Group Coordination for Mobile Families

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Abstract—**The MobiLife project researches new mobile applications and services that will support busy family members in their everyday lives. A user study was conducted with 17 families (61 participants) in Italy and Finland to discuss the user tasks and behaviors in illustrative MobiLife scenarios of use. The results of this study related to scheduling, group coordination, and time management for the family emphasize the importance of the user's control over his or her time and the use of scheduling as a method of personal communication.**

Index Terms—**user centered design, mobile communication, collaborative work**

I. INTRODUCTION

THE IST project MobiLife is investigating mobile applications and services to support families in their everyday lives. This paper describes the qualitative user research (which converges faster than a statistical approach) that has explored how mobile services might support families in their daily scheduling, coordination, and time management. The paper begins with an overview of the research objectives of MobiLife, a short survey of related work on coordination and time management, then explains the methods and results of scenario-based interviews with families in Italy and Finland.

A. MobiLife Overview

MobiLife aims to understand how innovative mobile applications and services can help families. In particular, we are interested in exploiting the user potential of several particular technology areas: context awareness, privacy and trust (among groups), adaptation, personalization, and semantic interoperability of services. The objective of MobiLife is to develop services based on these technologies that will meet the needs of family members who are juggling multiple roles, including their roles in the family, their roles at

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work and school, and their other social roles (Scout leader, friend, and so on). MobiLife's approach is to integrate different perspectives, such as the user-centred design point of view, business and marketing approaches, and technology development views. This paper describes the first step of the user-centered design process in MobiLife, which has been to conduct user research based on sample scenarios of use of such services. The next step is to build low-fidelity mock-ups of some of this mobile functionality that can be tested with family members. At this early stage, the MobiLife scenarios cover a wide range of possible user tasks and behaviors enabled by mobile applications and services; we have focused only upon the tasks related to scheduling and time management for this paper.

B. MobiLife Overview Related Work: Scheduling, Coordination, and Time Management for Mobile Families

One extremely important aspect of families' everyday lives is the scheduling and coordination of group activities, not only within the family but also with other people and organizations such as school, work, and so on. This kind of time management has the potential to make use of many of MobiLife's key technology research areas, such as context awareness, privacy and trust, and personalization. For example, a system that knows where the family members are and what they are doing might help the family coordinate its activities (this is context awareness), but will also need to allow each user to control the levels of access that other people have to his/her scheduling information (privacy and trust) and to tailor the information that he or she receives about scheduling to his or her personal preferences (personalization).

The use of shared (electronic) calendar or other time management systems in work settings has been an active research topic since the 1980s (for example, see [1], [2]). The use of Microsoft Outlook as a shared calendar system, for example, is common in many office environments. Lately this research area has expanded to address the ways in which people use combinations of tools to manage their time, including paper calendars and diaries, time-related applications on mobile devices such as phones and PDAs, and PC-based shared calendars [3]. While this research has usually focused upon time management for work rather than for family or other non-work uses, some studies have also examined group coordination and calendar systems for families ([4], [5]).

Finally, some researchers have examined the impact of mobile phones on the way people organize their time and coordinate with each other socially [6], arguing that mobile communication in fact makes people less reliant on firm time-

based plans to coordinate their activities. However, there has as yet been little research about how to help mobile family members in lots of different locations better coordinate their daily activities and manage their time in collaboration with each other.

II. USER STUDY METHOD

Within MobiLife, we are using a scenario-based approach to portray the experiences that users will be able to have with future mobile applications and services. In this context, the word "scenario" is used to mean a narrative description of what the user does and experiences when using a computing system [7]. First, we created scenarios that illustrate the types of user tasks and behaviors that might be enabled by the mobile services prototyped in MobiLife. Then we used storyboards of these scenarios to share these ideas with prospective users.

The results discussed in this paper are based on **qualitative user research** with technology agnostic scenarios conducted with families in Finland and Italy during November 2004.

A. User Study Participants

To better understand the communications and group dynamics among the family, MobiLife has decided to focus upon families who are undergoing some kind of transition period (for example, the birth of a child, or one member moving away from home). These transition periods often introduce new communication needs into the family, and the changes in the family's day-to-day activities are likely to make characteristics of group organization, problems, and so on more visible to the researcher. Therefore, for MobiLife, two particular definitions of the "family" were selected as the user groups to focus upon:

--Families with young children (e.g. a family with a child going to school for the first time) – referred to as "younger" families below

--Families with older children moving away – referred to as "older" families below

The families who participated in the user study belonged to one of these two categories. A total of 17 family interviews were conducted in Italy (10) and Finland (7). Four of the 10 Italian families and three of the seven Finnish families were younger families. There were 61 interview participants in total, with an average of 3.6 participants per family. Table 1 shows the mean age of parents and children in the respective family types, in both countries.

