

# Digital technologies in everyday environments: Zooming in and out to children's and their families' smart device practices with public and private screens

Long paper<sup>†</sup>

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## ABSTRACT

Digital technologies have become more and more ubiquitous. The role of technology in our everyday has changed radically, shaping existing practices and facilitating new ones. Human Computer Interaction (HCI) research has recently interested in practice studies. Looking beyond novelty value of technology, practice studies try to understand how technology becomes integrated into everyday life and how it shapes everyday practices in longer timespan. This paper responds to the recent call for practice studies and utilizes Nicolini's toolbox approach for making sense of technology-facilitated practices of children and their families in their everyday life. We first zoom-in on children's practices with a multipurpose public display through an ethnographic field study, and then zoom-out to the children's and families' smart device practices through a diary study. We show that children's practices with public display were surprisingly similar with practices elsewhere. The contribution is 1) demonstrating the use of the toolkit approach, and 2) shedding light on children's and families' smart device practices in private and public settings.

## CCS CONCEPTS

• **Human centered computing** → **Human computer interaction (HCI)**; *HCI Design and evaluation methods* • **Collaborative and social computing** → Collaborative and social computing theory, concepts and paradigms.

## KEYWORDS

Public display, practice, children, families, ethnographic study, diary study.

## 1 INTRODUCTION

Digital technologies have transformed our lives. New technologies are increasingly involved in our daily practices. Sometimes technology shapes existing practices, other times it facilitates the emergence of new ones. In HCI research emphasis has recently increased to real usage of

technological artefacts and practices around them. Practice approach has been called for to look at technologies beyond their novelty value – to understand how technology is embedded within social practices in the longer timespan [31]. Practice approach has its roots in social sciences. Instead of discourse or interaction, practice theories emphasize 'practices' as the origin of the social. Practices are relatively stable performances, ways how things get done, routines consisting of a number of interconnected and inseparable elements: physical and mental activities of human bodies, material environment, artefacts and their use, context, human capabilities, affinities and motivation. Practices are dependent of all of the mentioned elements and cannot be studied only through one of them. [31]

In this paper we respond to this call and utilize a "practice lens" for studying technology in use [26]; [20]. Practice lens enables a holistic perspective, which allows to understand technological artefacts as a complex sociotechnical ensemble with spatial, temporal, social, cultural, material and historical dimensions. We explore these practices in the lives of children and their families. Following Nicolini's toolbox approach [20], we first conducted a zooming-in study on technology-facilitated practices around a multipurpose public display located in a swimming center, and then conducted a zooming-out study on the multipurpose display users' everyday lives in wider scope for understanding their smart devices practices in space and time. We report on this trajectory of studies. including zooming-in and zooming-out perspectives.

During the recent decade, tablets and smartphones have truly changed family life and mundane practices. Children have easy access to smart devices and use them at younger age [22] ; [35] ; [27]. Smart devices have become mundane and natural part of our daily lives and are intertwined with many of our daily practices. Technology has changed existing practices and new ones have emerged, e.g., technologies are commonly used as parenting tools [35]. In this paper, we compare public display practices identified in the swimming center with the practices families and children

have with their personal smart devices elsewhere. We show interesting correspondences between public and private use of smart devices as well as distinguish location and device related differences in the practices.

The main point of this paper is to demonstrate the use of the Nicolini's practice toolkit [20]. Through the zoom in and out studies we explore: Are public displays in public settings used for similar purposes as personal media devices at home? What kind of constellations of technology-facilitated practices can be found in children's and their families lives? And finally, what value the zoom-in/zoom-out toolkit approach for practice studies may provide?

### 1.1 Practice lens by Nicolini

Practice lens introduced by Nicolini [20], combines practice theories and utilizes sensitivities of different approaches. This approach is coherent with most of the practice theories as they share common elements. The toolkit approach "adds value and offers benefits, as it enables us to exploit the strengths of the different theories in order to get a better grasp of the nexus of practices we live in." [20]: 213.

