

## **INTRA-FAMILY COMMUNICATION NEEDS; HOW CAN AWARENESS SYSTEMS PROVIDE SUPPORT?**

Vassilis-Javed Khan<sup>1</sup>, Panos Markopoulos<sup>1</sup>, Selene Mota<sup>1</sup>, Wijnand IJsselsteijn<sup>1</sup>, Boris de Ruyter<sup>2</sup>

<sup>1</sup>Eindhoven University of Technology, Den Dolech 2, 5600MB, Eindhoven, The Netherlands {v.j.khan, p.markopoulos, s.a.mota-toledo, w.a.ijsselsteijn}@tue.nl

<sup>2</sup>Philips Research, Media Interaction, Prof. Holstlaan 4, 5656AA, Eindhoven, The Netherlands  
boris.de.ruyter@philips.com

## ABSTRACT

This paper presents the concept of Ambient Awareness that pertains to using Ambient Intelligence technologies for the purposes of sustaining awareness between individuals or groups of people, over sustained periods of time. The first explorations of this concept are conducted within the context of supporting awareness for busy parents having young children. We sketch the requirements drawn from an interview study, involving 20 interviews with working parents and we identify unmet communication needs that this type of technology may support.

**Keywords:** Communication needs, Awareness Systems, Parental involvement.

## 1. INTRODUCTION

Awareness Systems are an emerging class of communication systems that support individuals to maintain with low effort, and often through incidental interaction, a mental model of the activities and state of another individual or group. An early example is the work around Media Spaces at Xerox in the 90's, see Bly et al (1), which supported co-workers within and across remotely located office-sites to maintain peripheral awareness of each other.

The present paper is particularly concerned with applications of Awareness Systems to support social communication for leisure rather than work. A very rudimentary and uninformative instance of an Awareness System is the "buddy list", common to Instant Messaging applications (this simply creates awareness of whether "buddies" are on line or not). More advanced examples are being developed at research laboratories worldwide, e.g., displaying the general availability for communication, location of a mobile individual Milewski and Smith (8) or even point-casting brief video footage of activity at home Hutchinson et al (4).

Awareness Systems are not meant to support efficient information exchange tasks nor intensive, media-rich communication experiences that emulate face-to-face interaction. Rather, they are usually designed to be calm technologies (10), populating the periphery of the attention of a person with information about others. Their added value over other communication media is in the long-term, low-effort link they create between individuals and groups. In our earlier research we have provided empirical evidence that peripheral awareness translates directly to improving social relations and group feelings Huijnen et al (3); Markopoulos et al (7).

Our research explores two avenues for advancing the state-of-the-art in Awareness Systems, which together comprise the notion of *Ambient Awareness*:

- *Automatic Capture* of awareness information through context sensing and interpretation. An environment, e.g., a home equipped with context

sensing capabilities, should construct a model of activities within its confines. This "social model" of residents' activities in the home could, for example, inform a remote user that the whole family is watching TV or that there is nobody at home, etc. Further, an aware environment could support the automatic or semi-automatic creation of Audio Visual (AV) content, e.g., helping residents capture interesting moments to share with remotely located family and friends.

- *Pervasive Awareness*. For mobile individuals, awareness information can be obtained from a surrounding (computationally augmented) environment, in order to be communicated to selected individuals. For example dad's mobile device may be tracked entering a train station and this fact may inform the family back home that he is on his way. An environment or, rather, a proxy representing that environment may compile such awareness information without any sensing at all. Rather, it may use information provided by numerous mobile devices to synthesize a model of the social situation. For example, the size of a crowd present at an open-air event, e.g., a rock-concert, does not need to be sensed when it can be roughly estimated by the number of mobile devices in the area (e.g., tracked by GPS or other localization mechanisms).

The true potential of Ambient Awareness becomes evident when Automatic Capture is combined with Pervasive Awareness. An environment may supply a description of the context (e.g., fun-fair) and its content creation/capture capabilities (e.g., taking a picture on the roller-coaster). Mobile devices can regulate this information capture through embedded privacy profiles of their owners, (e.g., such a privacy profile could consent to photographs being taken or even allow for the images to be directly visible to the family back at home). A richer (shareable) AV record of such a shared or public event may be created by combining information captured by different individuals. This record may be shared in a transparent way to the users, once their profiles for sharing information allow it.

