Redesigning and evaluation of a Smart calendar

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Abstract:

The ideas proposed in the last project are re-evaluated (chapter 1), some of them excluded, and re-implemented in an actual Android application. As a source of the design ideas, it is not considered, only (Dimov, 2013). This way, the chance for the *Design ideas* to go in wrong direction is reduced.
In the evaluation of the new prototype, group of eight students were gathered - however, with different participants are required to avoid *Confounding variables*. The prototype was implemented in Java and XML, build on Eclipse with ADT-bundle (Android development tools), and it was functional to the extend the the proposed ideas can be evaluated.
The experiment is set, according to (Benyon, 2010) and (Lazar and Feng, 2010), and the results are described in chapter 4. They are discussed in chapter 5, the results are compared to the results of the project form the last semester.
In the last chapter 6, the *Design ideas* are valued, and possible improvement are suggested.

Preface

This report was written by group swd104f14 in the Spring 2014 as a master thesis on the 10-th semester of the Software Development program at the Aalborg University. The competence of the thesis was "Information Systems" and my task was to improve and evaluate with users the prototype with the suggested by (Dimov, 2013) ideas. The purpose of the evaluations is to validate the refined ideas and measure the improvement according to the prototype form the last semester.

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Contents

Introduction

Nowadays, there are many variations of a digital calendars. Most of the popular digital calendars does not distinguish much from the ordinary paper calendars in matter of functionality. There are however, other not so popular solutions with more sophisticated functionality as "SensiCal" (Mueller, 2000), suggest that the calendar should fill missing information according to predefined criteria. Other, suggest that the digital calendar must be an agent, which helps you make your schedule by overtaking the negotiation for a meeting to much more advanced and automatic level (Faulring and Myers, 2005).

However, most popular digital calendars (Google Calendar, ICal), are not advanced to the level of a computerised agent as the mentioned above, but still they are preferred. The reason for this is the good design, consistency and no overcomplicated functionality.

The results of (Dimov, 2013) showed, that users prefer consistent design and this was a problem for "Smart Calendar", when new features were introduced. Some of the design ideas showed poor results, therefore they are excluded in this project. For the rest of the design ideas, the results were positive at general, but the feedback from the interview demands refinement. Information about the new features was provided in "Design of smart calendar", but the results showed that the users do not appreciate the manner in which the information about features was given.

The purpose of this project will be to refine the design ideas introduced by "Design of smart calendar", and reintroduce the refined design ideas to the users in manner that will be understandable. Then the results will be compared with (Dimov, 2013) and discussion will be enabled, with comparison with other related to the topic researches.

The research questions of this project are:

1. What value the improved design ideas will have for the users?

2. Does the mental model of the users about the new features match the

expectations of the design ideas?

By answering these questions, the design ideas will be validated or rejected according to the results in chapter 4. In chapter 5 the results of of the evaluation will be analysed and the design will be compared with existing work on this topic. At last, in chapter 6 the research questions will be answered, and elaborated.

Chapter 1

Design Ideas

In this chapter are described the design ideas, which the smart calendar must have. Those ideas, must have the most valuable features for the user and aid him trough scheduling his time.

In my last project (Dimov, 2013), I have suggested four design ideas. Some of the ideas where not accepted well from the users, as the different way of scheduling events (trough *dialog boxes*). According to Benyon (2010), there is a design principle *consistency*, which states, that the design of a specific product must not be radically different from the other products of the same type (for example, the e-mail form). This means, that the calendar must have a set of functionalities and view, common to the other digital calendars.

1.1 Different types of events

In the current digital calendars, there is only one type of events with one level of priority, which the user can schedule. The events, can be color coded, according their subject (work, entertainment and etc.). In the real life, the events that we commit are not the same type by nature. For example, we have events which we don't want to miss or can not reschedule. We also have events, which we have to commit but we don't have a specific time to do and can be postponed because of other more important events. However, such events can't be scheduled with ordinary digital calendar.

Tomitsch et al. (2001) distinguished three types of events, and two types of entries:

1. Scheduled events - Events which have fixed date, can not be postponed and user must attend. Such events are **out of user's control**, like:

business meeting, job, lectures, exams and etc. However, if the user is unable to attend the events can be ignored - for example if the user is sick and can't go to work.

2. Tentative events - Events which do not have fixed date and time, but the user has to attend as soon as possible. Such events are **in user's control**, and he can reschedule those events as it fits him. Such events, can be considered as chores for the user. These kind of events represent periodically repeating casual events as: shopping, laundry, making appointments and etc.

3. Subsequent events - Events which depend on the previous event and start as soon as the previous event finishes. Such kind of events represent real life situation from "Call parents after exam" to "Report for received delivery after its receiving". Those events are **in user's control**, but he is obligated to commit them right after the previous event.

4. Pro forma entries - Events which are so important and ubiquitous that the user would not forget about them anyway. Such events are **out of user's control**, and can't be rescheduled. Those events have so heavy weight for the user that their scheduling in a calendar would be unnecessary. Such entries represent events which user wants to commit, and look forward to as big concert or planned vacation.

5. Informative entries - Events which the user will not attend, but keep in his schedule for informative reasons. Such events are **out of user's control**, and the user is not interested in attending these events. However, the user is interested in the result of these events. Informative entries represent keeping track of other people's events such result of football match, loved one's schedule ant etc.

Faulring and Myers (2001) in their design of "Meeting Maker", suggest that the events must be prioritized according to how important and easy to move they are. However, there is a social issue with it, because those events are visible to other users, and they might think that a certain event is more important than it is for the user.

In my last project (Dimov, 2013) I have tried to implement event prioritization, by distinguishing two main events - scheduled and floating, subsequent, preparation and informative events. However, for the users it was not clear what are the different types are supposed to be used for (although the tips that the users had while making the events), which brought confusion

into the users. Therefore, such event prioritization must be clear for the users, and it should be easy for them to make a mental model of how the different types of events work.

1.2 Travel time estimations

As (Alexiadis and Refanidis) suggest, it is expected for the events to have locations attached to them. It is important for the user to be able to commit on time his events, this brings the necessity to have suitable time period between two events - travel time. Travel time estimation feature must be able to give proper travel time according to the physical distance between the events. (Alexiadis and Refanidis) also suggested, that such feature should be implemented in the smart calendars. However, such feature is not implemented on most of the digital calendars running on mobile devices.

The results of (Dimov, 2013) showed, that the users usually do the travel time estimations by themselves. The purpose of travel time estimations will be to provide the user with:

1. Provide the user with accurate information about the time required from the current location to the location of the next scheduled event.

2. Warn the user when the time required for transportation starts - when the user has to commit transportation to the next event.

3. Prevent the user to schedule two events with not enough travel time between them.

4. The user should be able to choose the method of transportation on a specific travel time period. The size of the travel time will depend on the method of transportation.

Those activities are usually done by the user himself and are not included in most available calendars. However, (Dimov, 2013) also showed, that the users are not keen to trust the travel time estimations, because they don't understand how the estimations are done. In order to be implemented in a smart calendar, such feature must be explicit to the users.

1.3 Semi-automatic scheduling

(Faulring and Myers, 2005) suggested solution for automatic scheduling - a calendar agent, which schedule events according to constraints extracted

from personal correspondence (e-mails and etc.). However, such agent is facing three problems:

1. The agent misunderstand the natural language of the user.
2. The agent may have inaccurate model of the users preferences and needs.
3. The interface should allow the user to understand and control the agents behaviour, which affect the trust in the agent of the user.

In order such feature to work properly, there must be clear interpretation of the users intents. Such problem, also could be avoided, if the user is able to provide the constraints of the events by himself.

As it is mentioned before (section 1.1), there are different types of events distinguished. The task of the *Smart calnedar* should be able to orchestrate the events according to their attributes and constraints. To avoid the problems mentioned above, the task of the automatic scheduling will be simplified to a level that the user understands how the calendar interprets his intentions.