The toolkit approach includes two phases which vary with each other: *zooming-in* on the particular practice and its accomplishment and *zooming-out* on the relationships of practices in space and time. In *zooming-in* study we concentrate on details of accomplishing a practice in specific time and space concentrating on following:

1. *Performances*: Practices are real-time events in specific moments of time and locations, which exist only when enacted and re-enacted.
2. *Material aspects*: Practice always involves body and material artefacts, accomplishing a practice necessitates bodily choreography
3. *Aims and meanings*: Practices are performed for some reason. Practical concerns guide the practitioners.
4. *Creativity vs. normativity*: Practices are re-produced each time they are performed. They are bounded but still dynamic and under continuous evolution.
5. *Durability*: People with similar skills and aims as well as the artefacts involved are making practices durable.

*Zooming-in* is followed by *zooming-out*, where the scope is expanded from specific time and place. It means "patiently following the trails of connections between practices; observing how these connections come to form entrenched nexuses of nets..." [20]: 230. Through these stages an account of the practice and its effects and dynamics is provided [20]. *Zooming-out* study focuses on:

1. *Connections between practices*: these are studied by following connections in time and space, shadowing the practice in other places where it shows up.
2. *Practice acting at a distance*: practices contribute to wider picture and distant practices affect each other
3. *Looking back in time*: one should also acknowledge the historical aspect, how did we get here?

Earlier, we have conducted a zoom-in analysis of the public display practices at the entrance hall of a swimming center **Error! Reference source not found.; Error! Reference source not found.** In this article we expand our earlier analysis by conducting a *zooming-out* study [20] through following the practitioners to their homes.

## 2 RELATED WORK

### 2.1 IT practices and public displays

So far public display research has touched upon dimensions of practice approach in scattered studies [9]. There are studies concentrating on users' performances and interaction around public displays revealing phenomenon like honeypot effect [5] and audience funnel [17]. Material aspects relating to display location and physical display [3] or bodily aspects [17] have been discussed. Aims or meanings of practices have been touched upon [15]. In most of these studies, however, the display installations have been short term that hinders studying the emergence of everyday practices around the displays in the longer run.

There are studies also on longer deployments, e.g. on community display deployments, within which recurrent routines like performances, practices or seeds of practices have been identified [32]; [15]. Previous studies have also concluded that public display installations should be designed so that they cause minimal interruption or fit well with the local practices [16]; [23]; [36]. Overall, in related research on public displays, practices have been mentioned as something that should be acknowledged, but theoretical or empirical approach has been limited.

### 2.2 Children and public displays

Children have not been entirely neglected in public display research earlier, but research has been limited. Children's interactions with public displays have been studied e.g. in museum [2] and in urban park [18]. Several studies around pervasive and public displays have concentrated on learning [7] and behavior change [4]; [14] in schools [14] and playgrounds [4]. In addition, observational studies of community or public display installations in urban environment have revealed that children and young people are frequent users of such systems, and keen to play with them [15]; [28]; [19]. Although children have been seen as users of public displays, their practices around such displays have not been examined in depth.

### 2.3 IT practices within families

With the proliferation of smart device technology, public debate on children's and families' media usage has become a hot topic. Myths like childhood and technology should not be mixed, and technology hinders social interaction and dominates children's lives are common [29]. The younger children are involved, the more critical opinions are. Also academic discussion on the topic has been vibrant in different disciplines. It is already known that parents use media technologies for managing daily lives with young children. Many parents turn to technology when they need to get things done (make dinner, take shower etc.). Most likely media used in these moments is TV, whereas mobile devices are used more when children are older. [35].