## 2. BUSY FAMILIES

Our examination of the concept of Ambient Awareness focuses on busy families, i.e., families with 2 working parents and with children who go to school and follow extracurricular activities as well. Such a busy lifestyle leaves less time and energy for intra-family and inter-family communication. Although existing media cover a number of family communication needs, they sometimes create affective and cognitive costs and leave other needs unfulfilled. In order to identify opportunities for supporting communication needs there is a need to investigate and unpack what these needs may be, and to consider how these vary over different families. We aim to design appliances and services for social communication, similar to Crabtree et al (2), taking a

social psychology perspective on family communication as in Koerner and Fitzpatrick (5). We take a holistic view of needs and daily life patterns for families as in Sellen et al (9), though we focus more on the communication between family members.

### 3. INTERVIEW STUDY: METHOD

We report an interview study aiming to gain insight into family needs and communication. The study is part of a larger scale investigation that will involve contextual observation and experience sampling.

The study involved 20 in depth interviews. All informants were Dutch parents. Sixteen of them had young children fitting exactly our targeted user profile. Four had children of older ages, but we included in the study to obtain a wider perspective and enable contrasts to be drawn out. The interviews were designed to get a better understanding of: communication patterns of parents, the content of their communication, their daily routine activities, their communication needs and eventually to identify opportunities for Awareness Systems in supporting such needs.

Two researchers conducted the interviews independently. Informants had an average age of 40.5 years (31min – 52max), average years of marriage: 12.05 (4min – 28max), average number of children: 2.05 (1min – 3max). All were working either full or part time. There were 8 men and 12 women. Half were well educated (Masters/PhD) while the other half was relatively well educated (high school, college).

The interviews were semi-structured. They lasted approximately one hour and were audio recorded. Following the critical incident technique, the interview commenced with an inquiry into communication events and activities during a recent weekday. The interviewer probed into exceptions and regularities for this day and the specific communications, trying to unravel an account of lifestyle and daily communication patterns. After the interview the recording was fully transcribed. Each and every statement was coded to denote the interviewer, the interview session and the statement. The transcriptions were printed and each set of responses was categorized in open categories. This analysis was done by the same two individuals who conducted the interviews.

Categories emerged iteratively by reading the transcriptions and clustering participant statements. Each statement was considered and tried to be fitted to one of the categories defined at any given point of the analysis; if that was not possible then a new category was created. After the categorization was complete, a small summary was written for each category. We report the results by summarizing the emerging categories.

### 4. INTERVIEW STUDY: RESULTS

#### 4.1 Needs with Communication Mediums

Communications between busy parents during work hours are also interruptions to each other's work activities. Concerns about interrupting each other are a theme that came up repeatedly in the interviews with the parents. While at work informants reported to resent interruptions, unless for an urgent matter, as they wish to concentrate on their work.

They refrain from initiating communications with each other for fear of interrupting their work, unless for an emergency or a change of plans. Contrary to our initial expectations, parents did not report as much a need for directly communicating affective communication, e.g., to indicate that they think of each other, or to display affection over the phone. However, in most cases parents use a practical reason to communicate as a pretext for a richer, more affective communication. This is consistent with earlier findings, as for example reported by Romero et al (11).

#### 4.2. Purpose of mediated communication

We identify several reasons that parents have for communicating during the day. We have clustered them in the following categories: *coordination*, *in case of emergency*, *exchange of experiences* and *support in new family situations*.

**Coordination.** Coordination between parents concerns mostly children's activities. We saw that theme repeating between different parents. The issue is making sure their schedule does not conflict with planned activities of the children. These activities could be either every-day activities, like going to school, weekly-activities, like going to a special class or special activities like going to a birthday party of a friend.