If a behavioural pattern is attached to each type of event, and the calendar manage the events according to their type and it is clear for the user how the different types of events work, it will be easy task to perform accurate automatic scheduling.

Practically the user can't be at two places at the same time. This means that it is not realistic to have two or more events at the same time or overlapping. There are two cases, in which such overlap may occur:

1. When the user is scheduling by himself overlapping events.
2. When the user receives an invitation for an event, that overlaps with other event.

However, there is no reason to make two events with different locations at the same time. The task of semi-automatic scheduling will be to avoid such problem by using behavioural patterns attached to the different types of events. In our case, the semi-automatic scheduling must also consider the travel time required between two events as a part of the attributes of the events.

Also, if the calendar has to change the schedule of the user, because of overlapping events, or other reason, this change must be explicit (Faulring and Myers, 2005) to the user before it take place - user must be able to see what is the change before it takes place and be able to discard it if it is not suitable with his personal preferences.

1.4 Design Solutions

In this section the is elaborated on how the design ideas should be implemented in the prototype.

It should be mentioned, that to the word "event" is referred as an activity, which has know duration (known beginning and known end).

1.4.1 Different types of events

The results of my last project (Dimov, 2013), showed that is it hard for the users to build a mental mode of how each type of events work. This was due not clear behaviour of the types of events and miss conceptional appearance (bad design name).

Therefore, the types of events have to be simplified and reworked. As a starting point will be taken an essence of the definitions from the theory behind the different types of events (section 1.1).

1. Scheduled events:
   (a) Attributes: Events can **not** be rescheduled - due they are **out** of user's control; the events can be ignored - due post major circumstances; events have heavy weight on the schedule and can not be postponed by other events or overlapping with *Scheduled* or *Tentative* events and travel time estimations; event location.
   (b) Appearance: Light red color - to signify **high** importance; name[1] - "*Important event*".
   (c) Meta data: Help box that will represent elaborated explanation about how the event behaves in the schedule and examples.
2. Tentative events:
   (a) Attributes: Events *can* be rescheduled - due they are **in** the user's control; events can *not* be ignored because the user has to attend them at some point; it is important to be known if the event is attended; *Deadline* - not mandatory (event can exist without deadline); can **not** overlap with other *Tentative* or *Scheduled* and travel time estimations; event location; event duration; event deadline.

[1] How the type of event will be called in the application.

(b) Appearance: Yellow color - to signify importance; name - "*Chore*"[1].

(c) Meta data: Help box that will represent elaborated explanation about how the event behaves in the schedule and examples.

3. Informative entries:

(a) Attributes: Events can **not** be rescheduled - due they are **out** of user's control; events **can** overlap with other types of events - user will **not** attend *Informative events*; event location (irrelevant for the work of the calendar).

(b) Appearance: Green color to signify **low** importance; name - "Keep track".

(c) Meta data: Help box that will represent elaborated explanation about how the event behaves in the schedule and examples.

Here as a starting point is used the theory from Tomshich (Tomitsch et al., 2001). It appears that the *Pro forma* entries will have no different behaviour in the schedule than the **Scheduled events**. *Pro forma* events will be static to the schedule and won't be rescheduled. Their implementation will make the scheduling more complicated and make the user doubts about his mental model about all type of events, since it will be hard to distinguish different behavioural patterns between *Scheduled* and *Pro forma* events.

The results of (Dimov, 2013), showed that it is hard for user to come up with situations where such subsequent event may occur, and the user is willing to add such event as a note to the main event. Adding such event as a note to the main event will fit in the definition of *Subsequent events* 3. Therefore, the implementation of such events type will make the scheduling more complicated.

1.4.2 Travel time estimations

There are two cases in which travel time estimations are required:

1. When the user has to travel between his current location and the location of the next event.

2. When the user has to travel between the location of two events.

[1] "Chore" definition - 1: A routine task, especially a household one. 2: A tedious but necessary task.

From user's point of view, the travel time is important in order the user to be accurate in his commitment to the event - to be on time for the event. The user doesn't want to have delay on his arrival if he wants to value the importance of the event. Therefore, that is the reason of why most of the users trust their own travel time estimations, as most accurate.

There are however, other trustworthy sources of travel time estimations - Google Maps™. Such applications provide the user with relatively accurate travel time estimations, alternative roots and transportation methods and etc.

However, such advanced functionality is more common for applications like Google Maps™, not for mobile calendars. Therefore, if such functionality exist in mobile smart calendar, it should be simplified. Otherwise, it will be hard learn about it - this could require resources (time).

It is not necessary to stress the user with complicated interface each time he attends to enter an event in his schedule. Therefore, the *travel time estimations* will be based on: distance between locations, method of transportation and alternative routes.

First will be taken into account the distance between the locations with the shortest route. If the distance is less than 1 km. the calendar will consider the "walking" as slowest method of transportation and "cycling" as fastest, then the average travel time on the shortest three routes will be taken as travel time. If the distance is between 1 and 10 km. the calendar will consider "cycling" as slowest method of transportation and "car" as fastest method, then the average travel time on the shortest three routes will be taken as travel time. If the distance is greater than 10 km. the calendar will consider the average travel time between "public" and "car" methods, then the average travel time on the shortest three routes will be taken as travel time.

At general, there is no need for the user to check on alternative routes, because if the distance is less than 10 km, the user probably knows the routes or has his own route. On the other side, if the distance is greater than 10 km, the user will perhaps to purchase a ticket, or check in details the alternative routes. Which doesn't mean that the smart calendar has to be overcomplicated to provide such functionality.

1.4.3 Semi-automatic scheduling

To enable atomization in the scheduling process, first have to be clear what behaviour should be expected from the different types of events mentioned in section 1.4.1. Therefore, accurate behaviour should be assigned according

to the types of events:

1. Scheduled events - These events will **be** static for the schedule and calendar will not be able to postpone them at any circumstances. The events of this kind, will also have fixed start and end time. And attached to them travel time according to the current location and the location of the event. However, the scheduled events can not overlap with other scheduled events, tentative events or maximal travel time required for the next event (due reasons expressed in section 1.2). The user also should be warned if he attends to schedule overlapping *Scheduled event*, which should be prevented and alternative to the schedule attend should be provided.

2. Tentative events - These events will **not** be static for the schedule and the calendar will be able to orchestrate them according to the other events. Events of such kind, will not have fixed start time and end time and can **not** overlap with other events of the same kind, *Scheduled events* and maximal travel time. It will be taken into account event's duration, according to that and the time slots available between the events and travel time between their locations, it will be assigned start time and end time within the first suitable time slot. However, in order events to be rescheduled, it should be know if the *Tentative event* is completed or not. When it is time for the user to commit transportation to the event location (travel time alarm) the user will be prompted if he is about to commit the event or it should be rescheduled for the next available timeslot.

   In case *Scheduled event* is scheduled over the tentative even (user enters overlapping scheduled event), the *Tentative* event will be automatically rescheduled for the next available time slot. In this case, there is no need of user's confirmation, because there is a level of importance of the events for the user, and there is no need questioning whether the *"Important event"* is more important than a *"Chore"*.

   There could be a case, where the user will have a huge stack of *Tentative events* constantly rescheduling. Such real life situation should be avoided, and it should be avoided in the *smart calendar*. Therefore the events will have to be committed in the last available time slot before the deadline.

3. Informative entries - These events will be static to the schedule and the calendar will not be able to orchestrate them. However, since

the user will not commit the events, there is no reason to prohibit overlapping with other events. Therefore, the location of the events will be irrelevant to the schedule and no travel time will be required for them - the location of the event will play informative role for the user, if it is needed.

Chapter 2

Prototype

According to (Benyon, 2010), there are several types of prototypes. However, it can be considered that for this project are used two types of prototypes:

1. Throw away prototype - Throw away prototype helps to make a good starting point and to represent the user's need and scenarios. It help us to materialize our first vision, and gather feedback from users.

