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STUDENTS STUDYREPORT

Group SW108F14

A Study on how Notes and Lists Integrates with a Group Calendar

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Synopsis:

This report documents the process of developing a functional prototype of an electronic calendar that is to be used as part of an experiment with human subjects.
The basis for the electronic calendar prototype is work we have done in a previous semester, coupled with existing related research in the areas of electronic calendaring, notes and list, group coordination and sharing. Following the designing and creation of the electronic calendar prototype, an experiment is designed to investigate, how notes, lists and the sharing of these affects group calendaring in electronic calendars, where the experiment consist of: a questionnaire, a feature test and an interview. After designing the experiment, we describe how we conducted the experiments and present our findings from the experiment.
Lastly, we have a discussion on the findings from the experiment and a conclusion on the findings presented in the report.

Contents

Chapter 1

Introduction

In this chapter we aim to describe the ideas underlying the project, the work we have previously done in the area of electronic calendaring and finally we describe the goal of this project.

1.1 Introduction

The work done in this report is the continuation of our previous work in the area of electronic calendaring.

The Calendaring and Scheduling Consortium defines a calendar to be "*a collection of events, tasks, journal entries, etc*" [1, s. 3]. Whereas, one of Merriam-Webster's definitions for a calender is that it is "*a list or schedule of planned events or activities giving dates and details*" [2, def. 3.c]. From these definitions we can gather that a calendar is used to keep tack of plethora of items (e.g. events, activities, tasks, etc.), at least in the case of conventional paper calendars. Electronic calendars differ from paper calendars in regards to which functionalities are available to the users. Often electronic calendars only support a subset of the aforementioned features of conventional paper calendars. Of the electronic calendars available on the market some of the common functionalities include: the ability to view the dates and days of weeks and months, making appointment entries and the ability to invite people to participate in appointments [3].

In Merriam-Webster's definition of calendars, events or activities are associated with dates and details. When an appointment is entered into an electronic calendar the information usually required is the date and time and a title, and optionally a description and a location. However, users of paper calendars are not required to fill out any of this information, as such they can use their calendars as they please. As users of paper calendars are able to use their calendars as they please, they are able to associate additional information to scheduled appointments (e.g. notes or lists) or to use the paper calendar as a storage container for information they deem calendar related.

A key feature of calendars in general is that they allow for their users to keep track of their schedule, in regards to scheduling new appointments and looking-up existing appointments. However, the scheduling of new appointments may not always be as straightforward as to just inserting an appointment in an appropriate place in the calendar, both for electronic and

paper calendars. When scheduling a new calendar appointment, for instance a work-related meeting, the appointment planner needs to take the other participants' schedules into consideration. With paper calendars the exemplified act of scheduling a calendar appointment can be rather difficult, as the appointment planner needs to know the contents of the participants' calendars beforehand, if the appointment planner is to make an appointment that does not conflict with the other participants' schedules. However, with electronic calendars the appointment planner is able to invite the participants to the appointment by way of e-mail or the electronic calendar itself. Following the participants' reception of the appointment invitations, they are able to consult their own schedules to determine whether or not they are able to participate in the appointment. Finally, in the aforementioned example of calendar usage, the scheduling of appointments in coordination with multiple participants can prove to be a challenging task to accomplish, as multiple factors can influence the final appointment.

1.2 Previous Work

In the previous semester we found that people often use memos in the form of notes or lists to supplement their calendars, both in the case of paper calendars and in the case of electronic calendars. It should be noted that the difference between notes and lists is quite vague, therefore the only clear difference we found was that lists could have a time of expiration (deadline), and that notes can both have the looks of *just a piece of paper* or a piece of paper organized through the use of bulleted items [4, p. 19-20]. Additionally we found that another common usage of calendars was the support of group coordination and scheduling [4, p. 7]. These ways of using calendars (i.e. note taking, list making and group coordination) were selected as our focus in our initial data gathering and were further investigated.

Based on the data we obtained from our initial data gathering, we examined an existing electronic calendar system with the purpose of investigating how note taking, list making and the sharing of these was incorporated into existing systems. We found that the existing electronic calendar system did have a list making system, however, this was only usable through its browser-based version and it was not available in its app-based version. Furthermore, the electronic calendar did not support note taking nor the sharing of notes and lists with other people [4, p. 13-14].

As a result of our initial data gathering we concluded that we would perform an experiment, based on a prototype of an electronic calendar for a mobile device. The purpose of the experiment was to understand whether or

not the inclusion of notes, lists and the sharing of these, was appropriate in electronic calendars. By this we mean that we were interested in understanding whether or not these features would allow calendar users to perform the normal calendaring activities, while also providing the users with the possibility of new and different ways for scheduling appointments and providing appointment information [4, p. 29].

From the experiment, we learned that the participant generally had a positive attitude regarding the note taking and list making features, however, some of the participants also noted that they could not see the difference between notes and lists [4, p. 32]. Regarding the ability for sharing personal resources (i.e. notes and lists) the participants thought it to be a good idea, but shared notes and lists would need restrictions in the form of permissions, as the participants pointed out that everyone should not be able to modify the contents of the notes and lists [4, p. 32-33].

As we learned through our exploratory experiment, different meanings were ascribed to note taking and list making, meaning that the difference between the two is blurred [4, p. 32]. Furthermore, we learned that our experiment participants were quite interested in the usage of notes and lists, in regards to the ability to share them, as they could see a number of ways in which sharing of notes and lists could be used to provide additional information about appointments [4, p. 37].

1.3 Problem Statement

In the existing calendars that are currently available, there is a lack of features for supporting calendaring in regards to paper calendars. Meaning that electronic calendars do not fully encompass the actual usages of paper calendar, making electronic calendar seem limiting and inflexible. Previously we found that electronic calendars could possibly become more flexible by including the functionalities for supporting note taking and list making (see section 1.2).

With electronic calendars, the users are able to invite people to participate in appointments scheduled in the calendar. Through the scheduled appointment the participants are able to get information regarding the date, time, location and a description of the appointment. However, users of electronic calendars are not able to associate additional information to an appointment they are invited to, which may be problematic, as some people may want to make a note of something they want to do before a scheduled appointment and then store it alongside the actual appointment.

Paper calendars can also be used to manage to-do lists, where the lists are

often associated to some calendar appointment. An individual may have a list, which contains numerous items, it is possible that the person managing the list decides to give some of the tasks to another individual, either in the form of a list or a note. However, as electronic calendars are limited in their number of functionalities, the research question for this project is as follows:

> *In an electronic calendar, how does the integration of notes, lists and the sharing of these affect group calendaring ?*

Chapter 2

Related Research

In this chapter we present existing research relating to electronic calendaring, notes and lists, group calendaring and sharing followed by a description of an existing electronic calendar, with the aim of substantiating the goal of the project.

2.1 Electronic Calendar Research

Calendars are currently being researched, as the development of technology provides new opportunities for improving on electronic calendars.

In the paper by Tomitsch et al. [5] it is found that paper calendars are still a prominent medium for calendaring in regards to personal scheduling. Furthermore, they observed that paper calendars were used for more than just recording scheduled appointments, for example, for managing to-do lists or as personal diaries. This leads them to conclude that emotionality and sentimentality are concepts that are highly relevant for calendaring, in regards to the development of future electronic calendaring systems.

In the paper by Payne [6] from 1993, an interview study is performed with the aim of understanding calendar usage. Through the interview study it is found that paper calendars are often used instead of electronic calendars, as the electronic calendars can be perceived as inadequate, with the argument *"Some critical aspects of paper calendars have not apparently been matched"* [6].

In the papers by Tomitsch et al. [5] and Payne [6], it can be seen that paper calendars have certain usages that have not been fully incorporated into electronic calendars, however, this does not mean that electronic calendars are not being used. In the paper by Palen and Grudin [7], they study how adopted electronic calendars are in two companies, through the use interviews and questionnaire-based surveys. In these companies it was not mandated to use electronic calendars, however, based on survey responses they estimated an adoption rate of at least 75% in both companies [7]. They note that when a few employees start using the electronic calendars, more and more employees begin to see the potential benefit of electronic calendars, in regards to coordination and scheduling, leading the non-users of electronic calendars being peer pressured into the adoption of electronic calendars [7].

So far we have illustrated how research into paper calendars can be used

to achieve a better understanding calendaring practices [6], while also seeing that some of the critical aspects of paper calendars are not mirrored in electronic calendars [5, 6]. Even though electronic calendars are not entirely as users desire them, they are still being used, and as we could see in the paper by Palen and Grudin [7] some people are peer pressured into using them.

As previously stated, in section 1.3, we have decided to focus on how the integration of notes, lists and the sharing of these affects group calendaring. By doing this we aim to see, if the inclusion of notes and lists in electronic calendars can help to bridge the gap there seems to be between paper and electronic calendars.

2.2 Notes and Lists

Bellotti et al. [8] performed a pilot study of to-dos, prior to an in-depth study of task management, and found that effective to-dos have several key properties. The key properties mentioned in the paper are as follows [8]:

- *Made expending minimal effort* – as many to-dos are made by expending the least amount of effort, they often only contain the minimal amount of information needed to recall the task the represent.
- *Only a minority of to-do reminders appear in lists* – the authors found that only a minority of the to-dos were organized in the form of lists.
- *To-dos are used in multiple ways* – the context of the to-dos affects the usage, or purpose, of the to-dos.
- *In-the-way in anticipation of a routine practice* – to-dos may be placed in locations or on objects to prompt a reminder for the task denoted by the to-do.
- *Represented at any level of abstraction or detail* – the contents of the to-dos may vary from person to person, some people may prefer more abstract to-dos, while others may prefer fairly detailed information.
- *To-dos don't all get done* – not all to-dos get done, since some people procrastinate about some, while others may lower the importance associated with the to-do.

In the paper by Palen [9], the author identifies several calendar activities also encompassed by calendaring, meaning that calendars are used for a wide range of activities beyond the scheduling of meetings. The additional calendar activities the author identified and termed "calendar work" are [9]:

- *Temporal Orientation* – orientation pertaining to days, months or years, rather than the hours and minutes of a clock.