"Micro-Coordination" on the return from work to home has a goal which is to ensure/organize what is commonly referred to as "quality time" in the evening. "Micro-Coordination" has been identified as a need by Ling (6). Our informants seem to mostly engage in what he termed "Softening of Schedule". For parents quality time is mostly time spent with children, playing, reading, having dinner together, etc. The parent arriving last and still aiming to catch some of the activity coordinates how to fit in the schedule with the homebound parent. For that reason, the parent before leaving work will try to collect planning information from the other parent.

Coordination around children can involve other people as well. Usually that happens in case of emergencies. In one case parents asked the help of other children's parents acquainted to them, whereas in another parents asked the help of grandparents. One participant comments:

*"Yeah, sometimes in an emergency situation we have to come up with a solution at once and then we have*

*to discuss it with parents of other children and we ask if she can go with them after school.”*

Coordination about future family activities whether face-to-face or mediated can take place at any previous time: during the morning, the evening before, some days before. It seems that the timing of coordinating depends on how important the activity is.

Participants reported that calendars or/and agendas are important means of sharing information. All sorts of family activities will be written in those. A participant mentions:

*“Of course we have to plan things, because otherwise if we both have an appointment or whatever yeah, we have to find a babysitter. At home I have a, maybe I haven’t tell you, also a calendar from school that all activities from the school, holidays plans all those things are mentioned on the school holiday calendar and this is also what I use for our private things. So both of us we write that <her husband> goes here or not, so that is also a kind of medium that we use. Very important! I cannot do without that.”*

**Emergency Situations.** Several participants report that safety of children and to be able to react in cases of emergency are two important properties they significantly appreciate in a communication device. It is important to mention the mobile phone is the communication device they used most to satisfy these two needs.

**Exchange of experiences.** Parents also express that they like to exchange positive experiences with their partners and children. The importance of sharing experiences right at the moment they happen was addressed in the project ASTRA (7). Dinner is an important family event when family members exchange daily experiences.

Moreover, parents highlighted the need to share experiences in special situations that involve strong emotions. For example, after a job interview, after a very important presentation or when a really bad experience has occurred. Those examples demonstrate a need for emotional support in such situations.

**Support in new family situations.** As mentioned in this paper before, parents do not contact their partners or other family members frequently when they are at work. However, some of them remark that this changes if the family is facing a new situation to which they are not use to, such as an illness of their child or business trip; or adapting to a new life style like new job, pregnancy, new born baby, moving to a new house.

Among the families we interviewed one couple, who had a young child and the wife was pregnant, explain that although they tried to maintain their previous patterns of communication it was hard. The reason was that they had to arrange too many practical issues to which they were not accustomed.

Another example was of a couple in which the grandfather had recently died. They decided it was better for the grandmother, to live closer to their family. Thus, the parents besides their job and family were helping the grandmother to move in town and arrange all the financial affairs for her. That fact initiated more communication between the parents.

Parents, who have often business trips, report that they do not contact their family frequently during this business trips. This might be for several reasons. Sometimes a reason is the time difference between countries. Another reason is the costs of the mobile phone and the regular phone. The most important reason is probably the busy schedule during these trips. However, they will always contact the partner back home to let know that they arrived to their destination and to inform about phone numbers where they can be reached.

Moreover, if the schedule and time zones permit it, participants reported that they will place a phone call during each evening to inquire from their partner about the family and to inform them about their status. Another usual practice is emailing photographs of the place they are and the activities they are having.

### 4.3. Parental Involvement

Among our results, parental involvement in children’s lives emerged as a category of particular importance, influencing the behaviour, communication and awareness needs of the working parent throughout the day.

Participants reported that after leaving their work, they switch their mind to the family sphere. They describe their evenings as a busy time in which they have to do multiple tasks at the same time, prepare dinner and pay attention to their children. Particularly if children are very young, they have to keep an eye on them to take care they do not have an accident or do not break anything. Most of the evening activities reported, concern children: cooking for them, playing, helping them with homework, bathing them, reading a book, putting them to bed, etc. Despite that children have the highest priority for them, parents are often less attentive to them because of having to attend to other pressing work-related and family-related tasks, such as house keeping, financial issues, laundry, or preparing things for children’s next day at school or for themselves at work. Sometimes they have to finish off things from their work. Our informants reported that they do not have any option, they have to complete both house and work related tasks to maintain the stability of their family life.