In HCI research, more child-centered views have emerged during the past decades. Still, they are mostly related to design for and with children [30] and they mostly do not concentrate on technology use at homes or in other private

settings. In turn, domestic HCI studies that do examine homes concentrate typically on smart home applications and not on practices, let alone children as users [21]. Some studies on family life and smart device practices have nevertheless been published. These studies have shed light on parents' mobile device usage [24], use of mobile phones at mealtimes [9], small children's tablet use [10] and parents' regulation of children's media use [8]. However, there is still a need to study how technology is consumed at home and in other private settings and how it becomes integrated with and shapes everyday practices in these settings. More research on children's technology-facilitated practice is also warranted.

### 3. RESEARCH DESIGN

#### 3.1 Study set-up

The study first focused on ubiquitous computing infrastructure consisting of 18 interactive large public displays (UBI displays) located around the city of Oulu in Finland. The interactive displays consists of various services including news, weather, public transportation, games, art, announcements and advertisements. The content and the user interfaces are identical in all of the displays, with the exception of a display at library with customized content. The infrastructure was launched in 2009 for the purpose of providing a testbed for ubiquitous computing research as well as for serving citizens [25]. Quantitative logging of use events showed that there were only few regularly used displays in the network [37]; [25]. Only one display collected clicks on its surface throughout the year. This display was located at an entrance hall of a swimming center. For the purposes of studying display practices, we decided to concentrate on this particular display. In this paper, we start by zooming-out in time and describe shortly the origins of the display project (more thorough analysis of the development process in **Error! Reference source not found.**). After that we zoom-in to the swimming center display and describe briefly four most common display-mediated practices we found (more profound zoom-in analysis in **Error! Reference source not found.**). Afterwards, we expand our earlier zoom-out analysis and follow the connections between practices. This is done by following practitioners and their families and shedding light on their display practices elsewhere. This necessitates also zooming-in to understand those practices in more depth.

#### 3.2 Methods and material

*3.2.1 Zooming-in – Ethnographic field study.* The first part of the data was collected through an ethnographic field study around the public display located at the entrance hall of a swimming center. The material consists of 55 hours of observations and field notes, as well as field interviews with 37 display users and their parents. In addition, we interviewed three swimming center cashiers, who work near the display and observe it regularly.

This material was analyzed qualitatively through data-driven method and the practice lens was utilized as a

sensitizing device. The analysis consisted of the following phases: 1) Studying concrete performance around the public displays, 2) Examining the cultural-spatial, temporal, social and material dimensions related to the display practices, 3) Analyzing the meanings of the practices.

*3.2.2 Zooming-out – Developer interviews.* To understand the background of the display project, we conducted semi-structured time-line interviews [1] with seven researcher-developers involved in the display project (authors of this article were not part of the developer team). Each of the interview lasted 1-2 hours, and they were conducted by two researchers. Interviews were audio recorded and transcribed. The data analysis was data driven.

*3.2.3 Zooming-out – Diary study.* Expanding the scope is also done by following the practices and by extending our observation to other places to compare with users' other smart device practices. This zooming out helps us to see the practice networks users have and how they may influence the display practices at the swimming center. Following the practice was conducted through a self-observatory diary study [6] and interviews with three families who were also users of the swimming center public display (see table 1). The number of families is rather small, but sufficient for detailed interpretive qualitative analysis. Diary study was selected as the method as it provided unobtrusive possibility to study what happens in people's private homes.

**Table 1: Families in diary study**

#	Members	UBI display usage	Smart media devices
1	mom, dad, sons 4 & 8 yrs.	Mainly 8 year old uses the UBI display at swimming center while visiting.	1 tablet, 1 laptop, 2 smart phones, 2 game consoles, 3 TV:s
2	mom, dad, daughters 3 & 6 yrs.	Mainly 6 year old uses the UBI display at swimming center while visiting.	1 touch screen laptop (~tablet), 1 desk top, 2 smart phones, 1 TV
3	mom, dad, daughters 4, 4 & 9 yrs.	Mainly 9 year old uses the UBI display at school	5 tablets, 2 laptops, 3 smart phones, 2 game consoles, 2 TV:s