- *Scheduling* – a complex task that involves the balancing of various constraints, e.g. time and location, and priorities.
- *Tracking* – keeping "track" of present-day or future events. Other examples of things that may be tracked could include contact information or budgeting.
- *Reminding* – a calendar can assist with reminding individuals of future events. Sometimes calendar users may employ memory aids to assist them in remembering certain events, an example of a memory aid could be a to-do list.
- *Note Recording/Archiving* – calendars may be used for recording notes, often the intention of using the calendar for this activity is so that it can be associated to a certain point in time, making it possible to find the recorded information based on an event or appointment.
- *Retrieval & Recall* – of information recorded in a calendar, often with the purpose of either retrieving recorded information or recalling something, e.g. the spelling of a name.

Of the calendar activities identified by Palen, the activities we found to be interesting were *Tracking* and *Note Recording/Archiving*. Tracking is interesting, as it shows that one possible usage of calendars is the management of tasks and the organization of information. Note recording/archiving is interesting, as it shows that calendars may also be used to store information, with the intention of associating it with the calendar or a certain point in time.

In regards to the aforementioned key properties of effective to-dos, the properties we have found to be interesting are: *made expending minimal effort*, *to-dos are used in multiple ways* and *to-dos don't all get done*. These properties of effective to-dos are interesting, as they illustrate possible reasons for people to prefer using paper calendars for to-do lists.

Furthermore, in the article by Blandford and Green [10], they find that the tools (e.g. pieces of paper) people usually use in conjunction with their calendars are primarily used to support prospective remembering, which was also reported by Payne in [6].

With the research presented here, we aim to illustrate some of the things that needs to be considered when trying to include the features of note taking and list making in an electronic calendar.

2.3 Group Coordination and Sharing

In the paper by Neustaedter et al. [11], they find that some people decide not to use electronic calendars for group coordination, in the context of family calendaring, and instead use workaround tools to achieve similar effects. The tools that were mentioned were *"... a to-do list or a piece of paper that contains a list of things that need to get done that day."*[11], and these supporting tools would then contain information copied from a shared calendar.

Furthermore, they also find that there is often an abundance of associated information regarding appointments and events. This information is often difficult to place in the user's calendars, as the users often struggle with the calendars not being designed to store the associated information.

An example of this could be that a scheduled appointment has a note, which contains information about the appointment, directly attached to it. This way of using notes to annotate appointments is not adopted in groupware calendar systems, and in the paper by Palen [9] the author concludes that users have to modify their calendaring practices, if they intend to adopt electronic calendars for group coordination.

The term *sharing* is not a new one, however, the word sharing came to have a new meaning during the first decade of the 21st century, as can be seen in the paper by John [12]. In the paper the author finds that meaning of the word *sharing* has changed through the emergence of Web 2.0, with one of the leading forces being social media. The author notes that in the early years of the 2000's, the word sharing is often linked with what could be shared, while in the latter part of the 2000's the word is not linked with what could be shared, as participants in social media have developed a certain familiarity with the term.

This usage of the word sharing is especially interesting for us, as it allows us to use notes and lists in ways different from usual. Currently we have seen that notes and lists are often used as supportive tools in regards to calendaring. However, if we were to give calendar users the ability to annotate their calendar appointments with information recorded in notes or lists, then how would it affect group coordination and scheduling ?

Followed by this train of thought, we were inspired by the world of social media, more specifically the concept of sharing, therefore we incorporated the ability to share notes and lists through calendar appointments. Our goal with this incorporation was to see whether or not this would prove beneficial to appointment scheduling and group coordination.

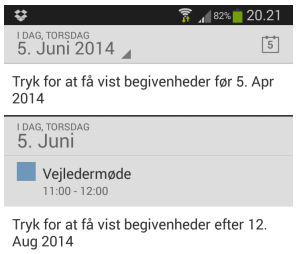
So far we have shown that notes and lists seem to be used for a range of activities relating to calendaring, however, we have not found any research relating to the effect of note taking and list making in relation to group co-

ordination and electronic calendars. Therefore we have chosen to focus more on how the sharing of notes and lists affects group calendaring in electronic calendars, as our previous work showed a positive attitude regarding the inclusion of notes, list and sharing.

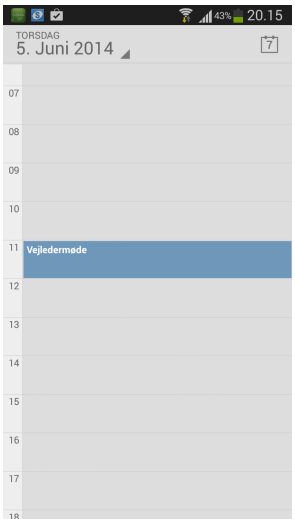
2.4 Related Technology

In the following section we present Google's calendar app. This presentation is done in order to give an idea of which features are available in a current calendar app.

Google Calendar is a freely available calendar application currently on the market. The calendar is cloud-based, meaning that given an active internet connection, any data inserted into the calendar is immediately available on other devices. Even though it is a cloud-based service, the Google Calendar app does function without an internet connection. However, as a consequence of not having an internet connection, the calendar will not be synchronized with the cloud, until there is an active internet connection.



(a) The agenda view of Google Calendar.



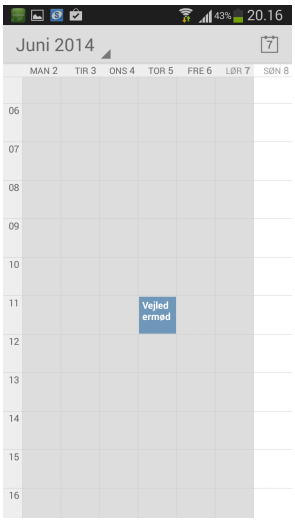
(b) The day view of Google calendar.

Figure 2.1: Screenshots showing examples of the agenda view and day view of Google Calendar.

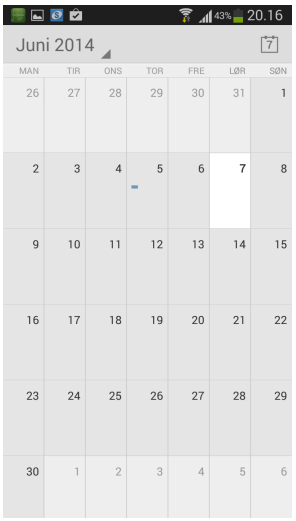
In Figure 2.1a we have the agenda view, which shows an overview of future calendar appointments, where each appointment is shown with its title and time. For more detailed information on the appointments, one can get an

appointment's information by clicking on the appointment in the agenda view.

In the figures, see Figure 2.1b and Figure 2.2a, examples are shown of how Google Calendar presents an overview of calendar appointments (displaying only their title), specifically for viewing appointments for entire days and weeks. Furthermore it is possible to view an entire month at a time, however, at this level of abstraction the calendar appointments are only shown as colored boxes on their respective days, see Figure 2.2b.



(a) The week view of Google Calendar.



(b) The month view of Google Calendar.

Figure 2.2: Screenshots showing examples of the week view and month view of Google Calendar.

Inserting a new calendar appointment can be done in to two different ways in the Google Calendar app: (1) by navigating to and clicking on the desired date and time, in either of the views for days and weeks or months; (2) through the app's menu, see Figure 2.3.

In Figure 2.4 the view used for creating new calendar appointments in Google Calendar is shown. In the calendar app it is possible to have many different calendars, so the first thing to do is to select which calendar the appointment should be added to. Secondly the appointment needs a title, so it can be identified in the different views, if left blank a default name will be given to it. A location is not needed, but one can enter a location if one wishes. A from and to time and date is needed, if one selects the entire day, by checking of the box, the time selection will disappear, leaving only the date selection. Guests are invited, by entering e-mails and sending out invitations.

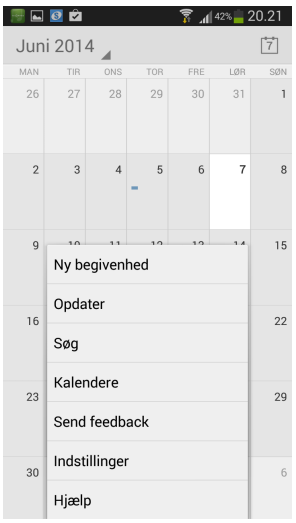
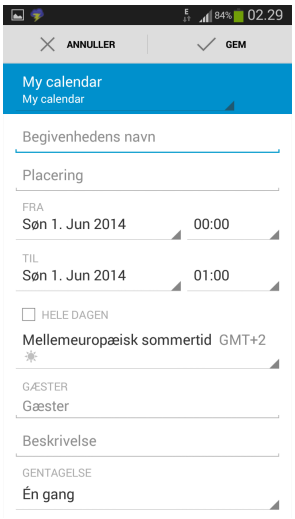
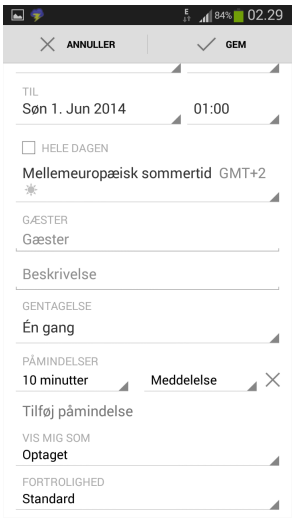


Figure 2.3: A screenshot showing an example of the menu view of Google Calendar.

A description can be added, if the title was not informative enough. If this is a recurring appointment, for example "Wednesday night, golf" it is possible to automatically add the future appointments to the calendar. It is possible to set reminders on the appointment, either by getting a message on the phone or by receiving an e-mail, at some predefined time interval before the appointment. The last two fields are only relevant, if the calendar is shared with others. The first indicates how one is shown in the calendar during the appointment, as available or busy. Finally, the last field indicates whether or not this is a private or public appointment, i.e. are other people allowed to see the appointment in the calendar or not.



(a) The first part of the view used for creating a new calendar appointment in Google Calendar.



(b) The last part of the view used for creating a new calendar appointment in Google Calendar.

Figure 2.4: Screenshots showing an example of the view used to create new calendar appointments in Google Calendar.

