# Bachelor thesis in MDA vt-01
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Introduction

From the start we knew that we would cooperate with Sapient and the subject in our bachelor thesis would be related to wireless mobile computer artifacts. We had ourselves to decide the focus related to the above subject. We started out with this wide focus:

Who are the users of WAP phones and hand-held computers and the services they offer? How does the information follow people in their daily life? (Those without and those with hand-held computers and/or with WAP phones) We want to map out the information flow in today's society to see how mobile services support the supply of information and also how they could be developed in the future. In the study we will look at how the design of the physical device as well as the design of the content supports this supply of information. 1

We felt it was best to start with a wide focus to later close in on a narrower one. This because we wanted to design from an already existing need and had to find out which needs that did exist before we could decide what to put our focus on.

After the Observations in the ethnography phase we felt like we could narrow down our focus a little bit. During these observations we saw that even though we try to create paperless offices, paper is still the most used artifact in connection to planning and taking brief notes. We also found it interesting to see that our observed informants use a lot of different paper artifacts in different situations and also that they wrote and had the same information in many different places. Because of these discoveries our focus became: how mobile computer artifacts could support and organize brief notes and planning.

At the beginning for us, information was a very wide and unspecified concept, which we narrowed down to include only the information you get and give with brief notes and scheduling. We decided to study how different designs affect the possibilities of taking notes, planning and also what paper artifacts mediates to you, which digital do not do today. This will also be the focus in our report. An example of the mediating property of paper, which we have noticed during our study is: paper notes lying on a desk triggers your mind to know that there are things to do and when these paper notes are gone you get an immediate feedback that the work, connected to them, is done.

Even though we are in a very computerized world there always seems to be a great need for paper artifacts of different kinds. Abigail Sellen & Richard Harper have as well found an interest in this subject and start of a paper with stating:

1 http://www.student.hk-r.se/~mda98mak/
For many years now the paperless office has been held out as the goal for organisations: with such an office, organisations will be able to create, distribute, store, and use information in new and more effective ways. Furthermore, organizational theorists explain that without paper, new organizational forms will emerge, curbing the shocking waste of wood pulp and the ever increasing cost of paper storage. Yet paper has obstinately remained a conspicuous fact in organizational life: even the most “hi-tech” environments find themselves increasingly burdened down by it. The emergency of yet another digital document form, the web, though introducing new possibilities for document access and delivery, seems unlikely to alter the situation.²

How is it possible for such an old technique to last even in these inventive times? It must be that paper offers potentials, which no other existing creation does. So in this report we will try to explore and compare digital artifacts to paper artifacts and we will do this in context to our work in our bachelor thesis including the design of our organizer. Should we in the future develop something to replace paper or something that supports the use of paper and its possibilities? We will also explore some developments in digitalization of paper artifacts and artifacts, which support paper artifacts.

We consider the work towards the goal to be just as important as the goal of our work and we have because of this chosen to also thoroughly describe how we have worked and what the methods has resulted in. Besides a good design is often the result of a work well done.

At the end of our study we made a mock-up of a digital interactive organizer, which shows some of our ideas on how to structure brief notes and schedules. The design is discussed in the last part of this report. However, our goal was not simply to finish a design but also to get a deeper understanding for how people take brief notes and schedule their time and how mobile computer artifacts, like WAP-phones and handheld computers could support these activities in the future.

Part 1: Work practice and work model
Part 1: Work model and methods

We have chosen to write quite a lot about our work model and the methods we have used, this because we think that a good result requires a good work model as well as good methods. But of course we are aware that good methods and a good work model is not enough to create a good design, since you must also be able to process the result from the work and put it in a design context. Löwgren and Stolterman write that the result of a process will never be better than the individuals that are performing the process. For IT-design this means that it is the designer’s abilities, which in the end will determine the quality of the system. The methods will serve as tools for developing the designer’s abilities.³

We have worked a great deal with finding the “right” methods for our situations and have let the result from every method be the guide to which method we would choose next. Since we think it is important to work situated with methods we have during our study tried a lot of different methods to see how they perform in a real context. This to give us some more experience with using methods well suited for the situation heading for us. The right method is dependent on which result we want to get, which informants that are involved, what information we have since earlier and much more.⁴ Experience of working with different methods will make you more able to choose the method best suited for the specific situation.

From the beginning of our work we have let different users of information, which some of them also are user of mobile computer artifacts, join all stages of our work to be able to develop a design, which is well suited for our users situations.

However, realizing the benefits of a link between ethnography and design presents many challenges including learning how to try to insights from an ethnographic study into terms relevant to design, providing designers with the skills necessary to be reasonably accomplished field workers, and altering the mind set of product planners and developers so that extensive in depth user involvements viewed as necessary throughout the design an development process.⁵

In the following section our work model and the methods we used in this work are described.