2. Hi fi prototypes - This kind of prototypes are similar in look and feel to the final product. This type of prototypes, are developed in environment which will be used to mock up the interactive effects of the system. It is used for evaluation of the main design ideas at the stage in which they firm up.

3. Evolutionary prototype - Is a step wise prototype which eventually develop into a full system.

In this case, "Design of a smart calendar" (Dimov, 2013) can be considered as something between throwaway and Hi Fi prototype. This prototype, it was build in Java, NetBeans IDE, and had only one view (day view) as a regular application. This development environment allowed the main functionalities to be simulated. This was enough to represent the main ideas to the user, and evaluate them.

The prototype application will be build on Eclipse with Adt-bundle (Android Development Tools), coded in Java and XML. The product will run on Android platform. This prototype the design ideas will be refined (section 1), and the product of this project can be considered as *Evolutionary prototype*.

2.1 Design ideas implementation

In this section will be presented in depth how the design ideas will be implemented in the prototype system. In (Dimov, 2013), the users had problems with understanding the behaviour of the application. "Design of smart calendar" suggested dialogue boxes to be used, when the user enters new event. It was assumed, that the dialogue boxes will be used to provide explicit information about the interface and the functionality of the application. The results showed that most of the users didn't pay attention to the provided by the dialogue boxes information and parts of the functionality remain implicit.

However, such information still needs to be provided, but new method of entering events will violate design principles (Benyon, 2010).

Therefore, the prototype will use standard model of entering events (form fill-in), with available hints for each field representing new functionality. This way, the user will be familiar with the entry method, not be pushed, and prone to investigate how the new functionality works.

In this prototype, the ideas have to be implemented in a manner that will be explicit for the users, and as a result, the prototype have to be explicit enough to be understood by the users.

Different types of events

When attending to create an event, the user will be presented to a form, in which he hast to chose the type of the event from a dropdown menu. Next to the dropdown menu will be a question mark ("?"). By clicking on the question mark, the user will invoke help dialogue box, in which will be description of the different types of events and general examples for each of them.

After selecting the type of event, the additional fields will appear according to the type of the event (section 1.4.1 for event names):

1. "Important event" - The additional fields of the form, will be: *"Title"* (event title), *"Beginning"* (start time), *"End"* (end time), *"Location"* (event location) and a text box for a short note to the event. After saving the changes, the event will appear in the *Day view* of the calendar according to the time of the event.

2. "Chore" - The next additional fields of the form, will be: *"Title"* (event title), *"Duration"* (event duration), *"Location"* (event location) and a text box for a short note to the event. After saving the changes, the

event will appear in the *Day view* of the calendar according to the first available timeslot, with acceptable *travel time* between the locations of the events. *Tentative events*, will be stored as a stack.

3. "Keep track" - The additional fields of the form, will be: *"Title"* (event title), *"Beginning"* (start time), *"End"* (end time), *"Location"* (event location) and a text box for a short note to the event. After saving the changes, the event will appear in the *Day view* of the calendar according to the time of the event.

For representation of the events in the schedule, see figure 2.1

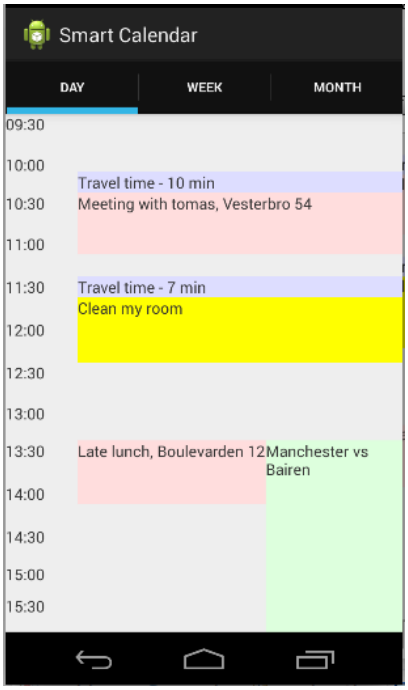

Figure 2.1: Day view

Travel time estimations

The user has to be aware of the travel time. However, it is not necessary to overcomplicate the view of the calendar. Therefore, an alarm fifteen min before the required travel time will be automatically set after an event is created (in case that time is within the time of the event before, the alarm will be silent), will be able to track the attention of the user.

However according to section 1.4.2, there two moments, in which travel time estimations have to be invoked:

1. Creation check - When new event is created, the system must check if there is enough travel time between the location of the event, and the locations of the event before, and event after.

2. Periodic - When the time for an event is about to come, the system must warn the user that he has specific travel time to the next event.

For the implementation of the creation check, the moment of invoking the check will be the saving the changes of the new event. This means that, when an event is about to save, the system will check if there is enough time to travel between the locations of the event which is about to be saved, and the locations of the next event and the event after. If between two events, there is more time, than the travel time required to travel between the locations, the estimations will be left to the second check. This check will not mark travel time on the schedule.

The periodic check, will mark the estimated travel time, between the current location and the location of the next event. The check will be automatically invoked, on each fifteen (15) minutes, and it will check is there, enough travel time between the current location, and the location of the next event plus fifteen minutes (minutes required for alarm). The estimated time will be extracted from the time to the next event (result time = current time - the time of the next event + 15 min - travel time required), and if the result is less than fifteen minutes (result time ¡ = 15 min) it can be assumed, that the user will not move away from his current location, and an relatively accurate alarm can be scheduled.

When the alarm is activated, the user will see, a dialogue box, in which will be written the details of the event (title, location, note), the relative leaving time (according to section 1.4.2) and relative travel time.

However, in case of the *Tentative events*, there will be no alarm (the opposite means that there will be an alarm each moment). The travel time will be check according to the rules of the periodic check. The travel time will be marked dynamically fifteen minutes after the current time, after which the tentative event will be added. It can be assumed, that when the user has free time, he will check for his events and things to do. Therefore, there is no need of alarm for the *Tentative events*, because they are considered as less important tasks.

It can be assumed, that the user will not change his location much, within fifteen minutes. Therefore, this interval is used for the algorithms.

Also *Travel time estimations* will not be invoked for *Informative events*.

Semi-automatic scheduling

There are two moments, in which intervention into the schedule is required:

1. When *Scheduled event* which is about to be saved overlaps with other event, or there is not enough travel time between the two events.

2. When *Tentative event* needs to be rescheduled for the next available timeslot.

When *Scheduled event* is about to be saved, the system will check is there an overlapping event. In case there is no overlapping event, the system will check is there enough travel time, between the event before, and the event after. In case one of the conditions above is not satisfied (false), the system will show dialogue, in which there will be shown the overlap, or the insufficient travel time, and request for rescheduling and change of the attributes of the event will be shown. On attending to change the attributes, the user will be brought back to the event creation form. See figure 2.2.

For representation of the event warnings in the schedule and the generated suggestions, see figure 2.2

The second intervention will be part of the implementation of the *Periodic check* 2. If there is time slot between the current time and the time of the next *Scheduled event*, the system will check is this timeslot enough to be enough for any of the events' duration in the *Tentative events* stack, plus the time required to travel from the current location to the location of the *Tentative event* and the time required from the location of the *Tentative event* to the location of the next *Scheduled event* plus fifteen minutes (time to the next event - (duration of tentative event [i] + TTR (travel time required) to tentative event [i] + TTR from tentative event [i] to next scheduled event)). If the condition is not satisfied for any of the *Tentative events*, the the check will be performed fro the next available time slot.

The *Tentative events* will be postponed until the moment, that the user mark them as attended. Then the events will become static, and will not be rescheduled further.