Chapter 3

Methodology

In this chapter we describe the methodology that we intend to use for investigating how the integration of notes, lists and the sharing of these affect group calendaring for electronic calendars.

3.1 Experiment Design

In section 1.3 we stated that we were interested in researching the effects of notes, lists and the sharing of these in regards to group calendaring. To investigate the effects of the aforementioned notes, lists and the sharing of these, we intend to conduct a series of experiments with a group of experiment participants. The experiment will consist of an initial questionnaire used to gather quantitative data about the experiment participants, a feature test, based on an electronic calendar prototype for gathering qualitative data about feature usage, and finally a semi-structured interview about the features of the electronic calendar prototype.

For the design of the experiment we intend to use the within-group design. We intend to use the within-group design as it is better suited for a smaller sample size, as opposed to the between-group design [13, p. 49]. Furthermore, by using the within-group design individual differences are effectively isolated, thereby allowing for the expected difference to be observed with a relatively small sample, as opposed to the between-group design [13, p. 47-48]. One disadvantage of using the within-group design is that it can be difficult to control the impact of learning effects [13, p. 48], in section 3.3 we describe how we address this issue in regards to the experiment's feature test.

Earlier we mentioned that we intend to use a group of participants for the experiment. We intend to select experiment participants based on their experience with calendars, meaning that the experiment participants must have some form of calendaring experience. In regards to the selection of the participants for the experiment, we intend to use our social circles and fellow students as the primary sources for recruiting experiment participants. As we intend to use our social circles and fellow students for recruiting experiment participants, we will only select those who willingly volunteers, as the only payment for partaking in the experiment is a beverage (e.g. coffee, tea, etc.) and some cake. Furthermore, we intend to emphasize to the experiment

participants that we will not be testing them. We intend to do this in an effort to calm and make the experiment participants feel relaxed during the experiment, with the aim of reducing errors in the results that may arise from a stressed mental state in the experiment participants [13, p. 61].

3.2 Questionnaire

In the experiment we intend to use questionnaires to obtain quantitative data about the demography and calendar usage of the experiment participants, with the aim of understanding the sample that our experiment participants constitutes. The questions for the questionnaire were chosen with the the following reasons in mind: (1) we are less interested in studying how the experiment participants use calendars, since there is already research detailing this subject [5, 6, 11]; (2) the questionnaire is meant for acquiring data that can be used to describe the group of experiment participants; (3) the questionnaire data could, in conjunction with the feature test data, assist us in formulating questions for the following interview.

Demographic information can typically be a set of close-ended questions, with a set of possible responses to avoid differences in the interpretation of the questions [13, p. 112] [14, p. 161], which is the reason for the questionnaire only consisting of close-ended questions (see Appendix B).

It can be argued that the questionnaire is superfluous, as we will be conducting an interview as part of the experiment and that the number of experiment participants is not significantly large [14, p. 156]. As we intend to use the questionnaire data in conjunction with the data from the feature test, to assist us in formulating questions for the interview, we believe it to be valid to have the questionnaire as part of the experiment, as it is a less time-consuming method for gathering quantitative data about the experiment participants demography and calendar usage.

3.3 Feature Test

The second part of our experiment consists of what we have named a *feature test*. The feature test is rooted in usability testing and is used to collect qualitative data regarding the effects of notes, lists and the sharing of notes and lists on group calendaring.

Usability testing can be understood and described as any process or activity which aims to improve a user interface's ease of use [13, p. 256]. When people think of usability testing they often think of user-based testing, which is to have a group of test participants perform a set of tasks that are repre-

sentative of a user interface's intended usage [13, p. 260].

From the aforementioned description of usability testing it can be seen that the primary goal is to gain an understanding of possible user interface problems. However, the basis for the feature test is a prototype of an electronic calendar (see chapter 4) that is created with the purpose of understanding the effects of notes, lists and the sharing of notes and lists in regards to electronic calendars, as such the user interface is of less importance than the features themselves. Therefore the testing method is not aimed at uncovering usability related issues in the user interface, instead we place little importance on user interface issues and focus on the features included in the electronic calendar prototype. By this we mean that we will examine how and why the experiment participants make use of the features in the ways they do.

As we have previously stated, the feature test is based on an electronic calendar prototype. The way we intend to gather data, through the feature test, is by having the experiment participants perform a set of scenarios that are designed to make use of the select set of features implemented in the prototype, namely notes, lists and the possibility for sharing notes and lists. While the experiment participants are performing the set of scenarios, we also implore them to *think aloud*. The reason for asking them to think aloud is that this can generally provide additional data regarding current problems [14, p. 154], where current problems refers to issues relating to the features of the prototype.

If we are to understand what effect notes, lists and the sharing of notes and lists have on group calendaring, then we cannot use the data collected from feature test of the prototype as it is. The reason is that we would have nothing to compare the data with, which in turn makes it difficult to conclude on the effects of notes and lists in electronic calendars. As such we have decided that besides attempting to complete the testing scenarios in the prototype, the experiment participants also have to attempt to complete the same set of testing scenarios in an existing, freely available, electronic calendar. The purpose of having the experiment participants attempt the same set of testing scenarios in an existing electronic calendar, is to provide us with data that can serve as a benchmark for the purpose of comparison.

In regards to the scenarios the experiment participants will have to attempt to complete, an example of a scenario can be seen in Figure 3.1 with the rest of the scenarios available in Appendix A. The scenario shown in Figure 3.1 illustrates how we intend to investigate the effects of lists in regards to group calendaring. Specifically the scenario describes a situation where the experiment participant is to plan and coordinate a barbecue event using the information provided in the specified set of tasks encompassed by

the scenario.

The phrasing of the scenario may seem somewhat ambiguous, however, if the scenario is to be completable in both the electronic calendar prototype and in the control calendar (an existing electronic calendar available on the market) we need a more ambiguous phrasing. The primary reason for the ambiguity in the phrasing of the testing scenario is that the control calendar does not contain all the features we intend to investigate (the features of primary concern to us are described in section 2.4), however, as the control calendar is representative of electronic calendars available on the market, we chose to allow for a degree of ambiguity in our scenario designs.

Scenario #03

Description: You and your friends wants to have a barbecue, and you know that you are the only one with enough space to host it, and the only one with a grill. Since you do not want to be in the kitchen all day, you decide that the guests are each to bring either a pre-cooked dish or some kind of meat, the challenging part is to coordinate this with your friends (Ann, Bo, Lis and Peter), without having to perform multiple phone calls for determining the date of the barbecue, and to make sure that everyone knows what to bring.

Tasks:

- Make an appointment for the barbecue.
  From: 17.00 - 17/05-2014
  To: 23.00 - 17/05-2014
- Invite your friends Ann, Bo, Lis and Peter to the appointment.
- Inform your friends of the items they need to bring: (no later than 17.30 - 17/05-2014)
  Ann Peterson - Beverages
  Bo Olson - Spareribs
  Lis Thomson - Potato Salad
  Peter Larsen - Sausages
- Save the appointment.

Figure 3.1: Scenario #03 used in the feature test, which is also shown in Appendix A.

Since the experiment participants will be attempting to complete the testing scenarios in two different electronic calendars there is a possibility of the two tests inadvertently influencing each other. As we cannot definitively prevent the tests from influencing each other, we try to lessen the influence they have on each other by:

- giving the experiment participants a brief walk-through of the electronic calendar they are to use for the given test, before they begin completing the actual testing scenarios,
- randomly assigning the experiment participants the calendar they will use for the first run-through of the testing scenarios, in such a way that each electronic calendar is used an even number of times relative to the number of experiment participants.

3.4 Interview

The last part of the experiment consists of an interview, more specifically a semi-structured interview. The interview will serve two purposes: (1) to gather qualitative data about the experiment participant's impressions and opinions regarding the features of the electronic calendar prototype in relation to an electronic calendar available on the market; (2) to serve as a sort of debriefing for the experiment participants, so they can gain a better understanding of how this experiment can improve upon electronic calendars.

The interview is semi-structured with a modest set of questions that will serve as a starting point for a discussion, regarding the features tested in the second part of the experiment, namely in the feature test. We intend to have semi-structured interviews as this allows us more freedom in regards to requesting clarification on answers to the prepared questions [13, p. 189], with the interview questions being:

- What did you think of the functionality for having notes and lists in an electronic calendar ?
- What did you think of the ability for sharing notes and lists through calendars appointments in an electronic calendar ?
- What did you think of the way in which notes and lists could be used to provide more information about calendar appointments ?

Furthermore, since we are interested in the possibility of using data from the first two parts of the experiment for formulating questions, semi-structured or unstructured interviews are better suited for this purpose as fully structured interviews requires that you to strictly adhere to an interview script [13, p. 189] [14, p. 152].

Chapter 4

Solution

In this chapter we aim to describe our considerations in regards to designing and creating a prototype of an electronic calendars.

4.1 Overall Design

In order to investigate the findings from our previous work, we needed to make a functional prototype of an electronic calendar system. In this section we aim to describe how we designed the electronic calendar prototype and the reasons for designing it as such.

For defining the functionalities to be included in the prototype, we used user stories as the main source of ideas, with the user stories being based on data acquired in our previous work. After identifying the functionalities to be included in the prototype, we began to look at the design of the system. Since we have been looking at Google's mobile calendar app in section 2.4 and as one of our focus areas is notes, we decided to center the system around a smartphone app.

We had a number of different ideas and approaches for the design of the overall system, each with their own strengths and weaknesses.

1. A solution with a server containing all information and clients having each their own local database, which is synchronized with the servers database at predefined time intervals and when the user makes changes to his/her calendar data. All information needs to be on the server as well as the client, in order to support multiple devices with the same account and sharing of data with other users.

   Strengths

   In theory this would have a fast load time, since all data is placed locally on the device.

   Weaknesses

   We cannot be sure, that the data we have locally is the latest, i.e. data from other users and other devices will not be available until a synchronization has been made.

2. A peer to peer solution, where the only information on the server is an address list of the other users in the system.

   Strengths

As with the first solution, this should have a fast load time, when all data is located locally on the device.
As long as all affected devices are on-line, in case of a change or addition to public data, the latest data should be available on all devices within a very short timespan.