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Experience modeling

In the beginning of our work with the bachelor thesis we decided to work with experience modeling, like our cooperating company Sapient does. We have heard from Jeanette Blomberg (our contact person at Sapient) how they work with it and also read about it on Sapient’s website, but have not seen anyone using it, which might resolve in that this was our own version of the model. Experience modeling consist of three phases:

1. Context
2. Ethnography
3. Assessment.

These phases are also performed in this order. The reason for our choice of work model is that we wanted to try a new way of working and compare it to the others we have tried. This because it might be the last time to try methods to work with before we step into our real work life.

Parts of the work model like the ethnography phase, the assessment phase and their order is not different from the way we usually work, but the structure and the speed of these phases. For us the context phase is usually not a separate part, which we start off with. This phase is generally something that evolves more and more during a project.

The Context phase

We worked with this phase the first two weeks of our project and it was also in some way a part of all the other phases. This phase includes getting to know the technical area of our interest (mobile computer artifacts- like WAP-phones and hand-held computers) and its vocabulary. During the first two weeks, when this phase was our focus, we read articles and searched for information on the web. We got to know what kind of mobile computer artifacts that exists on the market of today and also which were believed to exist in the future.

Since we both before this were not very introduced to the world of mobile computer artifacts this felt like a good and natural starting point. Without the context phase the ethnography phase would have been hard to pursue, given that the reliability of the ethnography would have been lost. We were looking at how the people of today get access to information and how mobile computer artifacts could support this access. Then we must also put it in context to how these artifacts are used today, which is only achievable if we know which possibilities are available. According to Gargarian *design is in large part redesigning*\(^6\) To us redesign is not necessary redesign of physical artifacts, but also redesign of thoughts and environmental aspects. So to be able to design you have to know something about the thoughts in the environment you are redesigning, which starts with the context phase.

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\(^6\) Constructionism in practice, p. 128
We think it is important that this phase is ongoing even during the other two phases, since it always pops up interesting questions and new words to explore. Though it should only be the focus at the start of the project.

The Ethnography phase

If the prestudy (the context and the ethnography phase) was the first dip in the water in the summer, the context phase would be the dip of your toe to get a small overview of the water’s temperature and the ethnography phase would be when you jump in and get a fuller idea of the temperature. In the ethnography phase we have worked with different methods to get a better understanding for how people of today get access to information.

We really did jump into this phase for in some way to see were the different methods would lead us. From the beginning we had a very broad focus and we wanted this phase to help us narrow it down, since we wanted to create something from an existing need and because of this we had to study people before we knew needs to focus on. We believe the ethnography phase will be performed differently depending on if you do or do not know the focus from the beginning. Knowing the focus from the beginning you will not have to search for one and you can concentrate on observing merely the focus of interest. You also want to know how something is performed or designed, but without knowing the focus you first want to know what is performed or designed.

We limited this phase to 6 weeks, which sometimes has felt like too short time and we have because of this also limited us to study less and less informants. Our hope was still to be able to make some kind of generalizations from our few informants. It might be an important thing to learn whereas we always have to generalize from the specific because it is never possible to study all users.

Our focus has, as expected, changed during this phase to something we at first did not find interesting, but during the observations did and also found a great need for. We also found interesting perspectives to look at in this behavior. If we would have had a more narrow focus from the beginning we might have missed these activities.

The methods we used in this phase, which will be presented in the following chapters are:

- Interviews
- Observations
- Visual Storybook
- Dialogues around Visual Storybook
Interviews

In the beginning of the ethnography phase we decided to interview 12 people with different backgrounds and the selection of people to interview was made according to following four categories of people:

- With WAP-phones
- With handheld computers
- With Laptops
- Without any kind of portable computer artifacts.

We considered these categories to be relevant for our studies since our starting point was to find out who the users of different portable computer artifacts are and how the information follow people in their daily life (those with and without portable computer artifacts).

Since one reason for the interviews was to select a smaller group from the larger one, the questions were basic and concerned the mobile artifacts and how the people organized their information flow. We modified the questions on the basis of which category the person in question belonged to.

The interviews gave us an opportunity to get some insight to how people uses mobile computer artifacts and what they think about them. We only found one user of WAP-services and had to limit the interviews with WAP-users to only one and exchange the others to one user of a “smart phone” and one who only uses the WAP-phone as a mobile phone. The interviews also gave us some insight to what kind of information and what medium people use.

This method was a good starting point for us since the interviews and the work related to these gave us informants to work with in the study. It also gave us ideas and made it possible for us to form our continuing work, even though some changes had to be done because of unexpected circumstances. For instance we analyzed the interviews and saw some antithesis, which we wanted to look further into, but we had to let go of this idea when we could not go on with the people we first chose to include in the observations.