2.2 Wrap up

The prototype will have three main tabs "Day" (day view), "Week" (week view) and "Month" (Month view). From the *Month view*, the user will be

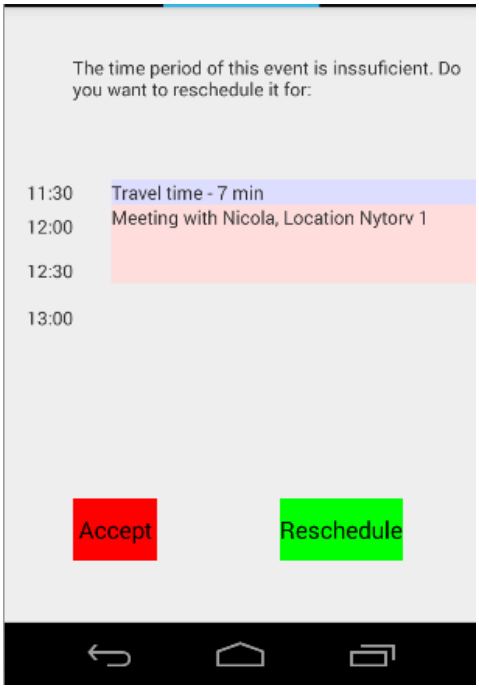

Figure 2.2: Overlap warning

presented to a view of the current month. In this view, the current date will be coloured with darker than the other dates and by selecting one of the dates, he will be transferred to the corresponding date in *Day view*. In *Day view* the events will be displayed corresponding to their time periods, with their title and the beginning of their note. By selecting an event, the user will be presented to the event details, and actions corresponding to their attributes (if the event is *Tentative*, it can be marked as attended). In the *Day view*, it will be displayed the *Travel time estimation result* as marked area, between the current time and the beginning of the next event. In the *Week view*, the user will be able to see his events, as to do list, for each day of the current week.

Chapter 3

Experiment

The design of the "Smart calendar" from (Dimov, 2013) suggested four design ideas. The design was evaluated with users - students, as most accessible social group. Some of the ideas received negative feedback, and were excluded from the design. The rest of the ideas were refined and the result of that is in chapter 1.

Now the new design must be evaluated, and the improvement must be measured. In order to do so, the new design of "Smart calendar" must be compared with the design form (Dimov, 2013). In this chapter, it is developed a method with which the new design will be evaluated and compared with the previous design of "Smart calendar".

Lazar and Feng (Lazar and Feng, 2010) distinguished three groups of studies:

1. True experiments - The experiment involves multiple conditions and the participants are randomly assigned to each condition.

2. Quasi-experiments - The experiment involves multiple conditions or measures, but the participants are not randomly assigned.

3. Non-experiments - If there is only one observation group and only one measure involved.

To evaluate the new design, and to have more valid results the experiment will be used, which must satisfies the following conditions:

- True experiment must be based on at least one testable hypothesis and aims to validate it.

- There are at least two conditions or research groups.

- The dependant variables must be measured trough quantitative measurements.
- The true experiment should be designed and conducted in manner which removes biases.
- The true experiment must be replicable with different participants, at different times, in different locations and with different experimenters.

This chapter is about the practices used to compare the two designs as a different conditions of one experiment. In section 3.1 are the basic statements of the experiment - hypothesis. From the hypothesis the variables which will be measured are extracted. In order to validate one of the research hypothesis, there will be evaluation tasks with participants. The variables will be measured according to the results form the interviews, where the participants are asked questions described in section 3.5.

3.1 Hypothesis

Each experiment has basic statement, which must be validated. Such statement is called "hypothesis". According to (Lazar and Feng, 2010), there must be at least one hypothesis and one alternative hypothesis and only one of them remains true at the end of the experiment.

Basic hypothesis is a statement which lies in the core of experimental design. Considering the suggestions in chapter 1, the core hypothesis (Null hypothesis) is

H0: ***The new design of the "Smart Calendar" is not better than (Dimov, 2013), because some or all of the ideas are not improved enough.***

In case the **H1** is not valid, there must be alternative statement which must be valid. According to that as an alternative hypothesis it will be considered

Ha: ***The new design of the "Smart calendar is better than the (Dimov, 2013), because of the improvement of the design ideas.***

The experiment aims to validate one of those hypothesis and the results will be discussed in later chapters.

3.2 Variables

In each experiment, there are aspects of the product which are evaluated. Those aspects are called variables. According to (Lazar and Feng, 2010)

tare two different types of variables:

1. Independent variables - Different design features which serve the same purpose (type of keyboard, screen resolution and etc.).

2. Dependent variables - Different user characteristics (age, experience, social status and etc).

The hypothesises compare the previous design of "Smart calendar" and the current design. Since the whole design is compared, each version of the "Smart calendar"[1] will be considered as whole set of features and independent variable, which will be compared. This way, the variable derived from the hypothesises will have two conditions - the previous version of "Smart calendar" and the improvements suggested in chapter 1 as the new version.

However, if we consider the previous experiment as the first task with the first condition and this design as condition two, the experiment must be conducted using the same experimental environment[2].

3.3 Experimental design

Each experiment has group or group of participants which are involved. According to (Lazar and Feng, 2010) there are two different experimental designs:

1. Within-group - One group is exposed to all of the conditions of the experiment (two in this case).

2. Between-group - Each group is exposed to only one condition.

The participants involved in the first evaluation were students, all with some experience in the use of digital calendars. Since it will be nearly impossible to gather the same group of participants due the temporal distance between the two evaluations it will be impossible to evaluate the new design with exactly the same group. However, this is not the only reason between-group design to be chosen, this experimental design has some advantages and disadvantages, and the reason to choose this design is described in the next section.

[1] The design in (Dimov, 2013) and the design in this project.
[2] The validity of the experiment will be discussed in chapter 5.

3.3.1 Advantages and disadvantages

Within-group

In within-group design we compare the performance of the same participants with different conditions. Therefore, this design requires much smaller sample size comparing to the *between-group* design. However, this brings another problem. The participants might gather experience with each task and get better and improve their performance - learning effect.

There are another effect that can affect the results. The participants must complete each task under different conditions and if the time to complete specific task might be quite long. This will bring fatigue to the participants and their performance will be reduced.

This experiment design requires much smaller sample size. This makes it much more appropriate for experiments whit many conditions, which is not the case pointed by section 3.2.

Between-group

On the other hand, in between-group design each participant is exposed to one condition. This reduces the time to complete the task significantly which helps to avoid the learning effect and fatigue. Another problem is the high level of "noise" in the results, caused by individual differences.

In order to exclude the high level of noises relatively large number of participants is required for each condition. However, if we have to compare multiple conditions, it will be hard to recruit enough participants.

3.4 Between-group design

According to (Lazar and Feng, 2010), between-group design should be used when we have relatively simple tasks. This way the individual differences will be avoided could be avoided. Evaluating the set of functions suggested in chapter 1 can be considered as more complicated task, which requires complicated cognitive and perceptual functions.

Since we have only two conditions of the independent variable which is tested, this makes two tasks and one group for each task. However, due the temporal distance between the evaluations there is nearly impossible to recruit the same participants, this could bring "noises" in the results and put place some biases. In order to reduce the noises from the individual differences, the participants will be from the same social group - students. Another source of biases, could come from the learning effect or fatigue that

might compromise the results, in this case between-group design will help us to avoid those biases.

3.4.1 Participants

As Nielsen over (Benyon, 2010) recommends a small group over three to five people to be involved in the experiment. There are however, different groups of users (*personas*) for the system. It is considered, that this number is to low for accurate measurements. Although, the recruitment of participants is costly the relatively low number of participants has been kept.

The *persona* that will use this application will has relatively heavy schedule, with regular *Important events* (*scheduled events*) each day and additional tasks to do (*Chores - Tentative events*). The *persona* has to be more open to the world, which require to keep track of other kind extrinsic events (*Informative events*. It is also required, the users to be familiar with any of the most common digital calendars. The system will require Android platform to run, therefore the users must posses Android device with Android 4.0 or greater.

Most suitable social groups for this experiment are the groups of business people, professors, students and etc. The main characteristic of the experimental group must be the heavy schedule and the previous experience with digital calendars. Because of time constraints, the participants have to be recruited relatively fast and there must be no reason that will prevent them to fully use the system for the period of time required by the experiment. Therefore, as most suitable the social group of the students will be used for the experiment.