Weaknesses

Peer to peer can prove to be difficult to apply to mobile data networks.
In case of shared data, the devices needs to handle the delivery, this can be very time consuming, depending on the number of effected devices.

3. A server-client solution, where all data is located on the server and the clients retrieve all information from the server, when it is needed, i.e. thin clients.

Strengths

One shared resource source ensures the clients are getting the latest data at the time of retrieval. We do not have to think about synchronization, since all clients are getting the data from the same source.

Weaknesses

Depending on Internet connection speed and server load, this can be a slow solution. Not only when the app is loading, but also in general usage.

We chose to go with the third solution, since it was the one fitting our needs the best and we would like to avoid problems with synchronization. One of our focus areas is shared resources, so we cannot avoid cross client communication, and thus possible synchronization problems with either solution one or two.

Now that we have an idea of the general structure of the system, we are going to look at the structure of the server in section 4.2 and client in section 4.3.

4.2 Architecture

In the previous section, section 4.1, we established that we want to built a client-server solution. In this section we are going to show how the server will be built.

One of the main focuses of this project is group communication / sharing of resources, so we needed some way of storing the data for retrieval from

many different clients. For this purpose we decided to have a database. To avoid having a direct connection from the clients to the database, which is both expensive and raises certain security concerns, we decided to make web-services and connect to the database via these. As mentioned we use web services for communication between the server and the clients. One might ask one self why web services and not a direct connection, where we could get instantaneous updates from the server, using push rather than pull. There are multiple reasons for using web services over direct connection for a project like ours. We do not need to have the updates from the server instantaneously, it is okay that we only update data every 5 min or so. Maintaining a direct connection to the server is expensive and resources are scarce on mobile devices. Also there is the economic aspect of the server cost, in order to support a direct connection to the server we would need a full server, where we have access to run programs, this is considerably more expensive than having access to a web server and database server, which is enough for hosting web services. And lastly with the implementation of web services for the mobile devices, a future addition of browser based clients with client side scripts will be easier, since the client side scripts like JavaScript uses web services to retrieve data from the server.

4.2.1 Servers

The server consists of a web server and a database server.

The web server is used for hosting web services. All communication between the server and the clients happens through RESTful web service calls. The response from the server is always a JSON object, containing the requested information from the server or an error message, if an error have occurred. To give a quick explanation of what happens when a web service call is received by the server. The RESTful web services works largely in the same way as when one visits an URL in a browser and some content is written to the screen. First the Handler in the *Presentation Layer* Figure 4.1 figures out which command to call in the *Logic Layer* Figure 4.1 from the content in the URL. Secondly the command called by the Handler, determines what to request from, or write to the *Data Layer* Figure 4.1, based on the content in the URL, which is passed along with the call to the command from the Handler. Thirdly the command creates a JSON object with the information retrieved from the *Data Layer* and sends this JSON object back to the Handler. And lastly the Handler writes the JSON object retrieved from the command to the screen, which is then read by the client.

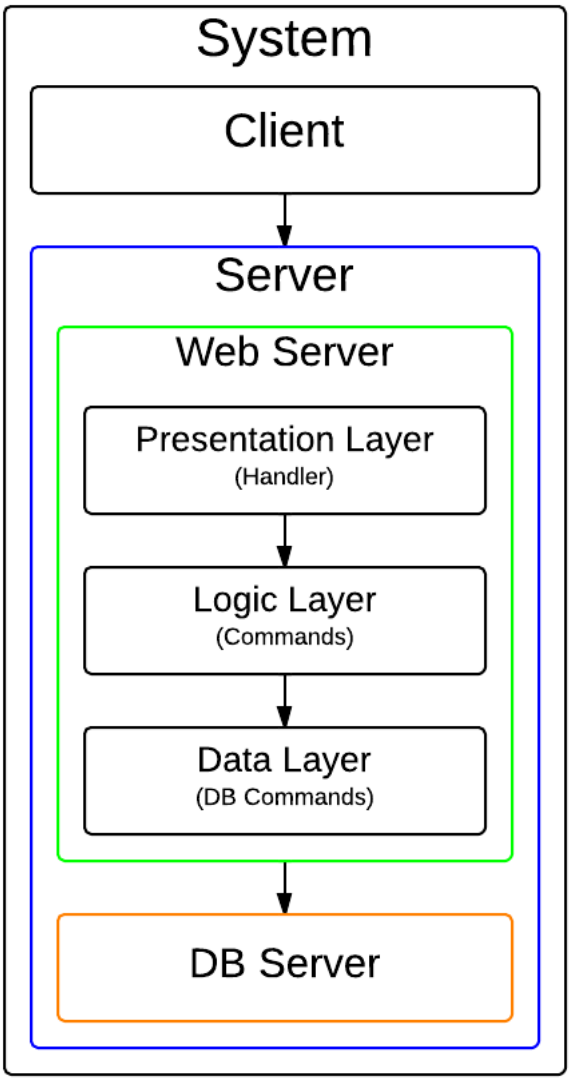


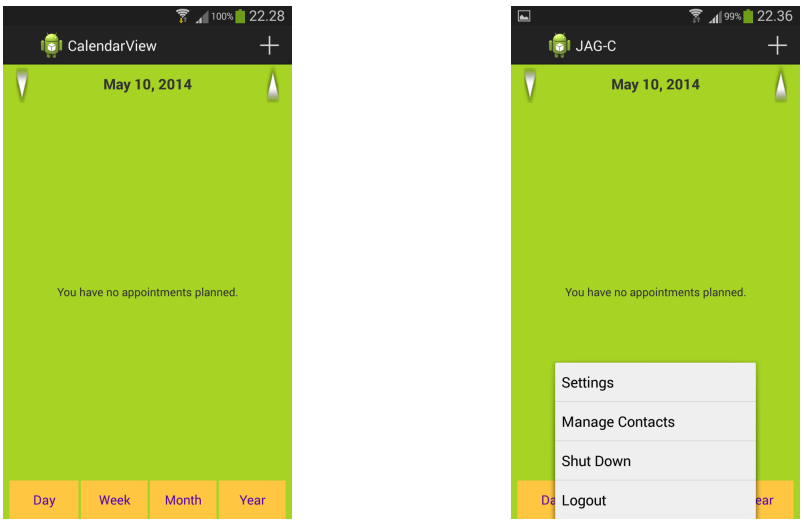
Figure 4.1: The architecture of the system.

4.3 Client

As described in section 4.1, the client is a thin client, which only contains graphics and the ability to connect to the server and send and receive data. The informations for the calendar is placed on the server to ensure, it is always the latest informations we have available on the client. The graphics are placed on the client to make load times faster. An alternative would be to send both data and interface graphics from the server at interaction with the client, but this would theoretically make the load time a lot longer, especially on mobile devices with low Internet connection speeds.

The design of the client is based on the findings from our previous work, where we made a design prototype for an electronic calendar. In the following we present the interfaces of the client, with descriptions on why we designed the interface that way.

The first thing the users will see, when they log into the calendar is the day view Figure 4.2a, the date is by default set to today on startup. If there are any appointments for the current day, they are shown as small boxes with a title, time, location, and a description, in the same way as it is illustrated in Figure 4.3b. We chose to display the appointments in this manner, because we had found in our previous work, that users preferred more information about the appointment in the overview, then just the title and time, which is the practice in the control calendar.

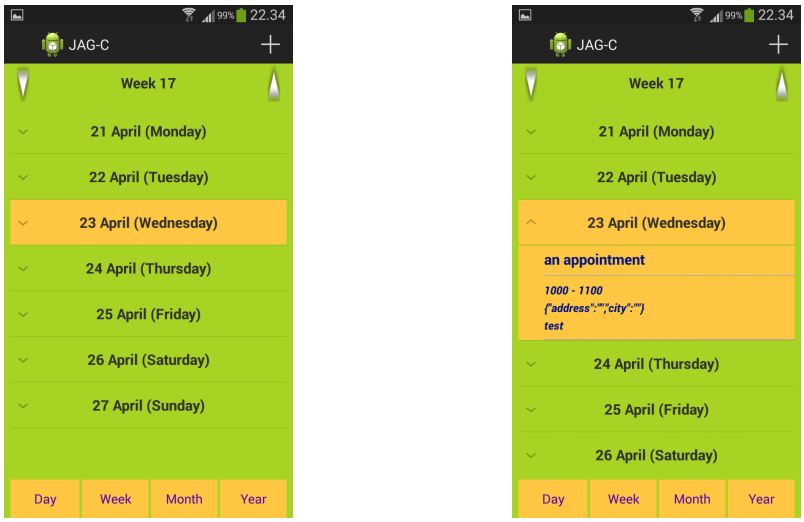


(a) The day and start view for the prototype.

(b) The menu, which is accessible from most places in the prototype.

Figure 4.2: The day view and the menu for the prototype.

The design of the week view Figure 4.3 was made this way in order to give a quick overview of the week, without too many informations cluttering the view. This is done by having a different color for days with appointments, if the user wants to see what is scheduled for the day, the information is viewed in listform by expanding the day. I.e. the day are parents in a list and the appointments are children. To edit an appointment or get more specific information, the user can push the list item like a button.



(a) The week view for the prototype.

(b) The week view with appointments showing for the prototype.

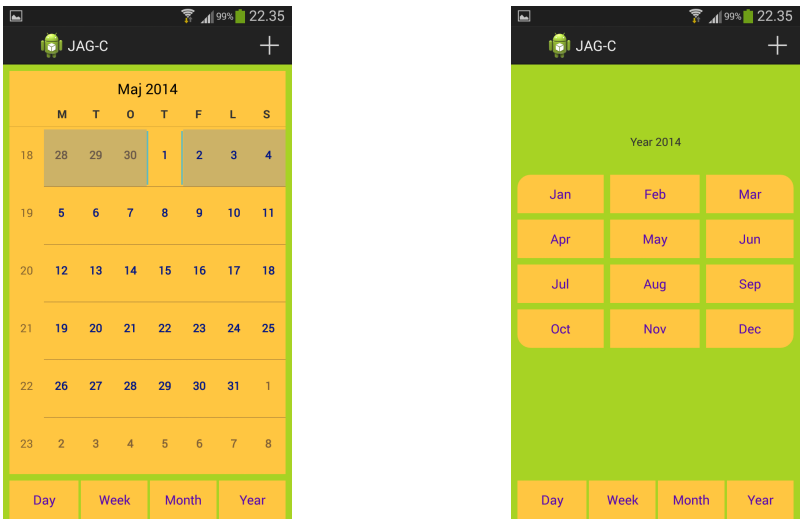
Figure 4.3: The week view for the prototype, both collapsed and expanded.