All families had some practices with the public display in the swimming center, where one or more members used the display. In addition to the display usage, the families where asked to report in the diary other smart device usage in their daily lives, and concentrate specifically on the children's smart device practices. The participants were asked to report every time some of them used the public display and at least twice a week usage of another media device at home or elsewhere. The diary consisted of 20 device usage events. Each participant was asked to answer the following questions related to these events: Device used; Space of interaction; Date and time; Where were you and why?; Who used the device? Who were involved in the situation? What other family members were doing at the time?; What was done with the device? Why?; Why and how use was stopped? How long the device was used in total?

In addition, the study included two interviews with 1-2 adult members of the family. The first interview was conducted prior the diary period, the second after it providing the interviewees a possibility to reflect on their experiences after the self-observatory diary period. The interviews were semi-

structured: some questions guided the conversation, but the interviewees were free to chat whatever related to their

families' smart device usage. The questions were related to smart devices at home, who was

**Table 2: Summary of the research material**

Data	N	Description	Rationale
<b>Field notes &amp; videos</b>	80 pages & 24 hours	Ethnographic field study at around the UBI display at swimming center	Zoom-in –study: for understanding, performances, material aspects etc.
<b>Field interviews</b>	36	Field interviews with display users and their parents at swimming center	Zoom-in –study for understanding aims and meanings of the public display practices
<b>Diaries</b>	3 diaries (3 x 20 entries)	Paper diaries with entries about UBI display usage as well as situations with personal smart devices.	Zoom-out – study, following practitioners and their families. To understand links between smart device practices.
<b>Interviews</b>	3 x 2 interviews	2 Interviews with each participating families, which lasted appr. 1 hour each	Zoom-out –study, understanding the wider picture and social arrangements behind the practice
<b>Developer interviews</b>	8 interviews	8 semi-structured interviews with developer-researchers	Zoom-out – understanding the background behind the emergence of practices, following the practice in time
<b>Log-data</b>	appr. 8 months	Interaction events in each display of the display network, most launched apps.	Zoom-out – Following the practice in space

using them, rules related to device usage in the families, possible conflicts related to smart devices, and practices at the swimming center.

The diary study data was analyzed qualitatively through data-driven method. The diary entries were tabulated into excel sheet, separating: family number, device in use, date & time, description of the situation, users & other people present, n of users, what was done, duration of use, the end. The interview data was categorized into babysitting, entertaining, parent control, social interaction, concerns, calming the child, positives, and negatives. Although this analysis was purely data-driven, the initial categorization already indicated correspondence with the swimming center study. Afterwards, we used the toolkit approach as a sensitizing device to both diary and interview data and analyzed a) recurrent performances with displays, b) spatial, temporal, social and material dimensions of the practices and c) meanings/aims/roles of the practices. For c) we used the practices already identified from the swimming center study as a sensitizing lens, while we also identified a new one: information seeking. We combined the diary entries on the public display usage with the ethnographic data from the swimming center, as they fitted together, and present this data in section 4.2. Table 2 summarizes the material.

## 4. RESULTS

We first zoom-out in time and present the motivation and rationale behind the public display deployment. We show how the past influences the emergent practices found today. Afterwards, we present findings from the zoom-in –study in the swimming center. This is followed by the zooming out study involving shadowing the practitioners in space and time and afterwards zooming-in on their practices in other settings. Finally, we discuss the connections between the screen practices at public and private settings.

### 4.1 Zoom-out - Historical aspect – How did we get here?

The whole network was part of Open UBI Oulu research project between local university and municipality. The project was based on an idea of building a ubiquitous computing environment for real. Besides working as urban

computing testbed for researchers at the university, the aim was to offer high quality services for the city dwellers and ease interaction between citizens and municipality. In the design phase, the developers had brainstorming sessions and interviewed and observed city dwellers to find out service needs and expectations of the people. Part of these ideas were implemented: content types such as maps, transportation, events, food, news and games were implemented according to citizen's wishes [25], [12].

