possible so users can customize their media and information access as well as settings for social intercommunication.

Regarding to our ‘jumping’ behavior it means that switching between devices and media is getting more seamless because services and content are related to each other and are not bounded to specific devices. In this way, available services and devices can be used for a better-integrated Social TV experience, e.g. father receives a recommendation about a movie clip on his Smartphone by one of his friends and brings the clip directly to the TV for watching it together with the whole family. In order to support such use-cases a very flexible overall platform is required. As starting point we designed a SocialMedia framework (see Figure 7) that consists of an in-house media server and a community server. The home-media server hosts the shared content and especially is responsible for recording and streaming TV and media content to different devices (in-home distribution). The SocialMedia community server hosts the community functionalities and offers registered participants access to sharing, awareness and communication functionalities. Existing image-, video- and community portals can be connected.

Besides the ongoing work of implementing the SocialMedia framework, we even started to face the identified needs by developing first concepts for integrated social media applications. While mobile phones are personal devices and have small displays, we started to work on a secondary shared screen approach [34]. The concept was implemented with a multi-touch

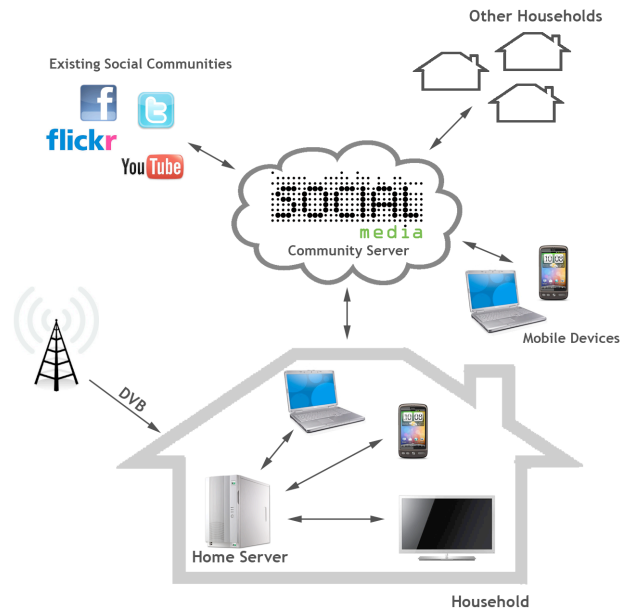


Figure 7. SocialMedia Framework

couch table as a secondary display that enriches the TV experience. In this context, we are developing several TV-centric widgets for remote control and intercommunication between households. A challenge here is the design of group profiles in social networks that are necessary for common interactions between several households. Even if such a concept has great potential for supporting exchange between households, current results indicate that the table supports social use among the members of a household, e.g. by doing something together. As another direction of research, we focused on ambient-aware infrastructure that automatically integrates available devices and services. In order to realize such a flexible detection and integration, we developed an ambient-aware infrastructure to discover high functional electronic devices (e.g. TV) in local environments. The implemented use-case detects available services and makes them accessible and manageable by using a Smartphone [22].

7. CONCLUSION AND FUTURE WORK

Recent years have seen a surge of new technologies and social media innovations, which alter the media landscape. Nowadays, television as one of the main pastime activities in the domestic environment is more and more supplemented by on-demand services. The broadcast content and on demand content are becoming increasingly interwoven. As shown in our study, media convergence has already been established in several forms. Media convergence especially becomes visible in a cross-platform usage that is characterized by a flexible access to content and communication options on different devices. This means on one hand, devices start to have extended functionalities, which leverage the functions of the others, for instance, watching TV shows from online portals at the PC. On the other hand, different devices supplement each other in an ever-greater extent, e.g. getting additional information for a TV show on the Internet. In all of those cases different kinds of jumps between devices and services take place.

Participants in our study requested for more integrated concepts that guide to interesting options in a smooth way, e.g. by linking to related information. Additionally, an intuitive interface concept is necessary that has a common look & feel also on different devices. Concerning such device-bridging approaches that are characterized by more integrated services, many questions regarding valuable and sensible concepts in an interconnected Social TV environment need to be answered. Using integrated empirical methods, we gained our first sight into the interplay of TV, PC and mobile technologies in domestic environments. Concrete use scenarios were generated based on this knowledge and then examined with the users. Through a series of empirical studies we were able to understand expectations and presented a shared understanding from the concepts we tested. Of course, further research is necessary to explore relevant aspects in more detail.

ACKNOWLEDGMENTS

This work is supported by the Ministry for Innovation, Science, Research and Technology of the country of North Rhine-Westphalia, Germany with resources from the European Union and European funds for regional developments (Ziel 2).

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