The month view Figure 4.4a is a basic electronic calendar month view. Since we did not find any other way to display data for a whole month in a more efficient manner, we decided to stick with what others have found to be the most efficient form of month representation. An example of this is Google's calendars app as shown in Figure 2.2b.

The year view Figure 4.4b does not indicate whether or not there are any appointments during a month, it is only meant as a menu of shortcuts for months in the selected year.

In our previous work we found that the users liked the structure with lists of notes, calendars, and lists in the left side panel Figure 4.5. The left side panel is accessed by sliding from the left side edge of the screen to the right side. Easy access to notes and lists from everywhere in the calendar app, helps users utilize the notes and lists features in the calendar.

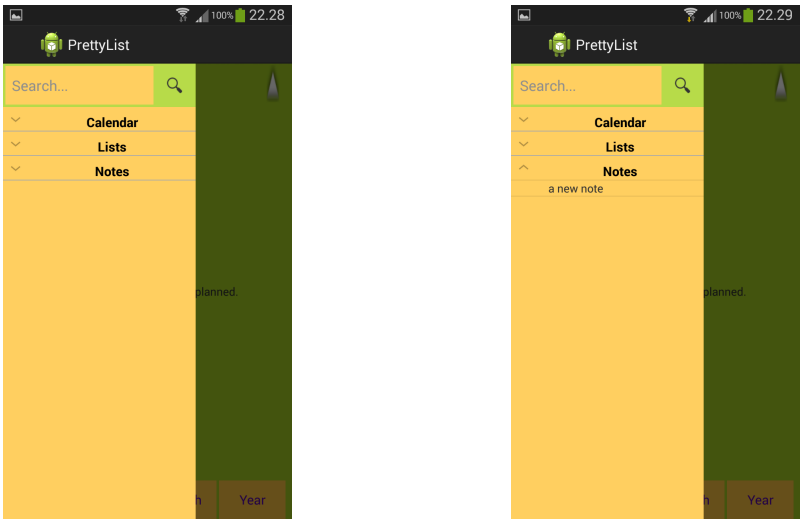
The right side panel Figure 4.6 is meant as a quick overview of the requests the user has from other users in the system. The right side panel is accessed



(a) The month view for the prototype.

(b) The year view for the prototype.

Figure 4.4: The month and year views for the prototype.



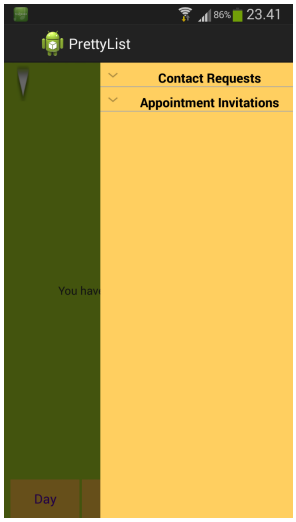
(a) The collapsed left panel view for the prototype.

(b) The expanded left panel view for the prototype.

Figure 4.5: The left panel view for the prototype, both collapsed and expanded.

by sliding from the right side edge of the screen to the left side. This is where the user can access *Contact Requests* and *Appointment Invitations* and respond to them. The reason for having these functions in a panel,

which is accessible from anywhere in the calendar, is that these functions are very important for group scheduling and that the needed information can be represented in a relatively small space. Arguably these functions could as well have been in their own full screen view, with access to them through the menu Figure 4.2b, but this could, for some users, be seen as a whole new activity, which needs to be taken care of right now, rather than additional information, which can wait. Information in a menu can feel hidden to some users, they simple does not notice it is a option, where as slide panels seem more accessible. Slide panels as extra information providers are also being used more and more on web sites and other mobile applications.



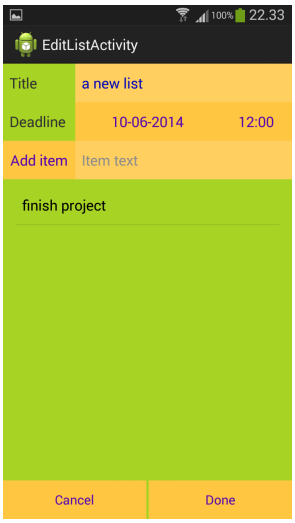
(a) The collapsed right panel view for the prototype.

(b) The expanded right panel view for the prototype.

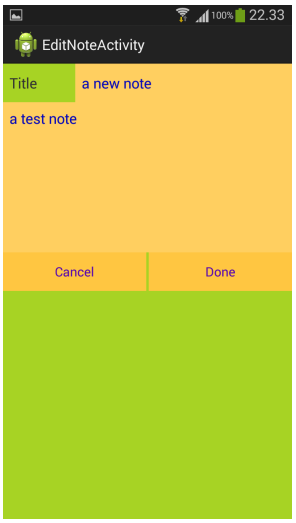
Figure 4.6: The right panel view for the prototype, both collapsed and expanded.

The *Add/Edit List* Figure 4.7a and *Add/Edit Note* Figure 4.7b views are accessed through the *Left Side Panel* Figure 4.5. The notes contain a title for identifying it later in the list view of the left side panel in Figure 4.5 and the append view in Figure 4.11b. Notes also contain a text field, this is for the content of the note, there is no restriction on the amount if text, the note can hold. The lists also contain a title for later identification, but instead of a text field, the list has a list where one can add or delete text from, each item of text on the list can contain a large amount of text, although this would not be advisable, since it quickly gets difficult to read the list with large amounts of text in each text item. Besides the differences between lists and notes in content, with lists containing lists and notes containing one text

field. The major difference in the two is that lists has a deadline.



(a) The add/edit view for lists in the prototype.



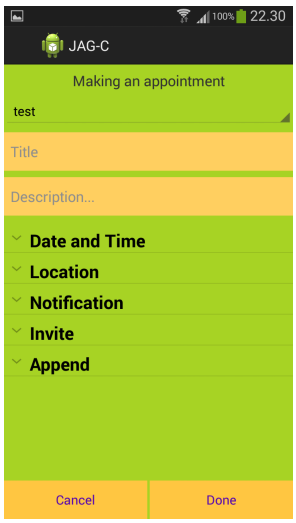
(b) The add/edit view for notes in the prototype.

Figure 4.7: The add/edit view for lists and notes in the prototype..

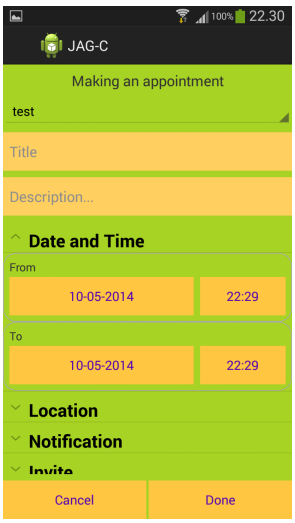
In our previous work we had all the informations for an appointment in a straightforward manner, but we found that some of the users found this confusing, so this time we chose to split the information into categories, see Figure 4.8a, and hide the input fields behind category tabs, which shows the input fields when pushed, and hides them again, when pushed again. The categories are *Date and Time* see Figure 4.8b, *Location* see Figure 4.9a, *Notification* see Figure 4.9b, *Invite* see Figure 4.10a, and *Append* see Figure 4.11a.

Date and Time contains two sets of buttons, one set for *from* date and time and one set for *to* date and time. The selection of date and time are done by pushing the buttons, which results in a standard date or time selection dialog box, depending on whether the date or time button was pushed. It is important to have both a start and end date and time for an appointment in order to schedule it. We have been working with the thought of *open ended* appointments, which is as such not a problem to store in the calendar, but it becomes a problem, when dealing with the scheduling part of a calendar, how do you schedule something you do not know when will end? How can you schedule something after an appointment, if you do not know when it ends? So for the prototype we decided to go with the traditional approach and have a start and end date and time for the appointments.

Location contains two text fields, one for address and one for city. The location for an appointment is not particularly important for the prototype



(a) The add appointment main view in the prototype.



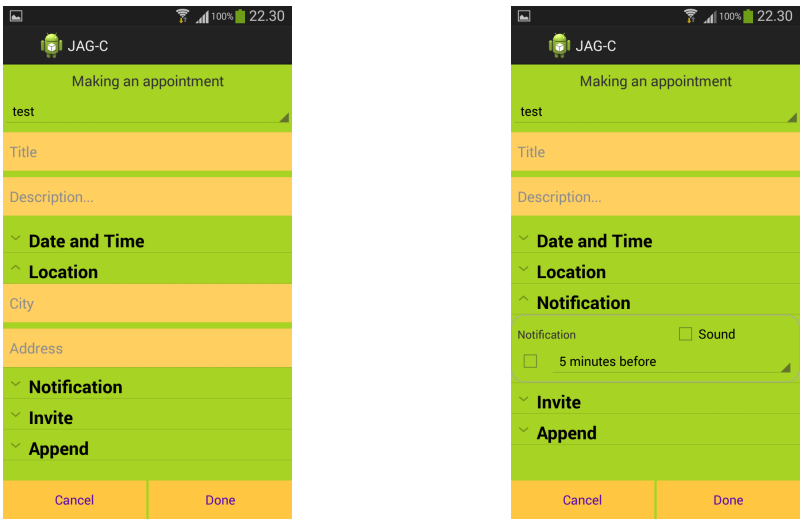
(b) The add appointment date view in the prototype.

Figure 4.8: The add appointment main and date views in the prototype.

test, but it is a piece of information which is needed in most cases, when entering an appointment in a calendar, unless it is given from the title or description. And for future work where automatic calculation of travel time, from location could be an interesting subject to look at. Many calendar applications today offer this feature, so it is nothing new, but in order to calculate travel time, a location is needed. We chose to include the location, because it is simply a integral part of the information needed for an appointment, so if it was not there many people would probably miss it.