During summer 2009 the displays started to be installed around the city. They were installed in different locations, some outdoors, and some indoors, including Pedestrian Streets, sports centers and the main library. Common for all the places was that they were not privately-owned commercial spaces. One of these locations was entrance hall of a swimming center. After the launch, usage rate of the displays started to decrease slowly [37]. Surprisingly, the swimming center display turned out to be clearly the most frequently used, collecting usage throughout the year. Content wise, interesting was that actual usage corresponded only weakly with users initial expectations, games being clearly the most used content type [12].

### 4.2 Zooming-in on the public display

Frequent use of the swimming center display indicates existing practices in the location. This section takes a closer look at the practices around that display. We first discuss some common characteristics of the practices and then categorize them according to their aim and meaning.

*4.2.1 Concrete performances with swimming pool public display.* According to our observations, the swimming center display is mostly used by 7-12 year old and younger children. Older children usually play games with the display in groups of 2 - 7. Younger users also just randomly touch the display surface without actually playing an implemented game. Display is typically used while waiting. Use sequences vary typically from 5–20 minutes.

*4.2.2 Cultural-spatial, temporal, social and material dimensions of the public display practice.* There are several features which boost the display practice emergence in the space. The display is located centrally in the swimming

center entrance hall. The hall is open space and the display is visible from most of the area. People entering and leaving the space are crossing the display. Space serves as a waiting area for many. During recurrent peak times the space is crowded while during quiet times it is almost empty.

The display interaction is touch-based. Due to its big size younger children have difficulties in reaching it. Hence, bodily choreographies to elevate this problem are common: jumping and climbing on the pedals is typical. Parents also lift their kids sometimes to the display.

**4.2.3 Aims of the public display practices. Display as entertainer.** Observation of practices revealed that the swimming pool public display was often used as an entertainer. In this practice, display is used every time when visiting the space. Users tend to be young children or primary school aged children (under 12 yrs). This practice is learned from and it persisted through groups of children, who regularly visit the swimming center to participate in hobby groups. The space supports practice development in the sense that it does not offer any other entertainments for the children besides the interactive public display.

**Display as time killer.** Slightly different practice is using the display as a time killer. These users do not use the display as enthusiastically as the previous ones. Display is used for spending time, when there is nothing else to do. These people are usually teens, children or sometimes adults who are spending time alone in the space, waiting for something. In these situation, personal smart phones may be preferred over the public display.

**Display as babysitter.** We also noticed that the display helps parents to handle waiting situation in the swimming pool entrance hall. While children are drawn to the display, play with it or watch others play, adults line up to pay fees, park car or chat with each other; i.e. they use the display as a babysitter. For frequently visiting families, the display has become part of the situational routine. Parents may direct the kids to play with the display, open an app for the children and watch their play from distance.

**Display as supporter for social interaction.** The display was also often used by groups, who play the games together, talk about the games, co-operate, cheer each other and laugh loudly. The small or bigger (2-20 players) groups belong to same training group or school class. These group players are usually approximately 10-14 year old children and teens, and they are visiting the space during school days (school PE class) or at afternoons and evenings (training groups). The big size of the public display is supporting these group activities, also particular games are well suitable for co-operation. Another type of social interaction emerges when family members, especially parents with children, use the public display together. In these cases pedagogical aspect is often involved.

### 4.3 Zooming-out - Following the practitioners

After concentrating on the public display, we expand the scope by following the practitioners through the diary study.

At first we take a look at the different dimensions of the smart device practices within the families studied.

**4.3.1 Concrete performances in each of the families.** According to our study with three families, displays are often used in the lives of families with small children. Although there were differences in the smart media device practices between the families, there were also similarities.