The participants weren't especially heavy users of the Internet or of mobile technologies, but in general did use the Internet frequently (at home and at work or school) and did use mobile phones. Among participants in both countries, it was common to own a mobile phone (91% in Finland and 77% in Italy), but less common to browse the Internet from a mobile device or use other types of mobile devices.

B. Interview Method

The families were interviewed in their homes in a group

TABLE I
AGES OF PARENTS AND CHILDREN IN THE YOUNGER AND OLDER FAMILIES IN ITALY AND FINLAND

		Mean Age (Minimum, Maximum)	
		Finland	Italy
Parents	Younger Families	35 (32, 40)	45 (35, 55)
	Older Families	53 (48, 58)	53 (48, 57)
Children	Younger Families	9 (7, 11)	8 (2, 16)
	Older Families	18 (14, 20)	22 (17, 25)

setting (not one-on-one interviews with each family member). Each interview session began with demographic questions about the members of the family. The family completed a drawing exercise to explain the social networks that the family members took part in; studies on social networking patterns were also used as a methodological reference [8]. The next part of the interview addressed the family's current methods of communication, group coordination and group awareness. Various means of communication and related habits were then added to the map. Finally, the storyboards formed the basis of a discussion about the mobile services shown in the scenarios (Figure 1). Two or three scenarios were discussed in each interview.

Mikko vastaanottaa muistutuksen aikapulasta ja kukista ja ehdottaa bussia.

Fig. 1. Sample illustration from the storyboards of the scenarios.

III. MOBILIFE SCENARIOS

The MobiLife scenarios depict a variety of mobile services and applications by showing how they might be used by the different family members. Each scenario focuses on a different aspect of life: planned activities during the work week (the "Monday" scenario), dealing with unexpected events during the work week ("Friday"), enjoying leisure activities on the weekend ("Sunday"), and taking a special outing as a family ("Olympics").

In particular, the Monday scenario shows a family with young kids planning for a hard working day, and indicates that the parents have different ways to reconcile personal and work lifestyles. In the Friday scenario something unexpected (a minor car accident) has interesting implications in the family organization. The Sunday scenario represents a slightly older

family on a typical leisure-oriented day, in which several social relationships with the extended family and beyond are shown. The last scenario, Olympics, shows a family with a grown-up child who is studying at a remote university; the parents decide to take a vacation to visit the Winter Olympics.

Each of these scenarios shows how the family members coordinate their activities with each other. The specific group coordination and scheduling tasks that are shown in the scenarios are:

-- The family members in different locations plan their time by staying up-to-date about each other's schedules, including last-minute changes.

--The users get reminders about important family events.

--The user searches for an external service (e.g. a babysitter) and share his/her family's schedule available to that service.

--The user checks the schedule of colleagues and friends.

--The user is informed about external events (e.g. a public transportation strike) that affect his/her schedule. The system automatically helps the user handle the situation.

--The scheduling system can make predictions about travel times will be and give notifications accordingly.

--When changes or unexpected events occur, the scheduling system devises and presents possible alternative reschedulings.

In each of these examples, the "scheduling system" refers to a shared, distributed application or service that the family members can access using their mobile devices or other devices and that can offer notifications to them in a proactive way. The specifics of the user interface were not defined, so, for example, the scheduling system would not necessarily have an explicit calendar-like interface.

IV. RESULTS: USER SUGGESTIONS AND FEEDBACK FOR SCHEDULING, COORDINATION, AND TIME MANAGEMENT

This section presents the key findings from the family discussions about the scheduling, coordination, and time management tasks shown in the scenarios. Because of the inherent limitations of the scenario-based interview method, these results will be used to inform the design of prototypes that can then be used to actually test the time management functionality with users.

A. Convenience and Perceived Added Benefits of Electronic Systems

One common finding across all scenarios is that ideas that convey a clear sense of convenience were generally positively regarded. The participants thought that technology could be useful in coordinating everyday activities, such as picking up children, taking care of pets, and deciding who could use the car and when. Electronic time management was also perceived as more accurate than paper-based. It was also mentioned that re-organizing plans in case of changes was difficult with current means and that technology could well be of assistance in this respect. Some perceived advantages were counter-balanced by a series of worries and negative feedbacks which overall build up a complex and articulated set of results.