For all informants dinner time was seen as an important event within family life despite that its daily and timely preparation puts them under pressure. They make an extra effort in order to make

dinner time as pleasant as possible for everybody, particularly for children. At dinner time they try to encourage children to tell what they have experienced or have done at school or with their friends during the day. In general, parents avoid talking about work related issues but this is not always possible. Work related issues include unexpected activities that happened during the day at work, plans for the next day or arrangements that have to be done in the near or far future. Another important family activity, is putting children to bed. Most of the parents get involved in this activity by trying to teach children new things, to talk with them, to read a tale, to play and enjoy being together.

Parents cherish the relation between them and their children. It is clearly observed that caring for children is one of the most important aspects of family connectedness. This is especially salient in parents' descriptions of business trips, where they indicate that the shared end-of-day rituals are the ones they miss the most. One participant that routinely spends three days away from home explains she really missed that connection because her child is still too young to use the phone.

A general conclusion drawn from the data is the overriding importance that working parents give to staying aware of the wellbeing of their children and sharing experiences and activities with them. Many observations support this. For example, parents adjust their schedule according to the activities of their children, they purchase communication devices for the children in order to keep in touch with them, and they mention that they are always interruptible for them during working hours.

Based on our results several communication and awareness needs can be identified that bear relevance to the design of Awareness Systems. For example, such a system could support parents by helping the children share their experiences during the day with their parents. Another example would be a system that would support engaging in an end-of-day ritual or joint activity when one of the parents is away on a business trip.

## 5. DISCUSSION OF RESULTS

We observe that parents report their communication is mainly for practical issues. Parents report that they would not call each other without any reason. However, some of the communication events are not just about conveying or requesting practical information. When parents call each other just before leaving work they are not just communicating dry facts. Along with the practical information there is a parallel communication of affective nature. By communicating practical information, such as *"I am about to leave the office"*, *"is there anything we need from the supermarket"*, we believe that parents are at the same time communicating their emotional status, such as *"did she had a busy day"*, *"how is he feeling"*, etc.

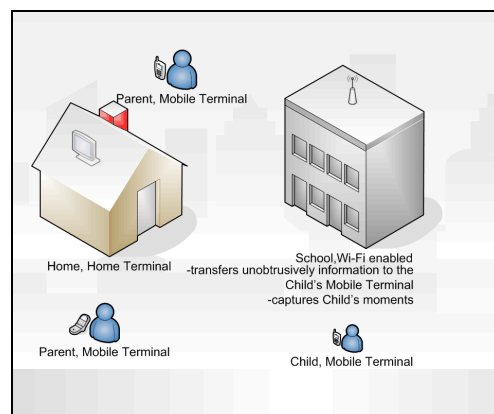
Moreover, any such communication event is a manifestation of intentionality. When a phone call occurs that fact alone conveys that the initiator thought about the receiver, put the effort and made the phone call. That observation is also an important fact of current mediated communication mediums.

We call the pre-mentioned observations the "Trojan horse" of practical communication acts. Thus, a communication event for a practical reason actually carries with it much more than that. A serious challenge for the designers of Awareness Systems is that if they would automate the practical information sharing, they might deprive users of the emotional communication channel.

## 6. PROTOTYPE OF AMBIENT AWARENESS SYSTEM

We are currently developing a prototype of an Ambient Awareness System to support the communication between parents, children and the day care centre for the children.

This first prototype set up has three terminals: one at home, one mobile for the parents and one for the child (Figure 1).



**Figure 1: Prototype of Ambient Awareness**

Automated capture through context sensing will be manifested by capturing interesting moments at school. Pervasive awareness will be manifested by sharing factual information between the communicators. This factual information includes schedule of the day such as subjects taught, times of breaks, etc. The school is chosen as the aware environment because the interview data points to children's school as an aspect of their life that parents need to be informed.