**Discoveries from our interviews**

All of our informants had a mobile phone and some of them could use it as a WAP- phone, but only one used at rare occasions in work related actions. The reason for this was that they all thought it was too expensive and also that the services offered were not the desired ones. From our studies and our own feelings about it we think that desired services for WAP- phones are short and selective information, like finding out when the next train, from the town you are in, is leaving. The interfaces of the WAP- phones are not suited for surfing and actually are not what our informants or we would like to do with them. The two persons who did use WAP- services used it to look at stock-exchange quotation and short news on TV4’s web page and Aftonbladet’s web page. Most of our informants used TV, newspapers (in paper) and Internet for getting news. Some of them also got organizational news from their organization’s website. To get in touch with
friends, relatives and colleagues half of our informants mostly used email and the other half mostly phone.

**Observations**

According to our timetable for the ethnography phase we had estimated that it would be reasonable to include four people in this phase. Because of some circumstances, which were out of our control, we decided to just observe three persons.

Our focus during the observations was information seeking and how they handled the information. We did not want to limit our work too much in this stage; instead we wanted the observations to be an opportunity to see what could be interesting to look further into. One point with the observations was to find a focus to concentrate on in the next method, the Visual Storybook.

We were to observe the informants during a day at their work. The methods we used during the observations were video recording, taking notes and asking questions when the situation let us. We tried to record the informants every time they had contact with different kinds of information mediators instead of recording the whole day, this to avoid too much video recording material. We decided that both of us would be present at the observations, but unfortunately there was only one occasion where we both had the possibility to attend at the same time. We took part of each other's observations by reading the notes and looking at the video recordings and by dialogues, which worked very well. Still we think it would have been better if we both were present at the observations since it was difficult to take notes and at the same time be alert on what to record. When you are alone it is also easier to miss something while you are taking notes.

One of our informants, the vice principal of work science and media technology, was a bit difficult to observe. Since he is very familiar with our, as students, way to work (as responsible for our educational program) he finds it interesting with studies like these and has a lot of opinions. Which is why he had a hard time ignoring the observer and just being observed. Instead there were a lot of dialogues and discussions. It is difficult to tell if you fail to notice important things when you observe in these kinds of situations.

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*Fast de använder sig av olika beteckningar kontinuum är experterna (...) överens om att innebörden av “deltagarobservatör” går från fullt deltagande (...) till stum observatör, dvs en person som försöker likna flugan på väggen.7 (Even though they use different terms the essence are agreed on (…) by the experts that the meaning of the word “participatory observer” is all from complete participation (…) to mute observer, i.e. someone trying to be the fly on the wall.)- Our own translation*

We believe, we missed what the person himself is not aware of and this unspoken knowledge helps us to get a fuller picture of what the informant really are doing which is important when you are designing new artifacts to support the activity of the person.

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Discoveries from the observations

The following text is meant to paint a picture of what was seen in the observations.

The medical consultant repeatedly had difficulties finding her way, which is described in the following scenario extracted from the observation:


(Which road is it to Lund the E6 or the E22? - she says out loud (…) She looks at some kind of moveable map which she has. It is the E22. She turned off at the wrong road and had to drive to the same road again. Then she continues, but is for a long time insecure if she has driven the correct way)– Our own translation.

To find her way she sometimes uses the moveable map as in the above scenario, or a city map and sometimes she asks people on the road for directions, but it does not always help. Road directions for an example can be given to quickly and it is easy to forget the details as Camilla evidently did when she said: Var det höger han sa? 9 ((Did he say right?) - Our own translation) 20 seconds after asking a man after the direction.

Paper and computerized artifacts are used in a mix by all of our informants, it seems like these artifacts sometimes work best together. Here are some different examples of this from our observations:

Tittar på datorskärmen och letar samtidigt efter ett dokument med olika kommandon i en pärm. Hittar en passande rubrik på indexet i en pärm. Letar upp dokumentet. Sedan skriver hon in ett kommando på datorn. 10

(Looks at the computer screen and at the same time she looks for a document, with diverse commands, in a binder. Finds a suitable heading on the index in the binder. Looks up the document. Then she writes a command on the computer.)- Our own translation

Han planerar även tid på Idenet (skolans intranät) och då berör det ofta föreläsningar. För att hålla koll på olika tider brukar han skriva ut schemat från Idenet. 11

(He also plans his time on Idenet (the school’s intranet) and then it often concerns lectures. To keep track of different times he usually print out the schedule from Idenet.)- Our own translation.