Notification contains a check box indicating whether or not sound is wanted on the notification, a check box for activating the notification and a select box with predefined time intervals, indicating when the notification should activate relative to the appointments starting time. For the prototype test it is only possible to make one notification on an appointment, but as we have seen in our previous work, some users prefer to be reminded more than once about an appointment, so for a real system, we would need to support multiple notifications on an appointment.

Invite contains a button, which opens a new interface, where one can choose contacts to invite to the appointment, this list should be sorted alphabetically, but as we can see in Figure 4.10b it is not sorted at the moment. The reason for having a list instead of the classic *write email or name*, is that we wanted a way to do quick selection, and avoid having to remember emails and the correct spelling of names. And since we have a contact list in the



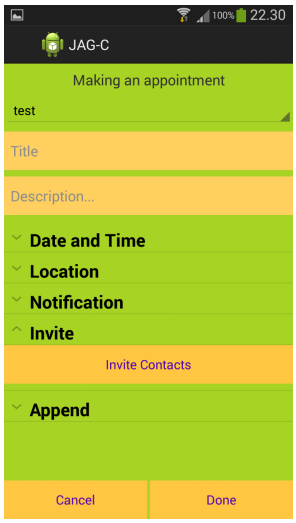
(a) The add appointment location view in the prototype.

(b) The add appointment notification view in the prototype.

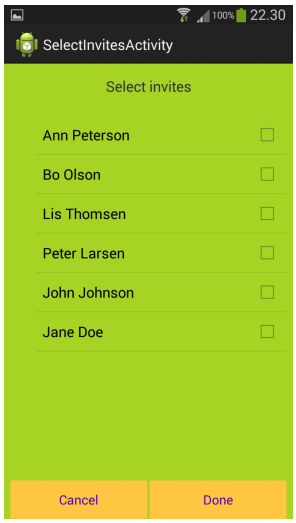
Figure 4.9: The add appointment location and notification views in the prototype.

application, we found it natural to use the contact list for contact selection. This obviously limits the invite possibility to people the user has in their contact list, but this is a mute point, since unless the contacts the user invites have this application, they wont be able to view potential appended lists or notes. The prototype is meant as a closed system, it is not possible to invite people, who does not have the application.

Append contains a button, which opens a new interface in the same manner as with *Invite*. This new interface contains two lists, one for the notes the user has in the system, and one for the lists the user has in the system, see Figure 4.11b. As with *Invite* the list selection was chosen to make it easier to make quick selection. An alternative would be to have a search on note or list titles, which would require writing, and for some users writing can take a long time.

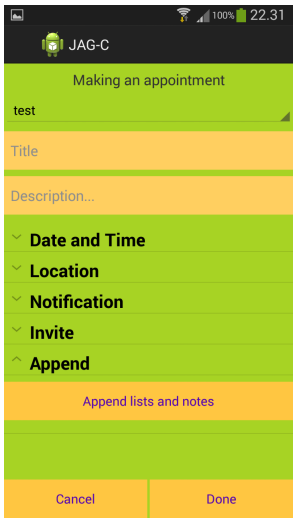


(a) The add appointment invite view in the prototype.

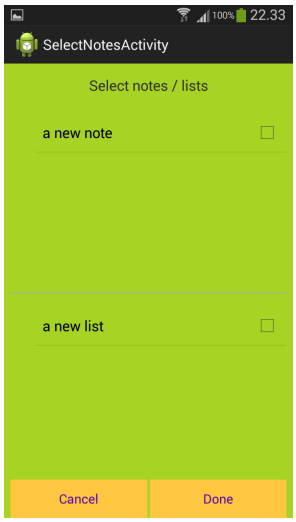


(b) The select contacts view in the prototype.

Figure 4.10: The add appointment invite and select contacts views in the prototype.



(a) The add appointment append view in the prototype.



(b) The append select view in the prototype.

Figure 4.11: The add appointment append and select views in the prototype.

Chapter 5

The Experiment

In this chapter we describe how we conducted the experiment, which we designed in chapter 3, furthermore we present the results we obtained through the experiment.

5.1 Experiment Conduct

Location-wise, the experiments were performed in the homes of the participants, this was preferred by the participants as it allowed for them to avoid traveling. As we performed the experiments in the homes of the participants, there were times when more than one of the intended participants were present when we arrived. Because of this we situated ourselves, along with only one of the participants, away from the rest of the participants and asked to be left alone for the duration of the experiment. This was done with the intention of not letting the other participants know of the specific details of the experiment, as this could potentially influence the results produced in the experiment (beforehand they were informed of the purpose, structure and duration of the experiment).

Before the experiments were conducted, we had the participants sign a form of consent stating that the material produced by the experiment could be used in our project and that the participants could withdraw from the study.

After the participants had signed the form of consent, we asked the participants to fill out the questionnaire we had prepared beforehand, see Appendix B, as this would provide us with demographic data about the participants and knowledge of their calendar experiences.

Following the questionnaire part of the experiment, we continued the experiment by performing the feature test. For the first experiment participant we randomly selected the first electronic calendar to be used, subsequently we alternated between which electronic calendar would be used as the first calendar for the feature test. After selecting the starting calendar, we gave a walk-through of the graphical user interface and the features available in the electronic calendar, we asked the participant to read aloud the scenario description and tasks, finally we asked the participant to think aloud during the feature test. Following this, the participant began attempting to complete the scenarios designed for the feature test, see Appendix A. Once the

participant had completed the scenarios for the first electronic calendar, a short break was taken. This was done in order to lessen the effects of fatigue, as the participant found it quite strenuous to concentrate on attempting to complete the testing scenarios. When we and the participant were done taking a break (usually around 5-10 minutes in duration), we resumed the feature test with the untested electronic calendar.

During the feature test portion of the experiment, one student was designated as the scribe, tasked with taking notes of how the participant used the electronic calendar in the experiment. To assists the scribe we used a microphone to record the feature test. The other student was beside the participant, tasked with ensuring that the participants observed the guidelines for the experiments, furthermore, the student was also tasked with taking corrective measures, if critical bugs occurred in the electronic calendars.

Following the completion of the feature test, we took another short break (5-10 minutes for stretching legs, using the toilet, etc.) before performing the final portion of the experiment, namely the interview.

The interview was conducted as a discussion on the participants thought expressed during the experiment's feature test, based on the questions seen in section 3.4.

During the interview portion of the experiment, one student was designated as the scribe, while the other student would be conducting the interview. The task of taking notes was performed by the same student who took notes during the feature test, to ensure that the notes were taken in a similar and consistent manner.

5.2 Experiment Results

During the tests, we taped the conversations between ourselves and the experiment participants, and took notes of what was said and how the participants interacted with the electronic calendar apps. This material was then later used to find the following results. We have split the results in three groups *Demography*, *The feature test and interview results*, and *Calendar usage*. *The feature test and interview results* describes the results from the feature test and the interview. The reason for having the results from the feature test and interview together, is that a lot of the actions the participants performed in the feature test, were discussed and commented in the interview. The questions used in the interview, allowed the participants to reflect on their interaction with the electronic calendar in the feature test. Furthermore, by including the participants thoughts from the feature test in the interview the participants could use the feature test as a point of reference

for the questions we asked.

We could have asked questions while the participants performed the feature test, but this may have interrupted their flow and train of thought, possibly affecting the results. Furthermore, if we were to ask questions during the feature test, we would have had to ask the exact same questions for the prototype test and the control test, in order to secure fairness between the two tests. Finally, by interrupting the feature test it could be difficult to replicate the results produced in the experiment.

The feature test and interview results is in itself split into four groups: *Interview results*, *Group coordination and scheduling*, *List and notes* and *Overall user interface design*. The *Interview results* contains the concrete results from the three questions in the final interview section 3.4. *Group coordination and scheduling* contains the results pertaining to sharing. *List and notes* contains the results regarding the list and note features. *Overall user interface design* contains the results related to the user interface design.

In following sections the participants are referred to as P1-P10 to ensure that the participants partaking in the experiment remain anonymous.

All of the participants completed all tasks without major difficulties, a few needed a hint or two to navigate the prototype, but as P5 said "Everything has a learning curve, and I have been using this for, what? 20 minutes.". The gist is, all tasks were completed successfully with both the prototype and the control app.

5.2.1 Demography

In Table 5.1 we have the results from the initial questionnaire. There were ten participants in total, three female and seven male in the age ranging from 18-34 years. Their education level varied from *grade school* to *higher education*, five of them were students, three unemployed and two employed. All but one participant had used smartphones before. All participants had used a calendar before, eight both paper and electronic calendars, one only paper and one only electronic. Two of the participants use calendars on a daily basis, it might be worth noting, that these two are two of the three female participants. In fact the last of the female participants and one of the male participants use their calendar every week. The rest of the male participants only use their calendars every month or less.

5.2.2 The feature test and interview results

This section contains all the results gained from conversation, pertaining to the feature test and the interview.

	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10
Gender										
Female		x					x	x		
Male	x		x	x	x	x			x	x
Age										
18-24	x	x	x	x			x	x		x
25-34					x	x			x	
Education										
Grade school	x	x		x	x	x				
High school			x							
Trade school								x		
Higher education > 4 years							x		x	x
Employment										
Private sector								x		
Public sector					x					
Student	x	x					x		x	x
Social security			x	x		x				
Earlier mobile devices										
Smartphone		x	x	x	x	x	x	x	x	x
Tablet					x	x	x	x	x	x
PDA					x		x			
None	x									
Earlier calendars										
Paper		x	x	x	x	x	x	x	x	x
Electronic	x		x	x	x	x	x	x	x	x
Other										x
Estimated calendar usage										
Every day							x	x		
Every week		x								x
Every month						x				
Very rarely	x		x		x				x	
Never				x						

Table 5.1: The results from the demographic questionnaire.