The prototype will be used with a diary study to get a better understanding of the exact type of information that needs to be captured and shared and the type of interactions that most suit busy families.

The user group characteristics for the diary study that we are aiming are:

- Participants have to be married or cohabiting,
- Participants need to have at least one dependent child,
- Both parents in the household need to work a minimum of 20 hours a week,
- The “focus” of the Awareness System is a 7 years-old child.

Some concrete research questions we would like to address with the deployment of the prototype are:

- Do parents appreciate a “constant flow of information” from school while they are at their office?
- Does an Awareness System which informs about schooling activities stimulate discussions between parents and children about the children?
- Do children feel they are being “watched over their shoulder” with such a system?
- When is the most suitable time to offer such information to the parents?

We are planning to find answers to those questions by deploying the prototype for a period of a month with several families.

## 7. CONCLUSION

This paper has outlined a research effort concerning Ambient Awareness Systems and their potential to support the communication needs of busy families. We have summarized an interview study that aims to uncover the types of communication needs that an Awareness System could potentially serve. The interviews have clearly shown the salience of parental involvement in children’s lives. Based on the findings, future research will focus on getting a better understanding of this need and related user requirements for Awareness Systems.

We plan to do this with an extensive diary study and an iterative development of a prototype to support parents and children sharing their daily experiences with each other. In this context, an Ambient Awareness System that supports automated capture and pervasive sharing of awareness information will be explored as a prototype system to support intra-family communication.

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## REFERENCES

1. Bly, S., Harrison, S.R. and Irwin, S. 1993, *Communications of the ACM*, 36, issue 1, 28-47.
2. Crabtree, A., Hemmings, T., Rodden, T., & Mariani, J. 2003. “Informing the development of calendar

- systems for domestic use”, In: Proc. ECSCW '03, Kluwer Academic Publishers, 119-138.
3. Huijnen, C.A.G.J., IJsselsteijn, W.A., Markopoulos, P. and De Ruyter, B. 2004. *Cognition Technology and Work*, 6, number 1, 41-44.
4. Hutchinson, H., Mackay, W., Westerlund, B., Bederson, B. B., Druin, A., Plaisant, C., Beaudouin-Lafon, M., Conversy, S., Evans, H., Hansen, H., Roussel, N., and Eiderbäck, B. 2003. “Technology probes: inspiring design for and with families”. In: *Proceedings CHI '03*, ACM Press, p. 17-24.
5. Koerner, A.F. and Fitzpatrick, M.A. 2004. In: chapter: “Communication in intact families”. In: Vangelisti, A.L., “*Handbook of family communication*”. Lawrence Erlbaum Associates.
6. Ling, R. 2004. In: “The Coordination of Everyday Life”, Chapter 4 In: “The Mobile Connection: the cell phone’s impact on society”, Elsevier, ISBN: 1-55860-936-9.
7. Markopoulos, P., Romero, N., van Baren, J., IJsselsteijn, W., de Ruyter, B., and Farshchian, B. 2004. “Keeping in touch with the family: home and away with the ASTRA awareness system”. In: *Proceedings CHI '04*, ACM Press, p. 1351-1354.
8. Milewski, A.E. and Smith, T.M. 2000. “Providing presence cues to telephone users”. In: *Proceedings of the 2000 ACM conference on Computer Supported Cooperative Work*, Philadelphia, Pennsylvania, United States, 2000, ACM Press, 89-96.
9. Sellen, A. J. Hyams, J., and Eardley, R. 2004. “The everyday problems of working parents: Implications for new technologies”. In: *Hewlett-Packard Labs Technical Report HPL-2004-37*.
10. Weiser, M. and Brown. J. S. 1996. *Power Grid Journal*, 1.01
11. Romero, N., v. Baren, J., Markopoulos, P., de Ruyter, B. and IJsselsteijn, W.A. 2003. “Addressing Interpersonal Communication Needs through Ubiquitous Connectivity: Home and Away”. In: *Ambient Intelligence, EUSAI 2003, LNCS 2875*, Springer, 419-430.

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