B. Contrasting with Paper Calendars and Phone Calls

Many of the study participants currently used paper calendars, and it was common in the interviews to compare and contrast paper-based and electronic time management practices. Some participants thought that paper-based means were adequate and did not need to be replaced by electronic means. The participants normally made phone calls to solve these scheduling problems.

C. Importance of Scheduling and Group Coordination as a Form of Personal Communication

In both Italy and Finland, family members implied that scheduling functionality was generally acceptable but was perhaps more suitable for the office environment. For managing free time with family members, many preferred to do this in a direct, face-to-face manner, to make this process more personal. For instance, one of the scenarios showed an example in which the system notifies the parents that their grown-up daughter has arranged with the younger kids in the family that she will be coming over for dinner (the parents were asleep when the daughter got in touch with the family). Some comments in response to this example were: *"I would much prefer hearing about such a change through my kids coming to wake me up and telling me about this."; and "We are a family, we can talk."*

The participants pointed out that everyday routines also serve other purposes besides just "getting the task done"; streamlining them with technological aids might disrupt the social coherence of the family. Everyday routines, no matter how mundane they may appear, tie family members together and thus make the unit a family rather than an arbitrary collection of people.

D. Importance of Critical Mass and Common Practices

Some of the participants used shared electronic calendars at work. One family raised the issue that these systems don't work unless everyone in the group uses them and follows a similar logic (common practice) with their calendar entries. The workplace of the mother had tried a shared calendar which failed because one or two out of twelve people did not keep their calendar entries updated. This resulted in double work since all appointments needed to be agreed in both electronic and older media (paper & face-to-face). The workgroup eventually went back to coordinating things in meetings.

Many family members pointed out that in the family context, it will be impossible to require each person to fill out his or her calendar information. In fact, many participants in the study did not plan their time to this level of detail in any case. However, one way to promote electronic scheduling for families is to make it extremely easy to input the calendar entries. Having lots of calendar entries would help an intelligent scheduling system make reliable inferences about the user's availability and preferences at a given moment. However, calendar entries are not the only way to judge what

the user is doing at a given moment; for ideas about how to make inferences about the user's availability (for example, for a phone call) from his or her context, see [9].

E. User Interface: Ease of Use and Affordances of Paper-Based Systems

As already discussed, family members pointed out that if the user needs to fill out an electronic calendar in order to participate in group scheduling, the ease of use of the calendar interface is extremely important. The participants indicated that the ease of use of paper calendars is a benchmark in this respect. One participant took one of the researchers to the family's kitchen, pointed to the paper calendar on the kitchen wall and said, "My wife wouldn't use it if it is not easy like that." Many other studies of time management practices have pointed out the special affordances of paper calendars compared to electronic ones (for example, [3]).

Some of the participants already used electronic calendars and said that the family scheduling system should mirror the interface logic of these more commercial programs, such as Outlook.

F. Time Windows and Soft Schedules

Some participants mentioned that rather than making firm time-based plans for everything, they often schedule activities in more fuzzily defined "time windows," for example, "at the beginning of the day," "afternoon" or "later." Other researchers have pointed out that mobile phones allow for a certain "softening" of schedules, since individuals can now "micro-coordinate" their time with each other as they are in the process of meeting rather than having to make strict arrangements in advance (see [6], [10]), which suggests that future scheduling may in fact become less time-based, rather than more strictly regimented. This finding suggests that intention-based scheduling and messaging systems, rather than strictly time-based group calendars, may be appropriate for mobile families.

G. Privacy and Trust

As expected, privacy and trust issues emerged about sharing one's calendar information with other family members. For instance, the teenage children in an Italian family reacted quite strongly when prompted about making their information available to their parents. These issues have been studied extensively in the context of shared calendars for work purposes, but are much less well-explored for families. One study suggested that for some young people and their parents, carrying mobile phone preserves the young person's privacy to some extent while still allowing the parents to feel that they have some control over the young person's activities [11]. This may indicate that perhaps if the young people do not want to share their scheduling information with their parents explicitly, they might still be willing to share general "availability" information, for example for the coordination of group activities.