Interview results

In Table 5.2 we have the positive results from the final interview and in Table 5.3 we have the negative results. Since there were ten participants in total, each of them counts for 10%, so it might seam a little off, that there

are 5% values in the table. The reason for this is that one of the participants liked to be able to share lists and notes, but at the same time was concerned about making mistakes and by accident sharing the wrong lists or notes. The reasons given for the positive results were, that the participants liked the fact that they could have lists and notes in their calendars and not only access them, but also share them with others through an appointment or add it to a personal appointment. In short, what most of the participants mentioned as being the positive thing, was reusing information, and not having to write the same information multiple times to multiple people. It could be something like a *wish list* for a birthday party, but not all guests are invited the same day, here you would have multiple appointments with the same appended note. We have a more detailed description of the results pertaining lists and notes in the *Lists and notes* section, where the difference between lists and notes in the prototype and in the control app will be made clearer too.

Good to have notes and lists in calendars	90%
Good to have notes and lists in appointments	90%
Good to be able to share notes and lists	85%

Table 5.2: The positive results from the interviews.

Bad to have notes and lists in calendars	10%
Bad to have notes and lists in appointments	10%
Bad to be able to share notes and lists	15%

Table 5.3: The negative results from the interviews.

Group coordination and scheduling

The participant P5, who does a lot of planning for larger groups of people, could see possibilities in the addition of notes and lists in appointments for planning events, especially if everybody associated with the appointment would be able to write in the notes and lists. We had a short discussion about the disadvantages of allowing everybody to change a note, as a possible prankster may be invited to some appointments. Participant P5, knew this all too well and his suggestion for a solution was to make a *message board* like we know from chat and forums, so instead of one note, there would be multiple entries from the different people associated with the appointment. P5 viewed this as a much better solution for coordination, than having to call everybody or sms them individually. P3 also noted that planning would be

easier with the sharing of lists and notes in appointments, but unlike P5 he did not want everybody to have access to change the information in the notes and lists. On the other hand P10 would like to be able to change permissions for the users, so for example a family could have a shopping list and add, remove or check off items. But in the case of an invite to a party, like in the test Figure A.3, the invited persons should only have permission to check off items, not remove or change them, so everybody could see what has been taken care of. P9 specifically mentioned, that in regards to sharing of lists and notes in appointments, he would like to be able to share individual lists and notes with the invited persons, he gave an example of this with a party planning and what if one of the persons should bring a surprise, like a cake, that would not be something the others should know about. All in all the lists and notes are not bad ideas for use in planning, but it needs to be more flexible to be useful.

Lists and notes

There is no way to have notes and lists directly in the control app, the only way to have notes or lists in the control app, is to make an appointment and write the information in a description.

Five of the ten participants were missing a note function in the control app, four of whom started with our app and the last one was used to having an external note app, which he would have used to make a note, if it were available.

P1 and P4 specifically mentioned the reuse of already written information as a very good feature, compared to the control app, were one has to write the information again, instead of just sharing a note it is in. P1 even compared it to writing a sms, which is what he does, when he needs to send a note to somebody.

All of the participants found it quicker to use the notes, than having to write in descriptions, like with the control app. This was probably a little clouded by the tests, where they had to reuse the information written in notes, if it is a one time use only, it might not be quicker to write notes over descriptions.

P3 and P6 specifically mentioned writing lists and notes on the go, meaning not only writing new lists and notes, when they think about something, but also adding or removing information to/from existing lists and notes. P3 mentioned that he already does this in a note app on his phone, but he would prefer if it were available in a calendar for sharing with others.

Some of the participants had some comments on the way we defined lists and notes, where lists have a deadline and were written in a list format. And

notes were just plain text without any time aspect. The participants did not really see a difference between lists and notes, at least not the intended time aspect difference. Some of the participants mentioned that in order to use the notes and lists, they needed to be more flexible, examples of this was, copying from one list to another, having lists in notes, lists without deadline and notes with deadline. P10 said, that there is nothing he could do in the prototype, that he could not also do in the control app. Not in the same way, but the basic functionality with storing and sharing data, could be done in both applications.

Participant P7, who uses her calendar multiple times every day and previously used a paper calendar for most of her planning, mentioned that she found the control app very inflexible, she preferred a calendar she could personalize. With the control app, and other electronic calendars she had tried, it quickly got cluttered in the calendar, when she added notes. She described the prototype as being ″paper-calendar-pocket-smart″, where she could have the notes in the calendar, without it being cluttered in the calendar view, because as opposed to the control app, the notes would not be mixed in with the appointments. She actually finished by telling us we needed to make this happen.

Overall user interface design

In general the participants had a problem with the way we show *date and time* in appointments. The primary issue is the fact, that we have chosen to hide *date and time* in order to save space. But this resulted in participants forgetting the time or felt annoyed, that they had to do extra work to input time and date. Most of the participants noted, that they liked our way of inviting people to an appointment, the list selection solution were preferred over the control apps *search function*. The reason given, was that it was faster than having to type an email. One of the participants, P4, asked about the technological possibilities for getting contact information from the phones contact list in addition to the prototypes contact list. We had a short discussion, where the main point was, yes we could do that, but then the information given to a person outside of our system, would only have access to the information given at the time, so in order for these persons to get any information about changes in notes, lists or appointment data, the entire appointment would have to be send again including appended resources. Participant P4 did not seam to have a problem with this, so it might be worth looking into this in a future release, and also look into how often changes actually occur in appointments, if changes rarely happen, it would not be a problem to send the information in a sms or an e-mail, either

as plain text or an iCalendar file for importation into an existing calendar application.

P2 called the prototype *fancier* than the control app, not only the colors, but also the way the elements in the prototype were separated. When asked to clarify, she said the prototype was easier to navigate and better structured, with groupings of information, than the control app which she found to be unstructured.

5.2.3 Calendar usage

We observed that the participants intuitively adds an appointment, by going to the day where the appointment is being held and adding the appointment there. This was regardless of whether they started with the prototype or the control app.

There did not seem to be any major difference in how the participants used an electronic calendar, overall they had the same approach to the tasks in the scenarios of feature test. Given their previous knowledge of calendars and educational levels, we had expected a slight difference in behavior, regarding calendar usage. But it would seem that the participants' approach to the electronic calendar is simply just an abstraction of how they would use a paper calendar. An example of this is that all of the participants navigated to the day, they wanted to add an appointment on, like you would do in a paper calendar, rather than adding the appointment via a shortcut and input the date and time information manually. This counts for the control app, the prototype does not work with navigating to the day of the appointment and adding by clicking on the day. The prototype only works with manually adding the date and time information. In light of this, there might be a reason as to why the electronic calendar applications still looks like a paper calendar.

Chapter 6

Discussion

In this chapter we discuss and reflect on the results from the experiment presented in section 5.2, followed by a discussion of possible subjects for future work concerning the focus of the report, see section 1.3.

6.1 Notes and Lists

As a concept, the integration of lists and notes in calendars were well received by the participants of our experiment. For the most part, the participants found notes and lists to be useful, not only for group coordination, but also as an addition to their private calendaring.

However, there was some confusion regarding the definition of lists and notes, where lists could have a deadline and bullet points, and notes only consisted of plain text. The confusion originated from the participants not thinking of notes and lists as being different in terms of usage. Therefore, the participants had a tendency to refer to both notes and lists simply as notes.

From our previous work [4] we learned, that even though people would refer to a to-do list as a list, they would often just write it as a note in plain text, which made it difficult to define the clear difference between notes and lists. Following this, we decided to make it more clear what the difference between notes and lists were, which is why notes only contain plain text and lists have a deadline and are formatted as a set of bullet items.

The experiment showed that most of the participants thought of the note and list features as being the one and same, even though there is a difference between them. The participants referred to lists, in the conversations as notes, in light of this we believe there to be a basis for further investigation in the area of notes and lists. Instead of having notes and lists as two separate features, the two features could probably be merged into a single feature for note taking. Furthermore, this single feature used for note taking could have additional functionalities for customizing its appearance (e.g. plain text or bullet items) and for applying deadlines and notifications to it. Another extension of the note taking feature could be to allow users to share saved notes, without having to associate it to a calendar appointment.

We could take it one step further, by having a group-based mobile noticeboard integrated in the calendar app. On this noticeboard, the members

of a group could post notices (in the form of notes).

This opens up for a whole new aspect of the group calendars. Suppose the group is for an organization, for instance, a football club. They would be able to post notes, with their matches, on the noticeboard, maybe some of these notes would contain appointments for the matches, with the time and place. Now the users can simply add these appointments to their calendars and, if changes in the time and/or place or there is a cancellation, this would be updated instantly in the shared appointments.

In the electronic calendar prototype, which we created for the experiment, there is no support for groups. If we were to investigate the aforementioned idea, we would first have to incorporate it. To clarify, in this respect group support means that a group of users have a shared calendar, any appointment made in the shared calendar will be available to all the group members. In the prototype we have group coordination, in the sense that multiple users can be invited to the same appointment.

6.2 Group Coordination and Scheduling

The addition of lists and notes used for group coordination and scheduling was well received, and a multitude of the participants were open to the idea of sharing notes and lists in appointments for group coordination and scheduling. One of the participants could see the potential in the sharing of lists and notes in appointments, but was a little afraid of accidentally sharing the wrong note or list by mistake. This problem could be solved by allowing the user to view the lists and notes after the appending them, with the aim of allowing the user to be verify that the correct notes or lists have been appended.

The only participant who was against the sharing of lists and notes was participant P8, this participant was not interested in sharing notes and lists with other people. For group coordination and scheduling, participant P8 preferred contacting people personally using the phone instead of a calendar, which shows that different people have different ways of performing certain tasks.

Participant P10, suggested that shared notes and lists could have a set permissions, with the example of a family's shopping list in contrast to a list for a party, based on the fact that families tend to share their calendars for coordination, which is also found by Thayer et al. [15]. Permissions could be a further feature addition to the noticeboard discussed in section 6.1, in order to dedicate administrators for a group. The alternative to administrators, would be that either all members of a group can change the notes posted

in the group, or only the user who posted the note can change it. As it was discussed in the experiment with participant P5, a possible prankster could have been invited to an appointment. This could also happen with a noticeboard, so it would be a bad idea for everybody in a group to have access to change everything.