Lazar and Feng also suggest small number of participants per condition and with proper knowledge according to the test subject. As it is mentioned before, the same social group of participants, will help to reduce the "noises" or it will make them easier to be noticed, which will make the results easier to interpret.

The participants were between the age of 22 and 27, three females, and five males, students, with previous experience with digital calendars as in (Dimov, 2013).

3.5 Interviews

The interview will be semi-structured, with main questions related to the design ideas mentioned in chapter 1. The questions have to be measured with the according to understandability and usefulness. It will be hard

to make the user to scale his answer for each question. Therefore, more specified questions, will be asked in order to dig deeper in specific aspects of the users feedback.

It can be assumed, that the results of (Dimov, 2013) gave us the basis to compare the new design of the smart calendar. In this project, the ideas are refined, some of them excluded (because of poor results) and relatively the same level of understanding is required for the new results. However, the results of (Dimov, 2013) aimed to give broad view over the design ideas, and it will make no sense to ask the same questions. It will be better to use for comparison feedback extracted with more elaborated questions. To measure the results with a values, some of the questions require to ask how often the user interacts with a specific feature.

About *Different types of events* the questions will be:

1. *Which of the different types of events you can make most often?*
2. *Relatively how often you used each of the three types of events for the evaluation period per day?* - the results require to be in events per day.
3. *For what do you use the different types of events? Give examples for each type of event?*

About *Travel time estimations* the questions will be:

1. *What do you think about the warnings when you have to leave for some event?*
2. *Does that help you to avoid delay for an event?*
3. *Do you find the estimations accurate, and why would you trust them?*

About *Semi-automatic scheduling* the questions will be:

1. *What do you think about the warning for overlapping events or insufficient travel time, when entering new event in your schedule?*
2. *How often have you been warned about overlaps?*
3. *How many of the generated suggestions you have accepted and how many times you had to reconfigure your events?*
4. *What are the reasons to reject the suggestions? Give examples?*

The questions will help to understand, how accurate the mental model about the different feature of the user is. Depending on the amount of interactions and the actions that user takes while interacting, will be measured how useful each of the features is.

3.6 Task

The evaluation from (Dimov, 2013) was conducted on prototype of the "Smart calendar" which was build and evaluated as desktop application. This prototype of the current design is developed to be evaluated on Android devices.

The participants will use the application on their own device for period of two weeks. They will be asked to schedule each task and event that they have during that period. The participants have to decide for their selves what type of event they must use for their events. Each participant is acquainted with the design features of the prototype, this way the participants will have in mind what the application is able to do and what they can use.

After the evaluation period, the participants will be interviewed (semi-structured interview) according to section 3.5. In case there is interesting results about a specific topic, further questions about that topic will be asked. Then the data will be classified and organized according to the topics, and compared with the results of from "Design of smart calendar".

3.7 Wrap up

In this chapter are described the guidelines, recommendations and choices about the experiment method. Unfortunately, due to time constraints, there are some *Confounding variables* which have to be assumed:

1. The participants represent only one social group of eventual end-users.
2. The participants have relatively tight tight age group.
3. The participants must have some background knowledge about that kind of applications.

There are however, positives in this compromise. The participants represent the characteristics of the *persona*. Also, the number of participants is not much, but still greater than number suggested in (Benyon, 2010).

The interview questions will cover the expected feedback about the design ideas, and there is no reason to consider that the results will depend

strongly to the user group. There will be benefits if more participants from each social group are involved, but this will require more time for recruit and the results will not differ much. Therefore, it can be considered, that the results will be valid enough to evaluate the targeted design ideas, with the available participants.

The different questions of the interview might bring some biases and difficulties when comparing the results with the previous work. However, the interview questions will help to get overall impression about the design, and it will be used to compare it with the results from (Dimov, 2013).

Chapter 4

Results

Lazar and Feng suggest that the interviews must be recorded. This gives unrefined access to the interviews, and everything that interviewee said can be accessed in long period of time after the interviews. The raw records can be analysed and discussed with other colleagues and researches. With the records, it is easy to reconstruct specific details and user feedback in order to share it. However, this method has disadvantages. It is very time consuming task to listen trough the hours of records, and analyse the comments piece by piece and repeatedly listen trough the interesting parts until the researcher gains the required understanding over the details, on which he wants to focus. The hours of record might also be hard and very time-consuming to transcribe. There are possibilities to use automated software, which might do the transcription for the researchers, but such tools usually make recognition errors due bad sound quality or noises. This might lower the quality of the transcription.

Another way to gather the results is to take notes on during the interview. The notes are much more compact and light to work with, and not so time consuming. The interviewer usually aims to make notes on the most interesting for him facts and feedback however, there is a threat of omitting other interesting details from the interviewee's feedback. Another problem to the notes, is that they get less useful with the time and the data must be analysed as soon as possible right after the interview while the interview is fresh in researchers mind. This helps the researcher to recall interesting facts which were verbal and not recorded in the notes. With the time the notes get less useful, because it will get harder to recall the facts that remained verbal.

Sine the interviewee group is eight people, there are only few questions

and if we assume that the interviews will not be more than five to then minutes, the result recordings will not be greater than 30-45 minutes. Such record will not be too heavy to work with and in this case the interviews will be recorded.

(Benyon, 2010) suggest, that the results have to be organized in a list of findings, that can be presented as a reasons for judging and redesigning the features. (Lazar and Feng, 2010) also suggests that the results must be classified into different categories. This categories are derived from meaningful hints, which reveals the importance of different concepts and the relation between them. This approach is known as content analysis. Another problem that might arise is that the interviews are semi-structured and (Lazar and Feng, 2010) mentioned that the results might be harder to interpret. However, since the results of the previous work are gathered trough semi-structured interviews to get deep enough understanding over the features, the feedback is gathered the same way in order to gather the required understanding over the new features. Although, the semi-structured interviews are harder to interpret, this is the way to gather the required feedback in order to compare both designs. The results of the questions will be classified according to each design idea, and two measurements.

As it is mentioned before, as a basis for comparing the results, will be taken the results of "Design of smart calendar". The results of the previous work, show that some of the design features are useful, but there were problems with the understanding of the features. The results will be classified according to each design idea as in section. 3.5.

The measurements of the results, will be according to how often the user interacts, with specific features, and how broad is the view of the user about the possible situations specific feature can be used. There will be two measurements that can produce a statistic - how beneficial is the interaction with the features (frequent interactions - low, medium, high) and how many reasons there are to use specific feature (possible interactions - few, several, many).

It can be expected, that the user will have interaction with the different features, according to the amount of events entered in the schedule. If we consider, that the user will have average of three events per day, for period of two weeks, it can be assumed that each user will have a decent amount of interactions as total for all features. The ranges of the values will be:

1. Frequent interactions - less than 5 - low, 6 - 10 medium, 11 or more - high.

2. Possible interactions - It is not expected that the user will have wild

Participants	*Important event*	*Chore*	*Keep track*	TTE warning	Overlap warning
P1	high	low	high	high	low
P2	high	low	medium	high	low
P3	high	low	medium	high	low
P4	medium	medium	low	medium	low
P5	high	medium	low	high	low
P6	high	high	low	high	low
P7	high	high	low	high	low
P8	high	medium	low	high	low

Table 4.1: Frequent interactions table for *Different types of events*

Participants	*Important event*	*Chore*	*Keep track*	TTE warning	Overlap warning
P1	medium	medium	high	high	low
P2	medium	medium	high	high	low
P3	high	high	medium	medium	low
P4	medium	medium	high	medium	low
P5	medium	medium	medium	high	low
P6	high	medium	medium	high	low
P7	high	high	medium	high	low
P8	high	medium	high	high	low

Table 4.2: Possible interactions table for *Different types of events*

imagination about the possible usage of each feature. Therefore, the measurements of the possible examples for each features will be measured - less than 3 - low, from 4 to 6 - several, 7 or more - high.