H. System-Suggested Contingency Plans

While better support for rescheduling and contingency plans was seen as a possible benefit of this kind of mobile scheduling system for the family, the Finnish families raised doubts about the system being able to make sensible plans. Several issues were raised that were believed to impact the extent to which the system could reliably perform such actions, doubts as to whether the system could be so 'smart', or be expanded beyond the family network.

Some of the scenarios showed the users receiving automatic notification from the system that their schedule had changed. There was a lot of resistance among the participants about automatic alerts of this nature: in part such automatic action doesn't support the social side of the scheduling interaction (for example, it was considered important to apologize to someone when you are going to be late) and, moreover, these automatic actions induced a feeling among the participants of being out of control of their time. Comments included "*I want to decide for personal things.*"; "*I won't let it coordinate my time.*"; and "*It can propose changes but the user must be able to authorize these… Technology must not be the master.*"

This finding was common in the interviews in both Finland and Italy; the participants were adamant that they should be in control of their own time. Interestingly, research conducted on recommender systems (see, for example, [12] and [13]) has identified similar concerns among users. For instance, the fact that the system makes predictions about the users' tastes and opinions induces the (unpleasant) feeling among some people of being categorized. The participants did not like the idea of a system that was "smarter than they were." It is generally recommended that the scheduling system should suggest changes to the user's schedule, rather than executing these actions automatically (even in response to requests from other people). If the system makes recommendations for changes, the user should have the option to see why this recommendation has been made (transparency).

I. Social Skills

As noted previously, scheduling and group coordination was considered a form of personal communication. Accordingly, completing routine scheduling tasks (and negotiating about them) were seen as beneficial for the well-being and development of social skills of children.

The scenarios also showed the scheduling system helping the user with social interactions, such as reminding the user to buy a birthday present or to take flowers when invited to dinner. Several participants also pointed out that even if the system could help the users in being socially skilful, using it would be somewhat problematic. Should others see the user is being helped by someone or something, there is a danger that they would label him socially incompetent. As one subject noted about the husband in the Monday scenario that "*He should remember his wife's birthday anyway!*"

If the user is getting help from the system in this way, this should be disguised from other people. For example, when someone brings flowers to another person, it is crucial that it appears that this idea originated with the user!

V. Conclusions and future work

Users' response to the proposed scenarios was mixed. As long as the proposed functionalities bring more convenience they can be accepted and even welcomed, but not at the expense of individual sense of freedom, self-determination and social inclusion. Families' scheduling, group coordination, and time management activities may well benefit from better technological support, especially from mobile systems. As MobiLife studies users in multiple roles, we note that electronic time management is currently more widely used and accepted in work than the home domain.

We expect that the user acceptance of systems that support scheduling, group coordination, and time management activities will rely on several important factors:

1) Users must be in control of their own time. Instead of automatically managing scheduling/calendar entries, the system should help the user in managing them. The system should not send automatic scheduling messages without the user's confirmation, and the system should suggest viable alternative scheduling arrangements to the user who can then select one rather than automatically making contingency plans.

2) If the system has an explicit calendar interface, making calendar entries should be as easy as using a paper calendar. In addition, the interaction between new scheduling systems and the ones already in use by the family (for example, personal diaries and shared paper calendars) must be considered. Finally, with the "softening" of schedules, it will be wise to consider scheduling systems that do not rely on explicit calendar entries at all.

3) Managing shared events and changes should be at least as easy as it is today by calling people with a mobile phone.

4) Within the family, scheduling is a communication method (e.g. like an extension of messaging) rather than being only for the purposes of scheduling. It is useless to streamline or automate every scheduling task; rather, the user should be supported in negotiating plans with others.

5) Privacy and trust are nuanced subjects within the family and will require special attention. For example, there may be many different levels of access at which the user will be comfortable sharing personal information with particular individuals or groups (even within one family).

As described in the introduction, MobiLife is considering a broad range of possible mobile functionality for further development and prototyping. The project is now in the process of deciding which functionality should be the focus of the prototypes in the project. Time management is one of the candidate areas for prototyping. If this area is selected, we will be able to expand upon and validate the previous results through more situated user testing of a semi-functional time management system, looking at specific issues such as privacy and trust, appropriate interfaces, and interaction between this scheduling system and others that the families are already using, such as paper calendars.

In general, the prototyping stage will allow more detailed user research based on the specific tasks and behaviors that are illustrated in the scenarios. MobiLife has planned three phases of iterative prototype development, with user research built into each phase, to enable user-centered design of future applications and services for mobile families.

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