6.3 The prototype

Some might wonder why we chose to make a calendar app from scratch, instead of making an add-on for the Google Calendar app (Google provides the functionalities for doing so). The reason for this is by using the existing Google Calendar app as the basis for the calendar app, would give us the same restrictions that the Google Calendar app has, as the backend is still the same. You can already get add-ons for the Google Calendar app, which contains notes, but these notes are only available locally on the device they where created on. So one cannot share these notes with others nor access them from other devices.

6.3.1 User interface design

The participants were not impressed with our ”new appointment” interface design, see Figure 4.8, in which we tried to make a less cluttered interface, than the one found in the existing calendar application, see Figure 2.4. Our thoughts behind the design was that in this way the user only has to look at the information being worked on at the moment and there is no need to show input fields that are never used. For instance, if the user does not want a notification, see Figure 4.9b, there is no need to use real estate on unused input fields.

Some of the participants found this design confusing and annoying, they all felt it was unnecessary work, as they had to look for the date and time input fields, especially because this is information they always need to enter when making a new appointment. A few of the participants almost forgot about the date and time, because the fields were not visible by default.

For future releases we need to find a solution to this problem. One possible solution could be to have the date and time view expanded by default, such that the fields are visible when the user starts adding a new appointment. Another solution could be to have the date and time fields in the same way as in the Google Calendar app, see Figure 2.4. A third possible solution could be to completely rethink the interface and make a ”1-2-3” kind of interface, where the interaction is split into multiple steps. Each step would be shown in their own views, where each view would contain three buttons, *Cancel*,

Back and *Next*, in the final step *Next* would be substituted with *Done* and in the first step the *Back* would be grayed out.

The first step would be to select the calendar the appointment should be added to. The second step would be the title of the appointment. The third step would be date and time for the appointment. The fourth step would be the description. The fifth step would be the location. The sixth step would be for notifications. The seventh step would be for appending resources, like lists and notes. The final step would be for inviting other users to the appointment. The only three steps that have to contain data is the first three steps, whereas the rest can be left empty. This solution would require the user to interact more with the calendar, when adding an appointment, since the *Next* button has to be pushed at all steps. But when we split the information into steps, we may be able to eliminate the confusion a cluttered screen seems to cause. But this is only speculation, the only way we can be certain is by making the system and test it.

6.4 Future Work

Based on the feedback from the experiment participants, there is a basis for finishing the electronic calendar app and releasing it to a small group of test users, with further development as motivation. As the electronic calendar is a prototype, it still requires a lot of work to be able to compete with existing calendar solutions, like Google's calendar app, but we are on our way to having usable solution with the potential of filling some of the gap between electronic and paper calendars. Namely the flexibility of the paper calendar, with regards to notes. And the group calendaring aspect of the electronic calendar.

It could be interesting to do further research in regards to calendar usage, with the aim of investigating whether we use calendars based on our observation of time or if we use calendars based on past experiences. This is grounded in our observation on calendar usage in section 5.2.3. Furthermore, this might be able to provide an understanding of why many electronic calendar systems still resemble paper calendars in their interface designs, is the reason simply familiarity or are there psychological founded reasons for their designs ?

Chapter 7

Conclusion

In this relatively brief chapter, we conclude on the work we have presented in this report, specifically we conclude on the research question stated in section 1.3.

Through a series of experiments, this project has investigated the question stated in section 1.3, specifically we investigated the question

> *In an electronic calendar, how does the integration of notes, lists and the sharing of these affect group calendaring ?*

In order to investigate this problem we designed an experiment. The experiment consisted of three methods for data acquisition, a questionnaire, a feature test based on two electronic calendars and an interview. By performing the aforementioned experiment we acquired: quantitative data on our experiment participants' demography and calendar experiences; observations of how the experiment participants used notes, lists and the sharing of these in respect to electronic calendars and group coordination; qualitative data on the experiment participants' opinions and thoughts regarding notes, lists and the sharing of these in respect to electronic calendars and group coordination.

As a result of performing the experiment, we learned that even though notes and list have different properties in the electronic calendar prototype we made, the experiment participants did often not think of notes and lists as being different. However, the experiment participants felt that the inclusion of notes and lists was an interesting addition to electronic calendars, with potential for further extension in regards to their usage in electronic calendars.

From the experiment we also found that the experiment participants approved of the idea of sharing notes and lists as part of a calendar appointment, as this could be used to provide additional information about appointments by reusing existing notes and lists. Furthermore, we found that if notes and lists are to support group coordination, then it may be appropriate to allow the users of electronic calendars to also share the note and lists without the use of a calendar appointment as an intermediary.

In conclusion, we have found that notes and lists are able to support electronic calendars, as they provide some of the capabilities available in paper calendars. Furthermore, notes and lists can be used by appointment planners to communicate their intentions to the receivers of appointment invitations, meaning that notes and lists can be used to facilitate group coordination.

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Appendix

A

Test Scenarios

Scenario #01

Description: You are away from home and only have your mobile phone with you, and you remember that there is a concert with your favourite band, but you cannot remember when they are performing, therefore you make a note of this so you can remember it later.

Tasks:

- Make a note of the concert with your favourite band.
- Save the note for later usage.

Figure A.1: Scenario #01 used in the feature test with the purpose of understanding how the experiment participants would take a note of something using an electronic calendar.

Scenario #02

Description: You are in the process of planning this evening's dinner, and therefore you need to go shopping to ensure you have everything you may be missing. To help you remember what you need to buy you make a shopping list, and you decide to use you mobile phone for it, since you always have it with you.

Tasks:

- Make a shopping list with the following items: (must be done before 17.30 - today's date)

  Milk

  Minced meat (beef)

  Bacon

  Bell pepper

- Save the shopping list for later usage.

Figure A.2: Scenario #02 used in the feature test with the purpose of understanding how the experiment participants would make a list things using an electronic calendar.

Scenario #03

Description: You and your friends wants to have a barbecue, and you know that you are the only one with enough space to host it, and the only one with a grill. Since you do not want to be in the kitchen all day, you decide that the guests are each to bring either a pre-cooked dish or some kind of meat, the challenging part is to coordinate this with your friends (Ann, Bo, Lis and Peter), without having to perform multiple phone calls for determining the date of the barbecue, and to make sure that everyone knows what to bring.

Tasks:

- Make an appointment for the barbecue.
  From: 17.00 - 17/05-2014
  To: 23.00 - 17/05-2014
- Invite your friends Ann, Bo, Lis and Peter to the appointment.
- Inform your friends of the items they need to bring: (no later than 17.30 - 17/05-2014)
  Ann Peterson - Beverages
  Bo Olson - Spareribs
  Lis Thomson - Potato Salad
  Peter Larsen - Sausages
- Save the appointment.

Figure A.3: Scenario #03 used in the feature test with the purpose of understanding how group calendaring is affected by the integration of list sharing, from an appointment maker's point of view.

Scenario #04

Description: Earlier, while you were away from home, you made a note of a concert with your favourite band. After having some time to learn more about the concert, you edit your note to contain the new information. Since going to a concert with some friends is more fun than going alone, you decide to see if any of your friends might be interested in going.

Tasks:

- Edit your note from *Scenario #01* so it contains the following information:

  Name of the band (your pick)

  Date and time: 20.45 - 09/05-2014

  Location: Aalborg

  Ticket price: Kr 150,-
- Make an appointment for the concert.
- Invite some friends to the appointment, for instance, Ann, Bo, Lis and Peter.
- Share the concert information with the friends you invited.
- Save the appointment.

Figure A.4: Scenario #04 used in the feature test with the purpose of understanding how group calendaring is affected by the integration of note sharing, from an appointment maker's point of view.

Scenario #05

Description: Your friend John Johnson annually hosts a weekend-trip at a holiday home for his friends. Usually he calls every guest to personally invite them, however, this year he has taken the liberty to use his calendar to make the weekend-trip an event. Since you don't know if you want to participate this year, you look at the appointment for more information about the trip and then decide if you want to go.

Tasks:

- Find the appointment invitation from John.
- Look at the information he wrote in the invitation.
- Decide if you want to attend the weekend-trip.

Figure A.5: Scenario #05 used in the feature test with the purpose of understanding how group calendaring is affected by the integration of note sharing, from an appointment invitation receiver's point of view.

Scenario #06

Description: The 10/05-2014 your friend Jane Doe is hosting a party because of her birthday, and to help her keep track of the arrangements, she has sent out invitations using her calendar, per reflex you decide to participate.
While browsing through the appointment invitation, you notice that she has also shared a list called *Gift Ideas*. As you do not really know what to give her for her birthday, you look at the list and find something you think is appropriate for a birthday gift. To make sure that you not forget to buy the gift, you add it to your current shopping list.

Tasks:

- Accept the party invitation.
- Find the gift suggestions, *Gift Ideas*.
- Decide on a birthday gift.
- The gift idea you decided on, write it onto your shopping list from *Scenario #02*.
- Save the changes to the shopping list.

Figure A.6: Scenario #06 used in the feature test with the purpose of understanding how group calendaring is affected by the integration of list sharing, from an appointment invitation receiver's point of view.

Appendix

B

Questionnaire

A survey of you and your calendar usage

Background information

Gender

- ☐ Female
- ☐ Male

Age

- ☐ 13-17
- ☐ 18-24
- ☐ 25-34
- ☐ 35-44
- ☐ 45-54
- ☐ 55-64
- ☐ 65 or older

Education, what is your highest level of education ?

- ☐ Grade school
- ☐ High school
- ☐ Trade school
- ☐ Higher education $<$ 3 years
- ☐ Higher education 3-4 years
- ☐ Higher education $>$ 4 years
- ☐ Don't want to answer / other

Current employment

- ☐ Private sector
- ☐ Public sector
- ☐ Self employed
- ☐ Retired
- ☐ Student
- ☐ Social security
- ☐ Other

Calendar usage

Earlier mobile devices. Which of the following types of mobile devices have you used before ?

- ☐ Smartphone
- ☐ Tablet
- ☐ PDA (Personal Digital Assistant)
- ☐ None

Earlier calendars. Which of the following types of calendars have you used before ?

- ☐ Paper calendars
- ☐ Electronic calendars
- ☐ Other / None

Current estimated calendar usage. How often do you use a calendar ?

- ☐ Every day
- ☐ Every week
- ☐ Every month
- ☐ Very rarely
- ☐ Never

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