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8 Extract from observation with the medical consultant Camilla
9 Extract from observation with the medical consultant Camilla
10 Extract from observation with the software designer Anna-Maria
11 Extract from observation with the vice principal Björn
Camilla såg att hon fick ett meddelande och lyssnade av röstbrevlådan. I meddelandet lämnades ett telefonnummer till en person hon skulle ta kontakt med. Hon tog ett block i ett fack som fanns i den panel som är till höger om ratten och skrev upp numret på lappen (detta sker samtidigt som hon kör bilen)\(^\text{12}\).

(Camilla saw that she got a message and listened to her voicemail. In the message a phone number was left to a person she should get in contact with. She took a notepad in a compartment, which is in the panel that is on the right of the steering wheel and wrote down the number on a note (this happens at the same time as she is driving).) - Our own translation

The above examples are of the interacting use of different computer artifacts and paper artifacts and this use have for our informants sometimes ended up in the same information getting stored on more than one location.

Han använder sig av post-it lapparna som finns i datorn. Det han antecknar där är telefonnummer. Han har även telefonnummer i mobiltelefonen och på smålapparna på skrivbordet\(^\text{13}\).

(He uses the post-it notes on his computer. What he makes notes of there is phone numbers. He also has phone numbers on his mobile phone and on the small post-it notes on his desk.) - Our own translation

When the information changes the information has to be updated on all the diverse locations, which we have not seen getting solved when having the information on both paper and computer artifacts, but with two computer artifacts we have seen how synchronizing the information can solve it.

Hon säger att hon oftast skriver in på kalendern i den stationära datorn för att senare synka den med handdatorn. I enstaka fall händer det att hon skriver in på handdatorn istället. Det är när hon är borta från den stationära datorn. Den som är senast uppdaterad av handdatorn och den stationära uppdaterar automatiskt den andra vid synkningen.\(^\text{14}\).

(She says that she often writes in the calendar at the stationary computer to later synchronize the handheld computer. Once in a while it happens that she instead writes on the handheld computer. It is when she is away from the stationary computer. The one latest updated of the handheld and the stationary computer automatically updates the other at the synchronizing) - Our own translation.

The medical consultant has a paper calendar and a calendar on the computer. To update the paper calendar she has told us that she needs to write the information by hand and because of that she writes the schedule from the computer in the paper calendar first when she knows the computer one is fixed. Having the information on many different places makes it possible to access the information from many other places, but with digital artifacts it is possible to have the information in one place and still access it from many other places.

\(^{12}\) Extract from observation with the medical consultant Camilla  
\(^{13}\) Extract from observation with the vice principal Björn  
\(^{14}\) Extract from observation with the software designer Anna-Maria
En sak som arkivdatorn nyligen var bra till var när Björn och en kollega tog bilder med en digitalkamera på elevernas legobygge. När de tagit bilderna lagrade de dem direkt på Björns server från en dator i salen de var och togbilderna i. Efter några dagar kom det en elev och frågade om de kunde få titta på bilderna som togs. Det var då Björn kom på att det var mycket lätt att distribuera ut bilderna från den datorn genom att lägga upp en WWW-katalog och maila ut adressen till eleverna. 15

(One thing, which the archive computer recently worked well for, was when Björn and a colleague took pictures with a digital camera on the students Lego building. When they had taken the pictures they were stored directly on Björn’s server from a computer in the room where they took the pictures. After a couple of days a student came and asked if they could look at the pictures that had been taken. Then it was Björn who realized that it was very easy to distribute the pictures from the computer by put out a WWW-folder and email the address to the students.)- Our own translation

The extract above shows how it is possible to make digital information accessible from many places as well as distributing the information to others, which also makes it easier to communicate with a lot of people. In our study we could see that the different informants uses diverse ways to communicate and that the most common ways to communicate were by using e-mail, a stationary phone, a mobile phone and eye-to-eye communication. The medical consultant said that contacts over the mobile phone was a way for her to manage her work, to confirm meetings, get information from colleagues and get in touch with her booking central. The software designer said she had more use of e-mail, but when observing her we saw that she in fact used the phone just as much. Eye-to-eye communication is often some kind of informal meeting where knowledge is shared and appointments are set and here are two extracts from our observations that will exemplify this kind of informal meetings.