Table 4.1 for how frequently each feature is used, according to the users. Table 4.2 represents the number of possible usability interactions according to each feature. The horizontal axes represent the different features of the calendar. The vertical axes of the tables represent the participants as the way they are ordered is kept on both tables. First five users of the table are the male ones, the last three are the female users.

4.1 Different types of events

According to table 4.1, there is a general dependency between the types of events. The users with relatively more light schedule are keen to keep track to extrinsic events (keep track of other peoples' events). As general, most

common events scheduled are the *Important events*. However, it could be said, that the users with less personal (*Tentative* events) and have more time to keep track of extrinsic events. This tell us that the different types of events are matter of personal preferences and routine. Another thing that is interesting, is that there is a difference in the usage of specific type of events between the genders.

According to table 4.2, it could be said that most of the users have general idea for what will different types of events could be used for. It was also hard for the users, to give accurate examples of what kind of events they can't schedule with the available three *Types of events*. It is interesting, while the users try to give examples for what kind of events they miss to have in the calendar they give inappropriate examples, which in second thought fit in the available types of events.

4.2 Travel time estimation warnings

The amount of interaction with the travel time alarm, is co-related with the mount of *scheduled events*. But that is not surprising result, since the warning occur only about the scheduled events.

The more interesting part of the results are, that the user consider the travel time warnings as reliable, and they are keen to trust them (table 4.2). Most of the users, at first impression found the warnings annoying, because their invoke is uncontrolled. However, while getting used to rely on the new feature, they stated that the warnings help them to avoid delay for their events as table 4.2 points.

4.3 Semi-automatic scheduling

According to the results of table 4.1, it is rare to happen two events to overlap when the user is making new events. This is due the nature of the events and their behaviour in the schedule - there is not much cases that the events might overlap. Obviously, the users will not participate on two events at the same time in any conditions and practically this is not happening as in the case that the results pointed.

Corresponding to that, the users are unable to identify much cases in which the generated solutions will be accepted or rejected (see table 4.2), but most of the time the users reschedule their events manually and do not consider to accept suggestions on which they don't have clue how the logic works. It is important for the user the first opinion of how the feature works

- if they don't like the first suggestion they interact with, they are likely to reject the future suggestions.

The overlapping events are rarely to occur due the possibility to schedule the events in the calendar in manner corresponding to their nature. This helps the user to avoid the overlapping events and allows the calendar to work as it is planned.

4.4 Wrap up

Most of the results from the interview classified in tables 4.1 and 4.2, are refined by the help of additional, more specific questions for each of the main topics. It is interesting fact, that there is a difference in the given examples of usage of the *different types of events*. It appear, that there is difference in the examples which were given, according to the personal habits of the participants. Another factor that influence the usage of the different types of events is the gender of the participants. However, (Lazar and Feng, 2010) states that such distinction should be avoided, and it is more important to focus on the general result - the usability of the features.

There is also a relation between the *Tentative events* (considered as personal tasks) and *Informative events*. Users which entered less *Tentative events* had more *Informative entries*. This is because the users have more free time, and are likely to keep track of extrinsic events.

The travel time estimations help the users to avoid delays and prevents the users from delaying as it was expected. The users trust the estimations when their personal expectations for travel time estimations relatively match with the estimations pointed by the calendar.

It is obvious that the interaction with warnings for overlapping events is avoided by the usage of the different types of events.

Chapter 5

Discussion

In this chapter, the results of each main topic of the interview will be discussed. This includes short analysis of the results, and explanations. The results will be compared to the previous work on that subject (Dimov, 2013) and other existing digital calendars.

5.1 Different types of events

According to the results it can be said, that by having more time to use the system, the users were able to gather deeper understanding, of how exactly the different types of events can be used. Most of the users have a personal guidelines for what *different types of events* could be used for.

If we compare this to the results from (Dimov, 2013) it can be considered the range of the possible usage can be wider, if the users had more practice with the application. It could be said, that the range of events enabled by the *Different types of events* is wide enough, to cover the most common events and variety of other events, which are unusual to schedule in digital calendar.

There is a possible bias about the improvement of the different types of events, because the users in (Dimov, 2013) has less time to work with the application. In the last results the users had more time to work with the application than in (Dimov, 2013). If we assume that the test subjects got better applicability for the improved version of the different types of events, because the got more time to work with it and they were not under stress because of short evaluation, it could be said that the previous design might not be compared in proper manner. However, the results from (Dimov, 2013) stated that is hard for the users to identify any usage of some of the

types of events suggested in the previous design. This is why it can be stated that the the types of events suggested in this design are improved.

It is interesting, that the users gave various examples of usage according to lifestyle differences. However, the given examples correspond adequately to the types of events that they are scheduled as. This leads to the conclusion that the users had gain better understanding by the new way in which the information about the features is given. It can be stated that concerning this features and the way of giving information about features the design is improved.

5.2 Travel time estimations

Most of the users, found the *Travel time* warning annoying at first impression. This is due the fact, that the alarm was automatic. However, most of them stated, that the feature helped them to prevent delays.

The users also found, *Travel time* estimations relatively correct, and close to their personal estimations. One of the users stated, that once the travel time estimation was not correct enough. After further questioning, it appears that the user had relatively light comparing to the other users schedule (P4 at table 4.1). He also stated, that the possible delay is his fault, because he had distractions (the user decided to do something else buy the way) on the way to his events.

Concerning to the way the travel time warnings work, the users are more aware about how much time they need to travel to their events. This detail makes the travel time estimations more useful than the suggested by (Dimov, 2013).

Comparing the current implementation of *Travel time estimations* to (Dimov, 2013), it could be said, that for the users is more clear, what the travel time estimations are, and they are more willing to trust them, because it reminds them when they have to leave in appropriate time before the actual leaving.

5.3 Semi-automatic scheduling

Most of the users, ignored the generated suggestions on regular basis, and attended manual rescheduling. Some of the rejections however, were due unsuitable suggested time for rescheduling. In these cases, rescheduled *Scheduled* events are suggested to be rescheduled for inappropriate time (too late

in the day). This means this part of *Semi-automatic scheduling* is not designed well.

According to the automatic rescheduling of *Tentative events*, the users fully understand the reasons behind the behaviour (movement trough the schedule) of these events. This might be due the examples in the help boxes. In this case, this might limit the potential of this type of event as it attends to enables it.

Comparing the semi automatic scheduling to the "Design of smart calendar", it seems that with explicit reasoning on the generated suggestions gives the users understanding over the suggestions. However, this part is still yet to be improved.

Digital calendars can be much more advanced. According to (Payne et al., 2002), with the emergence of the semantic web and their design of RCAL, calendar agents and Web can be combined to make schedule. The agents can schedule meetings into the calendar by URI and keep track of changes. It also can identify relevant to the schedule information from personal correspondences, schedule the necessary events and identify personal preferences.

To learn personal preferences and look for services that the users might need can be very useful for the users. However, the everyday users doesn't need such advanced interface of a sophisticated on his mobile device. The tend of the mobile applications aims to improve the usability, increase the features and bring relief to the users, not expecting them to learn to use complicated software in their everyday life. This is why "Smart calendar" aims to automate simple tasks regarding his schedule that the user has in his everyday.

SensiCal suggested by(Mueller, 2000), suggest that the calendars must have common sense about the events that they have in their schedule. According to models stored in self evolving database, the calendar should be able to predict and suggest by default details of various events. SensiCal is also able to predict possible conflicts in the schedule, that might prevent user to schedule inappropriate events. Shih-jui Lin and Jane Yung-jen Hsu suggested (jui Lin and jen Hsu) similar design. Such design can be really useful for the users, and as Muller suggest it is time for such intelligence to influence many areas of the digital environment.

There are much more tasks that the calendar should solve, which have higher demand. Such advanced peace of software requires self evolving resources to be reached by the calendar. Such resources need significant time resources to be developed in order the calendar to achieve completing tasks which require common sense. Therefore, this design of "Smart calendar"

aims to solve much simpler tasks, which present as common problems as the increasing the speed with which the users put events in his schedule.