In **family 1**, 8-year-old son used a tablet device, which was his own, typically alone (in 7 out of 20 reported events). He used the device for relaxing between hobbies and school work. He even took it to bed sometimes at night. Sometimes, also little brother watched, but he did not use any device by himself. The family also reported activities, in which the whole family, or a parent with one or two sons, participated (7/20), watching videos or playing games. The family had one tablet, owned by the 8-year-old, but also parents used it occasionally. The tablet was purchased when the son started school, because it was needed for school work. The tablet was usually kept in the kitchen, but the older son could take it into use when he wanted.

In **family 2**, 6 year old and 3 year old daughters used most often the devices together (18/20). They played with mobile phones in versatile ways, they not just played games or watched videos. During the diary period the children often used the phone camera and photographed toys, nature and each other, and looked at the pictures (9/20). Children also used the phone for timing, running around the house. The parents did not use devices together with children. The typical situation of device usage was described by the father as: "It is probably at noon, when I have to make lunch or something, when I put some video for them in YouTube." The family had only one touch screen tablet at the house. The parents controlled the usage by giving the device for the children and controlling the passcodes.

**Family 3** had more smart devices in use than the other families: five tablets, which were shared with all. 4-year old daughters used the device usually together (16/20), but also mom participated sometimes (4/20). Most often children watched videos while eating breakfast or evening snack. Parents were doing morning routines, household chores or working at the same time. Also 9 year old daughter used devices, usually alone. She e.g. listened to Harry Potter talking book through YouTube. The mother described a typical situation of tablet use: "Well, at the morning when they wake up. They start almost right away to watch something from iPad. When they eat breakfast - - If the older daughter has later morning, she takes it too." 4-year-old twins used devices typically in shared family spaces (living room, kitchen) where parents were able to control what they were doing. However, they had usually free access to the devices and knew passcodes of each device.

**4.3.2 Cultural-spatial, temporal, social and material dimensions of the practices.** Children used the devices most often in groups of two, usually siblings watched videos together. Older children used devices more often alone. All families reported adults doing household chores and other duties, while children were using devices. Most of the

reported usage events were located at home (living room, kitchen, child's bedroom) but another common place for device usage was car. Families reported display usage during short daily travels to hobbies etc. Most often the device was tablet, which was used at home. Phones were frequently used in car. All families regulated children's device usage. Devices were taken away from the children, when they had used them for a certain time. None of the families had a specified a maximum "screen time".

**4.3.3 Meanings of the practices.** In the interview diary data, we noticed similarities in the smart device practices at home compared to the swimming center. Next, we discuss the corresponding findings on smart device practices, categorized into the four afore mentioned groups.

**Smart device as an entertainer.** In these families, using smart devices was fun and entertaining. Children used them eagerly. Thus, most of the reported events concerned using device as an entertainer. Parents said that at least sometimes the children would use the devices all the time if allowed.

*Well, I guess always when he has time. This 8 year old would probably use it all the time (Mother, family 1).*

*They would always want to take it to the dining table. Sometimes we try to forbid them, if we have time to eat together. If everybody are eating together or something. I don't think its [using tablet] no different than reading a paper [in the table]. (Mother, family 3)*

When device is an entertainer, playing or watching videos etc. is the primary function. Devices are used because it is fun and not because parents are trying to keep a tired and hungry child calm, or do something else. In these situations devices can be used alone or with others.

**Smart device as a babysitter.** Parents also used technology to keep the children occupied and still. Using smart devices as "babysitters" was very common at home, when adults were not able to pay attention to their demanding children, and they had duties to do or just wanted to relax. The devices were either given to children, or the children took the devices themselves. Mornings were mentioned as times, when devices were used for this reason: at weekday mornings for letting adults to do things, and during weekends for giving parents the possibility to sleep later. Another busy time for using the devices as babysitters was after workday when making supper.