Medan vi står där kommer en kollega till honom (Jan) som vill träffa honom senare under dagen (Björn har ingen kalender med sig). Ingen precis tid kunde bestämmas för Jan visste inte riktigt när han kunde förutom att det var tvunget skulle bli före lunch. 16

(While we where standing there a colleague approaches him (Jan) who wants to meet him later that day (Björn has no calendar with him) No exact time could be decided as Jan did not quite know when he was able to except that it had to be before lunch.)- Our own translation

15 Extract from observation with the vice principal Björn
16 Extract from observation with the vice principal Björn
Peter följer med till fikarummet och de pratar lite om problemet. När vi sitter där blandas priset mellan jobb och annat. De återkommer till problemet i mailet och säger att en del av problemet är nog bristen på dokumenterade rutiner. De säger att de ska ta upp det med chefen. (...) Medan vi sitter där kommer en annan person in i rummet och Anna-Maria ropar på honom. Han ställer sig bredvid oss och de diskuterar dokumenterade rutiner och hon tar även upp problemet som hon och Peter sitter och pratar om.17

(Peter comes along to the coffee room and they talk some about the problem. When we are sitting there they talk about job and other things. They return to the problem in the mail and say that a part of the problem is probably the lack of documented routines. The say they will bring this up to the supervisor. (...) While we are sitting there another person arrives and Anna-Maria calls out to him. He positions himself next to us and they discuss documented routines and she also mentions the problem she and Peter are sitting and talking about.)- Our own translation

To be able to take notes of the information you get on these kinds of informal meeting it is good to have a mobile artifact for taking notes.

Den lilla anteckningsboken säger han är en av de bästa investeringen han gjort när det gäller yrkesrelaterade hjälpmedel. (...) Det han använder den till är att bland annat skriva ner tankar, idéer, adresser, boktitlar och tentafrågor. Det är blandat jobb och fritid (...) Det som är bra med den är att den är mycket liten, så att han kan ta med den överallt och att det då är möjligt att skriva ner något i stunden (det jag tror han menar är att man inte vet när man blir inspirerad och får en viss tanke och skriver man inte ner den med samma så försvinner den).18

(The small notebook he says is one of the best investments he has done when it comes to work related aid (...) The things he uses it for is among other things to write down thoughts, ideas, addresses, book titles and exam questions. It is a mix of work and spare time (...) The qualities of it are that it is very small, so that he can bring it everywhere and that it then is possible to write something in the moment (what I believe he means is that you do not know when you get inspired and gets a certain thought and if you do not write it down it will be lost)- Our own translation

The mobility in this case obviously depends on the artifacts size, since the notebook being small it makes it possible to carry it with him, often in his breast pocket on his shirt. Size, shape, position and other appearances are according to what we have seen in these observations of great significance to more aspects than just the mobility like what it mediates, how it should be used and what for. Björn has for an example a large rectangular calendar, which shows a month per page and gives a good overview of a month. He also has a smaller calendar, which is more suited for getting a weekly overview. Except for the small notebook described above he also has larger ones where he puts down notes taking a lot of space and notes written during a formal meeting. The mediating prospects of these properties are also noticeable.

17 Extract from observation with the medical consultant Anna-Maria
18 Extract from observation with the vice principal Björn
Arbetsplatsen verkar innehålla människor och faktorer som påminner honom om saker eller som ger honom vissa idéer.19
(The workplace seems to contain people and factors that remind him of things and that give him certain ideas.) Our own translation

Like this extract says, the physical properties of things are often a good reminder of things you for a moment have forgotten.

What we found most interesting in these observations was the fact that all our informants seemed to use a lot of different paper artifacts (more than we had expected), especially for planning and taking notes, which also made us wonder in which situation they chose which artifact. At this time we could narrow down the word information to the one you write on and read from brief notes and schedules. Also the aspect that they seem to have the same information on many different places caught our interest and the question when, how and why they choose to use each place of information arose. These interests were the ones guiding us to the next step in our work.

Visual Storybook

We decided to include only two of the three persons observed in the Visual Storybooks, which were the vice principal and the medical consultant, since we only had enough time to do a thorough study with this amount of informants. Our reasons for choosing these two informants were the likenesses we found in how and what they use to support their work.

Visual Storybook is a method we came to hear about at a seminar with Jeanette Blomberg, where she talked about how they use this method at Sapient. It is techniques for gathering information by letting some chosen people write a diary and taking pictures according to instructions. The instructions in the storybook include tasks and descriptions on what they should document. The storybook is meant to trigger the informant’s mind to recognize situations affected by the instructions.

After deciding which two we wanted to give the visual storybooks to, we looked closer into the examples of the storybooks we got from Sapient and made our own version of them. Our visual storybooks included two tasks, one called “A day in your life” and a second one called “Tools and strategies”. The first task was shaped in the same way for both our informants and was formulated in the following way:

Tell us about things like:

- Your daily routines connected to meetings, notes and planning.
- Does these daily routines work, when does problem occur and why?

The other task differed a little bit from one informant to the other. The reason for this was that in this task we wanted the informants to write about their tools

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19 Extract from observation with the vice principal Björn
connected to information handling. To highlight the interesting parts we had seen from each observation and to link the contents to the respective person’s work situation, we had to adapt some parts to the different storybooks. In the vice principal’s storybook this task was formulated in the following way:

Tell us about things like:

- Tools you use to plan your time and write down notes of different kinds.
- At which times do you use the different tools and for what purpose.
- The tools color and shape mediate different messages; tell us what your tools mediate to you except the text.
- The advantages and disadvantages with different tools and events you would need support for.