There are other calendars that partially solve the problem of the overlapping events. (Refanidis and Yorke-Smith, 2009), compares two calendars on of which is called "Emma". This calendar supports overlapping events, because this might have different meanings for the users. Ioannis Refanidis and Neil Yorke-Smith have pointed the problem with the overlapping events. The design of "Smart calnedar" suggested by this calendar aims to solve the problems arising with the overlaps, by suggesting simple logic behind the events

5.4 Comparison with other designs

Digital calendars can be much more advanced. According to (Payne et al., 2002), with the emergence of the semantic web and their design of RCAL, calendar agents and Web can be combined to make schedule. The agents can schedule meetings into the calendar by URI and keep track of changes. It also can identify relevant to the schedule information from personal correspondences, schedule the necessary events and identify personal preferences.

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The literature, aims into development of networks of schedules, which can cross check individual schedule, ease the creation of the events, learn user's behavioural patterns, but pays little or no attention on simple tasks that exist in the scheduling of the events. There must be paid attention to problems as, the nature of the events, the time required for travelling between events and the overlaps. The design suggested by this project pays attention to other, more simple common problems of the normal/busy user.

5.5 Wrap up

The users were familiar with the entry method of the events (form fill in - common among the digital calendars). This ease the amount of design characteristics that have to be learned by the user. The user was not pushed to understand the new features right away, the learning was more stepwise, invoked by personal curiosity. The users reported the help boxes invoked by the questions marks ("?") and additional explanations, as unobtrusive and they were more keen to pay attention to them.

The users, also liked, the preview of their schedule as to do list, in the week view of the calendar. They found that preview for brief, easy to preview their plan for the day and prepare themselves for the day. This means that there is no need of high level of details when previewing schedule and in some cases it might be viewed as to-do list.

Chapter 6

Conclusion

It is difficult to measure accurately the differences, because of the different evaluation methods aims of the evaluations. It can be considered, that *Different types of events*, and *Travel time estimations* have significant improvement in their design, comparing to (Dimov, 2013). The *Semi-automatic scheduling* needs to be more broadly reworked, in the aspect of the generated suggestions.

The more common way of making events, reduced the amount of new design characteristics which has to be learned by the user (*Consistency* (Benyon, 2010)). This doesn't apply for the refined design ideas, introduced in this project. Simply because, there are no digital calendars, that provide the functionality brought by the new design ideas (section 1).

Generally, the design ideas have improvement comparing to the "Design of Smart calendar". It is hard to measure how big is this improvement, because there aims of the evaluations were slightly different. However, it can be stated that the users have gathered better understanding over the features of the application, by spending more time working on it. This throws biases over the improvement of the design. However, it can be stated that, there is an improvement, because the design suggested in (Dimov, 2013) had some design ideas suggested for improvement (Different types of events, Travel time estimations) some suggested to be excluded from the design.

There are possible improvements that could be done over the *Different types of events* that could be done, according additional features for the types of the events. However, there are no indications that additional type of event needs to be created.

Travel time estimations could be improved, in the aspect that the alarm have to be programmed, according to personal preferences. As general, this

design idea fits the needs of travel time estimations of the users. However, it would be better if the user is able to make some adjustments over the warnings or the way in which the travel time estimations are made.

The *Semi-automatic* scheduling was arising in the previous design of "Smart calendar", in this project it has been formed as separate design idea and the results pointed that the generated suggestions had not been accepted in common. This means that that design feature has to be improved. *Semi-automatic scheduling* needs to have adjustable criteria according to which, the generated suggestions are made. This way, the suggestions will not only play a role of a warning with absurd suggestion, but will have more precise and correct suggestions.

At general, it could be said, that the new version of the "Smart calendar" managed to refine the most of the ideas suggested in (Dimov, 2013). However, some of them need more improvements.

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Paper reviews

6.1 Calendars: Time Coordination and Overview in Families and Beyond

by: Susanne Bødker and Erik Grönvall

The paper is based on two cases in which the authors worked sharing timer resources with related groups of people - families, care givers, employers and municipal authorities. Based on two calendar systems build to support different forms of collaboration across organisational and social settings, this paper examines the calendars as collaborative tool between families, organisations, employers and municipality.

The authors look on the calendars as a tool, which can be used by a small group of people, who have dependent on each other schedules. That tool provides the collaborative group to share their availability with others, book each others time availability, negotiate the responsibility for common with other users tasks and provide overview of the situation (see what other members are doing). However, if the relationships in such collaborative group is disrupted, shared personal schedules might persist privacy issues. Therefore there shared information must be limited.

In order to address the challenges of the shared calendars and how the users deal with the time availability of the others and what is their over view of the situation, the authors presented two cases.

CareCoor: Supporting Homecare-referred Older Adults' Care Networks

The system is developed in research project based on ethnographic field studies and participatory design process. The research involves care workers, their team-leaders and family members. The purpose of CareCoor is to address a number of collaborative challenges related to home-based care, particularly in situations where the person who need special cares, can not

be active member in the collaboration between the persons who bare the responsibility. The authors examine what are the benefits form such collaborative calendar and how it changes the negotiation between the members, buy replacing normal tools (phones, letters, paper-based schedules) for collaboration about common goals. In this case, the normal tools might bring discomfort in the collaboration between the members. CareCoor enables the members to share the tasks related to the care for elderly person provides the care-workers and family members with the necessary information, and enables correspondence which will not disrupt members privacy.

The challenges in front CareCoor are:

- How to provide shared overview across the members.
- To enable sharing of the time rhythms of the members at level which concern only the common goal.
- Facilitate negotiation rules and contract.

CaseLine: Couples Planning Parental Leave

The system is developed in research trough design process, involving field studies and participatory design. The findings are based on data from various workshops where the prototype was tested, and initial field studies. CaseLine aims to enable parents to use most of their parental leave and make most of the payment that both parents get from their employers. However, their right of parental leave is interwoven with one another, and the system enables the users to get most of the situation regarding personal preferences. CaseLine also supports the negotiation between the parents and their employers, provides them with the necessary information about their municipal rights and the ability to choose between different parental leave configurations.

In this case, CaseLine has the following challenges:

- Show the available configurations and provide contract negotiation.
- Sharing plans with different stakeholders in different granularities and personal information.
- Enable change and control over sharing of extensive time period.

The authors compare the differences and the similarities between the two cases. Both target the collaboration negotiation between different types of users. Both systems are developed for their primary users, benefit form the

use of secondary users. They represent the communication between private and public stakeholders.

This systems, differ from the ordinary calendar tools, because they serve as a bridge between family and municipal stakeholders. However, both cases the panning and collaboration is triggered, and centred on by the person with special needs. The membership in such collaborative groups can make tension when such collaborative systems are being used by different groups. This happens when there are personal goals who are not suppose to be shared between the groups.

The authors state calendars should bring rationality as related to carrying to particular person, not to shared purposes. There also the information over shared goals needs to be filtered, in order not to disrupt privacy.

6.2 An Exploratory Study of Personal Calendar Use

by: Manas Tungare, Manuel A. Perez-Qui nones, Alyssa Sams

Although, the calendars might bring great opportunity to share schedules and collaborate for common activities, this paper focuses on how people use their calendars for personal information management. The authors conducted ethnographic study based on techniques recommended by Personal Information Management Literature and it aims to investigate how calendar practices evolved over the years. The study had three parts.

A large scale online survey distributed among the members of a university (98 members). In this survey took part students, administrative staff, and mostly faculty members. The second part was to conduct in-depth semi-structured interviews. The participants were recruited among the survey participants. The criterion for participants was to be regular users of some form of calendar, digital, paper or both. The interviews were in situ at their workplaces. During the interviews, the researchers were able to observe the calendar practices directly and gather artefacts (screen shots, paper calendars) - third part.

The interviews, were transcribed by full, and content analysis were performed, which purpose was to summarize the findings into groups of common observations. From each interviewed participants, calendar artefacts were collected, with worth of at least two weeks.