*Mornings are usually very busy, you have to do many things, so it helps in certain way, so that they are not at least requiring anything when they are watching it [tablet]. Of course, it makes it more challenging, when they should start dressing the outfit and leaving (Mother, family 3)*

*They probably watch more during weekend mornings. When they wake up between six and seven and when we have not hurry, so that we stay in bed. It's just nice to lay down and time might pass (Mother, family 2)*

*It is very typical that when you are making supper when you have come from work. There when they are waiting [they may use tablets], they don't necessarily feel like playing together right away after daycare. (Mother, family 3)*

Devices were given for children also when they were tired or crusty, if parents were not able to give enough attention. On the other hand, devices were taken also away from children if they caused arguing between siblings.

**Smart device as a supporter for social interaction.** At home, devices were used often together: it was more

common than using them alone. Siblings watched videos together, or played in turns and watched each other's play. Typical was that older sibling played and younger watched. However, conflicts potentially emerged in these situations.

*Twins were playing side by side (with iPhone & iPad) Minions game. They chat where they are and how far they can get. (Diary, family 3)*

*Yes occasionally [they use the tablet together], but then again might be that the smaller is poking as much as, you have to let the older son to be alone. (Mother, family 1).*

Families had also practices, where a parent used devices together with children. Playing games with phone, tablet, or game console were mentioned. While playing games, next moves were discussed together:

*Mom was sitting and resting at the living room couch mobile phone at hand... mom had the mobile phone at first in hand, but all (twins) were playing (Diary, family 3)*

Also watching movies or videos together was common practice for some. However, for movies usually bigger screens were in use – television was preferred for that.

**Smart device as a time killer.** Children (as well as adults) often used smart devices while waiting and having nothing else to do. In public place, time killing seemed to be prominent practice with the display. At home, displays were rarely used for this purpose. This sort of role for technology was especially recorded when travelling in car. Common for these situations was that some sort of un-pleasant feature in the situation led to device usage: children could not move (in car), they were uneasy etc. In the following quote, smartphone was used in a car similarly for time spending purpose.

*We were waiting in the car the older daughter's ballet class to end. It lasts for 45 minutes and we were the whole family there this time... The younger daughter started to get tired after day at kindergarten and started to lose patience in the car, so we didn't go to the store all. Instead she stayed in the car with father... She was watching animations in YouTube. (Diary, Family 2)*

#### 4.4 Connections between display practices

The practices with different displays (public vs. private/ fixed vs. mobile) had surprisingly many similarities. Displays in both contexts were used eagerly as wanted and desired entertainment. They were used because they enabled a fun and nice way to spend time. Entertainment was the most common aim of practice in both situations. The difference was that for the public display, the eager users were typically small children or school aged boys. The user group was narrower compared to the private setting where all family members used displays.

Displays were also used for "babysitting" in both contexts. Due to the entertaining factor of the displays this was possible. In the swimming center adults paid swimming fees or parked their cars. At home parents did household chores or worked while children were entertained with digital screens. In both contexts adults were also relaxing, while children were playing with displays. Interesting was that while other adults rarely interacted with the public display at the swimming center, parents seemed to be more lenient with it, guiding their children to interact with it.

The social nature of technology was visible in both private and public contexts. In the swim center the public display was regularly used together by group of friends socially. We found same sort of behavior with private and mobile screens in families. Parents played games with children or siblings watched videos together and discussed the games. Family members also used multiple devices at the same time, playing for example same game side by side. However, in the home context the groups were smaller due to smaller screens and fewer people involved.

The biggest difference between the two types of display practices was that although mobile private displays were also used as time killers, in the swimming center this was much more common. According to our diary study, displays were given for children to pass time most often in car, while having nothing else to do. On the other hand, in the swimming center, most people, especially adults and teenagers, preferred their own mobile phones for time killing purposes. However, it is not surprising to find different smart devices to be used for time killing at the swimming center, as the space is a waiting space for many.