To show a difference between the visual storybooks we will write one sentence from the medical consultant’s storybook that can be compared to the first sentence in the other:

- What tools do you use to plan visits and get access to information related to the visits and also tools in connection to own reporting of information (receipt, reports from visits). How you use the tools and how the information they mediate is created (when and how).

This method demands much from the informants involved, since it takes a lot of time to read through the instructions and to write and think about things treated in the storybook. As the researcher you are depending on the informants motivation, willingness and opportunity to give the visual storybook the time it demands. Because of this the result from the storybooks can differ from informant to informant. What we mean is that the information you get from the informants can vary in case of quantity and deepness, i.e. detailed descriptions. This was the case with our two storybooks.

The notes in the vice principle’s visual storybook were short and told us what he did and what happened in some situations but mostly not how. Further he had not done the second task, which were Tools and strategies. The Medical consultant’s storybook contained more thorough notes and she had written on both tasks. Apart from the reason earlier mentioned, we also think that the medical consultant’s storybook were more thorough because she has written her own personal diary almost all her life and that can also have an effect on the ability to write in the storybook.

The vice principal was the first to return the visual storybook. When we had read it and found that he only had written about the first task and only about what he did, but not how, we first wondered if our instructions were confusing and unclear. But after reading the medical consultant’s visual storybook we could establish that the instructions could not have been completely indistinct. To get some feedback on the visual storybooks we asked the informants what they thought about the method. The response we got was that it was a lot of
instructions to read and it demanded that you read it through a couple of times. They thought the tasks was very similar and had a hard time distinguishing them. Since they only had the storybooks a limited time, they said that they had to think back on some occasions since some artifacts is not being used every day or week. A positive thing they experienced was that the storybooks made them think about the information handling connected to their work and consciously think about things that are troubling in it.

For us, this method was a way to expand the observations by concentrating the content in the visual storybooks of things we came to be interested in after the observations. A big strength with these books according to us, is that it offers the possibility to include many people without spending a lot of time with all of them. With this method you have the possibility to reach out to people which you would not have time to meet personally. However we chose to meet with both our informants and talk about the notes and the pictures in the visual storybook.

The dialogue around the Visual storybooks was an opportunity for us to ask questions and for the informants to talk about what they had written. In the case with the vice principal, the visual storybook would not have been much help without this dialogue. It gave us the answers on how he handles some things and what he thinks of the tools he uses.

We chose to have dialogues around the visual storybooks with both of our informants, but we believe that it will not be necessary if the instructions are comprehensible so the returned storybooks are well written and thorough.

We think the pictures plays a big role since it triggers the memory and we believe that if you are going to have these dialogues it is important to have them as soon as possible after they have returned the storybook.

*Discoveries from the Visual storybooks*

Here is what we found out about our informants in the visual storybooks and the dialogues around them. Everything that is told about them here is what they have written in their visual storybooks or told us in the dialogues around them:

The artifacts that the vice principal, Björn, and the medical consultant, Camilla, use most frequently are the laptop, their calendars, small notepads, small note slips and pens, and for Camilla her mobile phone and car are also very important.

For Camilla the mobile phone together with her calendar plays a central role in her work. She uses the mobile phone a large part of the day. In her work she has contact on the mobile phone with her secretary of reservation to find out about the schedule, other colleagues to exchange experiences, the person responsible for the medicines to get some more information about the medicines, clients and restaurants to make and confirm reservations. When she can get hold of information on the mobile phone and in other ways, the mobile phone is usually her first choice, since it is easier when driving. given that she can keep her hands on the steering wheel. The information she needs to write down while driving are often phone numbers, which she writes down on a notepad or a paper note, but can also be appointments that she writes directly in her calendar so they are on the right place immediately.
A physician, who she at an earlier occasion has tried to reach, calls Camilla on her mobile phone while driving. Together they set an appointment that she writes down in her calendar. She thinks it is rather difficult to drive and at the same time pick up the calendar in her bag, look in the calendar for a free time and to write down the appointment. It happens quite often that she is checking and writing in her calendar while driving, but when she sometimes has the opportunity she stops the car. After talking to the physician she calls her secretary of reservation to tell him about the booking, so another meeting will not be reserved for the same time. She is sitting in her car, which is standing still and has her mobile phone in the holder on the panel in her car and the calendar in her lap. The reason for her not adding the meeting to the computerized schedule herself is that she thinks it is easier to get doubled booked if both she and the secretary of reservation will add meetings. At the same time she browses through her calendar and notices that an upcoming appointment is at a totally different location than the rest of the appointments that day, which she tells the secretary of reservations to get him to rebook the appointment if it is possible.