The researches found out, that most of the users from the survey, preferred to add event right after they are aware of it, the rest of the users (7%) do it at the end of the day. Users who use PDA calendars, prefer as

faster method of scheduling events, rather than expecting greater functionality. The usual information carriers of new events were: e-mails, phone, in person meetings and many other information sources, which could lead to information overload.

The most preferred view was the week view, followed by the day view. The day view help us to check what event have to be attended next, while the week view helps us prepare for future events. However, the view also depends of the type of activity user is doing. Most of the users keep their calendar program constantly opened, while other check it several times a day. Most of the users use craps or notes with the events to be added in their main calendar. The users record the events right after they have access to their main calendar, while other do it once a day. Typically the most common information about the events are the time and date, location of the event, and the purpose. Most of the events represent meetings or appointments, special events requiring advanced planning, long duration events (over a week) or all day events - scheduled events. Some participants mentioned the including of to-do list in their calendar, which remain there until they are completed with deadline. The calendars also usually are two types, work calendars which are usually digital and home calendars who are more likely to be paper, both serve for different purposes and held separately. It is interesting that home calendars were usually managed by female users.

The researchers elicited several reasons for the usage of paper calendars. The calendars can leave trail of cancelled events, quick rehearsal over the event, different annotations for about the events and pre populated events. Printouts who use electronic stated that the paper calendars might play complementary or supplementary role. Mainly because the printouts of the master calendar are more portable and can be quickly accessed on various places, shared read only view or provide quick access to the schedule in extreme cases.

On the other hand digital calendars provide the opportunity to set up alarms that help the user to prepare for an upcoming events. The alarms are usually audio notifications or on screen pop-ups. The time before the event vary according to the location of the event and the required preparation.

The calendars are also used as memory aid. The users might want to use their calendars as annual reports, as accurate log of their events in their schedule.

The researchers suggest, that the electronic calendars are more future-rich. However, the use of paper calendars still can't be replaced. Therefore, there must be richer printing options to support various kinds of digital forms. The digital version of paper trail can be replicated. There are also

events shared with other users, for which the date and time must be coordinated with other users, however the possible time slots should still appear as unavailable until the time of the event is chosen. The alarms can serve to prepare the users for upcoming even, however, they might differ on the purposes they are used for. They can be location related (as the alarms of the travel time estimations) and might spread across several devices. The researches point the need of different types of events, with different types of default settings, and list in which the events can be shown according to their type.

The participants overly on their calendars mainly in order to manage their personal time and as a source of information and awareness. However, if the calendar is shared with other stakeholders, the remembering of the schedule might be difficult. Another interesting finding is that the opportunity of rehearsal is greater with the digital calendars, however such data is not observed in this study.

The paper gives insight about how can events be used for different purposes and points out that the events can be different by natures. It also suggests about the travel time estimations, and the corresponding to them warnings.

6.3 Informing the Development of Calendar Systems for Domestic Use

by John Mariani

This paper focuses on the richness of the interaction with calendars and how they work, keep track of the temporal order of the events, and enables the users to record, remind, schedule, track and recall events according to temporal order. The calendars can also be used and shared with other users - Groupware Calendar Systems. However, the known GCSs used in workplace, can not be suitable for domestic use. The papers try to find out what features and taxonomy should be suitable for home use calendars, how calendars can be shared among the users, how to be available any time/anywhere and how members can specify read and writhe privileges. The paper is based of a number of ethnographic studies and with the by analysing them aims to complement the design of GCSs.

The calendars can serve to negotiate schedules between household members and as reminders of what should be done. This relies on the availability and collaboration between the users. Shared use relies on how members interact with the calendars, and what set of rules the members have into

agreement about the maintenance and usage of the calendars. The paper calendars used in home, enables the users to have specific for each household annotations and notions. This means that the calendars does not rely on standard set of annotations and notions. Any set of annotations and notions will work for the users as long it serves as common agreement of use between them. Therefore, the design should focus on the idiomaticness in the calendars when it comes for domestic use. The negotiation of schedule is enabled when the main user gives set of privileges over the calendar, this gives shared orientation over the schedule.

Therefore, the set of practices of the calendars for domestic use must include:

- The calendars must be situated to enable collaboration.
- Defined agreement of how the users coordinate their schedules.
- Distinct annotations, that provide necessary background information.
- Notations that compliment annotations or provide information about the activities.
- Collaborative access to the calendars, according to set of rules.

However, there are may interaction practices, which are ignored by formal analytic account of calendars, because of missing information about the interaction. This is replaced by abstract work practices in terms of definitions, due to design reasons.

When moving GCSs from work place use to domestic use the set of issues arise. The regular paper calendars for domestic use are not portable this bring issues when the calendar collaboration must take place outside home. Transferring the calendar to a PDA might not solve the problem. The calendars for domestic use must still exist in their initial place in order to maintain the collaboration. The GCSs need to augment negotiation protocols between the users to satisfy personal preferences. However, the collaboration and the access need to obey specified access permissions. Therefore, the different uses must have specified roles according to what privileges they have over the calendar.

The paper gives insight of how the groups wise calendars are used in domestic environment. It points out set of features that have been ignored in the current designs. Provides guidelines to what aspects of the interaction of the users with the calendars needs to be paid attention.

Representation of time in digital calendars: An argument for a unified, continuous and multi-granular calendar view

by: Philipp M. Hund a, n , John Dowell b , Karsten Mueller

The paper focuses on features as searching and scaling in the calendars, and points potential benefits from such kind of interface. The paper suggest that the views of the calendars should be unified, according to dynamic scaling of the schedule, it should present information about the events on different levels of granularity. However this might bring challenges, because the current views (day view, week view, month view, list view) bring different types of properties. The paper promotes the list view, as linear representation of the schedule, which can contain granulated information about the events. The amount of information about the events depends on the level of details required by users, this could be achieved trough vary of scales on the list view, which can improve the searchability of the schedule. The list view also provides opportunities for endless scrollable views, and the fact that the view grows in one dimension gives the possibility to fill the second dimension with other information that might help orient the user in the current situation. Such view can also provide cross platform usage.

Hypothesises, which aim to test and compare the usability of the grid view and list view were tested in within subject design, facilitated on web server, accessible by the participants. 51 of 62 participants fully completed the test, and were used for analysis. The instructions about the tasks and the task were constructed as web pages. The participants were navigated to the pages of the study, where they had to perform several tasks, once on grid view and once in list view, by following according to each task. The time that took for the participants to complete the tasks was recorded, in order to be compared between the different views. The task was to run trough six different scenarios for both types of views. The error rate was not been discussed, because it was relatively low.

The result showed that there grid view was slightly better where the users had to search fro specific day. However, the list view was significantly better for scenarios that the users had to search in specific month. The authors suggest, that the searchability for specific date can be increased by highlighting. The search times were also higher than expected for the list view rather than the grid view.

After that, questionnaires in which the participants were asked to rate both views. According to the personal opinion of the participants, it is found

that the results are in favour of the list view, according to the speed of use. However, the participants rated the list view as slightly better than the grid view, and 21 form 41 participant who participated in the questionnaires preferred the list view over the grid view.

The authors promote the list view as better solution to design concerns about the readability and usability of the schedule. This is due the results showed insignificant preferences in favour of the grid view, and the reasoning for such preferences were nearly the same as the preferences in favour the list view. The main reason fro the preferences in favour of grid view come from that they are used to work with grid view in their own calendar.

The conditions of the experiment might bring some biases over the usage of the list view, because they were not so well controlled and might differ for each participant. However, the study gives directions on what aspects of the list views should be further examined.

The research gives ideas of how the different views can be used and points out that different levels of details should be used according to the required information. In order to unify the views in one common view, which posses the strong sides of the list and grid view, and minimise the weaknesses.

Simple form of list view is used in this project with combination of week view. It brings the notation of events to a level, which is quick to rehears. It limits the information about the events to peace that can invoke recall over the events quickly, by providing clues of information related to the topic of the event, and relative time.