## 5 CONCLUDING DISCUSSION

This paper responded to the call for practice studies [13] and used Nicolini's toolbox approach [20] for making sense of technology-facilitated practices of children and their families in their everyday. We zoomed-in on practices around a public display at a swimming center. We observed that frequent users were children, who regularly visited the place. We also identified recurrent usage patterns of the display: using the display for entertaining, babysitting, supporting social interaction and killing time. After zooming-in to the swimming center display, we zoomed-out to the display users and their families to find out connections between practices in other contexts. Surprisingly, the smart device practices elsewhere were quite similar to those found around the public display. This indicates that especially for children the public display was just one of their mundane smart device "toys", which was used for the same purposes than devices at home. Also parents seemed to have the similar mindset.

This study indicates that public display (or any other technology-facilitated) practices do not emerge out of the blue. We see several factors contributing to the practices to emerge: the artefact itself and its affordances, the nature of the space, but also the mindset of the users and developers. As for the users of this public display, the display practices are just on one end of the continuum of media practices today. We can assume, that public display practices do not come first, but instead the use models are learned at home or at school and then applied to the public displays. Then again, interestingly also parents seemed to follow the same routine in public context as at home; they harnessed the smart screens for baby-sitting their children in a similar manner in these different contexts. Hence, our study suggests that particular practices may migrate to different places through

the practitioners, who end up doing same things and serving the same needs in different places with different devices.

This finding has implications for research and design: it indicates that when developing technology, we should pay attention to many factors that might be contributing to the emergence of practice around that technology. Developers make many influential decisions, but understanding users, their motivations and their existing practices is significant too. Important is to understand that it is not necessarily obvious from where the technology-facilitated practices originate or derive their inspiration. In the swimming center case, it was mainly children and their families who found use for the public display, and their existing smart device practices at home bore clear resemblance to the practices in public space. This might have been difficult to anticipate by developers. It is a challenge to figure out from where the potential practices might be migrating. One natural way to start approaching this is to identify potential users and start examining their baggage with technology-facilitated practices with quite a broad scope. Of course, one could try to concentrate on practices with somewhat similar technology, but it is not always clear what this somewhat similar technology entails. Important are also field studies on the use of existing technology: through those we can develop understanding of different technologies and practices emerged around them. Evaluations of technology in use necessitate long-term deployments and studies, looking beyond the novelty value of technology.

The main contribution of this paper is to present the practice approach and to demonstrate how to use the practice toolkit [20], with zoom-in and zoom-out studies in practice. The zoom-in –method encourages researchers and designers to study interactions with artefacts within several layers which all have implications on the emergent practices. The zoom-out method, on the other hand, expands the scope and helps in finding similar practices, which may have an influence on the artifact and its usage. Overall, the zoom-in and zoom-out perspectives encourage *in situ* examinations of people's performances with smart devices, also taking into account various kinds of historical, social, cultural, spatial, temporal and material aspects. They encourage studying people's life worlds broadly, not merely focusing on usage events of single technology. However, there are many open questions relating to this type of studies. It is still not clear how far and where zooming-out studies should be done to find something meaningful. In our case, following everyday life, concentrating in the home, was enough, but this was not known from the beginning. Another interesting, yet open question concerns the possibility to support or encourage such migration of practices we discussed. It is not known whether existing practices could be intentionally relied on in this sense or whether their emergence merely needs to be appreciated but cannot be deliberately directed or predicted in any way.

The diary study could be extended with observational one to make sense of the variety and richness of smart device practices in families with children. Diaries and interviews

provide only glimpses of the practices. Then again, it might be very challenging to conduct such an observational, longer-term study in people's homes. Moreover, even with this data we managed identifying similar technology-facilitated practices around smart devices at home and in a public space, alone a valuable contribution. Researchers interested in practice studies should consider the implications of our results in their context: what kind of practice constellations could be identified in their case, what kind of trajectories of practice migration? We welcome other researchers to utilize the toolkit approach by Nicolini and start zooming-in and zooming-out to understand technology-facilitated practices as a significant part of our everyday life.

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