When the medical consultant started her present occupation she wrote down all her bookings from the database in her paper calendar. In the margin of every booked appointment in her computer calendar there is a mark that changes color according to if the appointment is not yet accepted, or accepted, or reported after a visit. Not yet accepted means that she still has not agreed to make the appointment, accepted that she has written it down in her paper calendar and accepted the meeting, reported after a visit that she has written a report and sent the report to the company’s mutual database. She thinks it works especially well for having control over when new bookings have been entered by the secretary of reservation. New appointments can be added at latest one week in advance, which is why Camilla first at every Friday goes through the appointments for the upcoming week.

When she is preparing for a meeting, she is entering the client database on the laptop and checking previous reports, which she and other colleagues have made on the doctor she is going to visit next week. She writes notes on small notepads containing what she considers to be most relevant and it often takes two notes to fit the information, which she attaches next to the meeting in her paper calendar. The reason for writing this information on the small notepads instead of writing them directly in the paper calendar is that there is not enough space in the calendar. In the paper calendar she also keeps the credit card and the gasoline card she uses in her work. In the back of her paper calendar there is also an alphabetical directory where she writes important phone numbers.

She keeps ordered materials in her home and it is her responsibility to make sure that the materials do not run out and order more material when needed, which then arrives in a day. It is important that she keeps an eye on the appointments so she will bring the right material with her.

In the morning she takes a quick look in the calendar to see which clients she is going to meet during the day, where and what material they have ordered. She has a paper clip attached to the current day in her calendar to easily be able to find it. Just before a meeting she is sitting in her car and makes a quick check of the
notes she have made on the client she is going to visit, so she can make goals with the visit, check the material and if the client is one of her VIP clients, since it then is more important that the meeting goes well. In her hand compartment she has a list of these clients on a printout, which is done from her database of clients. She has the printout because it goes faster to get that specific info by looking on the piece of paper than on the database in the Laptop.

When she leaves the car for the appointment she does not bring anything for taking notes, because she does not like to take notes during the visit since it would interrupt her conversation with the physician. When she arrives to her car she usually writes down milestones containing information from the visit and sometimes even when she drives. She has to remember a lot in her head and if she does not write it down as soon as possible she will risk forgetting some important details until she later in the evening should write her visit report. She does not always have time to write down this information because she has to rush to the next visit and then she instead ponders about the visit while driving. Sometimes she can write the visit report right away, but just as often she does not have time to write it until a couple of hours later or sometimes not until the evening, which she tries to avoid since she wants to be able to enjoy her spare time.

When she arrives home she connects her laptop to the Internet to get access to newly arrived information for instance mail, not yet accepted appointments and to make her visit reports available in the company’s mutual database. She reads through her e-mail, answers the necessary ones and enters the appointments, she has made, to the database, if she has not already called the secretary of reservations and told her/him about the bookings. On Friday evenings she also synchronizes the bookings in her calendar on the computer and the paper one. She thinks it can be a little bit difficult to synchronize new bookings on her paper calendar with the one in her laptop. Some of her colleagues choose to only use the calendar in the laptop, but she also wants to have one in paper because it happens that she on a visit with a client decides to book a visit to follow up this one and then she wants to be able to write it down right away in the calendar.

She has a plastic pocket where she keeps all the orders from the physicians, which she checks once in a while. When she is driving past a town, in which there is a doctor who has ordered something she drops the things of.

At the end of the day when she is sitting by her laptop she completes the “traveling bill form” with the information; when she left the home in the morning, when she returns home in the evening and if she is going to make a deduction for business lunch. She has the possibility to get connected to the Internet via her mobile phone to make this task while being on the road, which she some times does when she has the time. She also makes a report of her driving by completing a paper form she keeps in her home. This report is sent in by mail to the office once a month and so is the traveling bill, but by e-mail to the person responsible in the office. She also makes one copy for herself and one for her chief, to whom she sends this copy together with the receipts in a mail for an approval.

On Björn’s rectangular calendar he plans the course he is responsible for and if he is responsible for two courses at the same time he uses two of this kind. When another course is being held simultaneously with the one he is planning he
lets the other courses schedule stand in the margin. He often is the last of the responsible teachers to plan a course and this is why he can enter the other courses’ completed schedule, but sometimes they are changed and lessons get double booked, which will first get noticed when the students complain. A disadvantage with this calendar is that it is very fragile and easy can get torn, which his personal calendar does not.

One time he had made a double booking because he had been careless and not written down an appointment from the school’s intranet, to his green personal paper calendar. He writes that this happens quite often though he thinks it should be rather easy. The advantages with the personal calendar is that it has more room for notes under every day and that it also is possible to write hour for hour, but a disadvantage is that it lacks room for general notes, which the rectangular calendar does not.

Björn always has a lot of things going on and sometimes when he sees colleagues talking he walks over to them bringing the small notebook. He often forgets to bring a pen, but he can usually borrow one. If an appointment is to be decided he has to go and get his personal calendar since he seldom brings it.

Björn prefers lists of bookings in paper compared to the ones on the computer, since he believes that the paper ones can start other processes. A student calls a friend to have him put his name on the list of bookings and they start talking.

Björn puts pieces of paper, he are supposed to take care of in some way, on his desk to remind him of what to do since he usually can not take care of it at that instance. If something is put above them he easily forgets them. Pieces of paper he has taken care of are taken from the desk.

The Assessment phase

The products of the first two phases are usually abstract and in the assessment phase something concrete is made of the abstract. This phase is where the designers make a design or implementation of ideas and thoughts, which came up during the previous two phases.

We worked with this phase for 6 weeks, which felt like to little time, since we had so many ideas of what to design. This is why we restricted ourselves to only visualizing one design idea, but we will in this report also introduce some other design ideas although only in writing.

In this phase we tried to use as many informants as possible from the ethnography phase to try to have some consistency through the whole work.

For us this phase was the most enjoyable since we finally could see a concrete result of our earlier work.

The methods we used in this phase will be presented in the following chapters and they are:

- Dialogues around Scenarios
- Future Workshop
- Mock-up
- Showing of our Mock-up
Dialogues around Scenarios

This method is what you would call a homemade one and it is a transitional one from the ethnography to the assessment, which mean that it includes features of both phases.

We wanted to see how people takes notes, plan their schedule and what different sorts of artifacts they use in this purpose, why, and how the design affects the choice of artifacts, which we in this purpose created a method for.

We created three scenarios on the basis of our observations and our informants’ visual storybook. During the dialogue with one informant at a time, we had a number of different artifacts like a hand-held computer, calendars and notebooks in different shapes and sizes lying on a table in front of the informant. We read the scenarios to the informant and he/she told us which artifact he/she would use in light of the scenario. Theses scenarios were general in a way, which we thought would not limit the informant to feel like we wanted them to pick a specific artifact. We also told the informant that he/she should tell us if they would use an artifact, which were not on the table. During the whole time we had an open dialogue with the informants so we just would not end up with a short answer on only which artifact they used.

The method worked well except when we used it with one of the informants (the vice principal), who had made a visual storybook, with whom we got the same information as from the storybook and the dialogue around it. Otherwise it helped us to get a better general idea of what artifacts are used in specific situations. The different artifacts made it easier to discuss them while they could pick them up, show us how they used it and so on, which also made it easier for us to understand each other.

From the dialogues we have mostly found out what kind of artifacts our informants uses in the area of taking notes and planning and why, but not in detail how.

Discoveries from the Dialogues around scenarios

The discoveries from our dialogues around scenarios are very complex and specific and worked as a confirmation on what we already knew but more detailed and specific. Because of this we will not describe our discoveries in detail since it would take too much room and no generalizations can be made of how our informants used digital and paper artifacts for taking notes and scheduling, we will just give some examples of how they told us they do.

When our informants are on the move and do not have their calendar or any other artifact for taking notes or scheduling, they grasp a piece of paper lying around and use it for taking notes on. Afterwards they put it in their pocket of their pants or jacket to bring it. This can also be how it works when talking on the phone at home and something has to be written down, like phone numbers, or messages for other people in the household, they usually write it down on what is in hand, like small pieces of paper, notepads, envelopes or advertising paper.

When taking care of paper notes our informants puts the paper notes on a place where the note will be visible, like on the desk at work and on the computer if it is a post-it note. One student even writes small messages on her hand since
the notes on her hand will be visible to her everywhere she goes and help her remember to handle the information or task associated with the note. Some of our informants nearly always bring their calendars and then they often write down the small notes in them, since they are more likely to remember it, browsing through and looking in the calendar every day. Larger paper artifacts can also function as visible reminders as one of our informants told us; that if having important information, which she did not want to forget in the paper calendar, she would leave it open to signalize it’s importance.

One of our informants says the following about taking care of her paper notes:

Notes of information, I get while being on the move, I do not organize, but I put them in a pile on my desk. Small paper notes like post-it notes I put on my computer screen since they have to be visible for me to remember them. Duties or meetings, which are time-fixed, I write down in my calendar on the computer and the temporary ones I keep on the paper. Phone numbers, which I will use more than once I write down in the address book on the computer, but if they are temporary I throw them away after having used them.

The physically of notes makes them easy and visible to throw away, but organizing of the notes to at least be able to easily find the notes you are looking for seems to be harder.

Our informants have expressed that it can be difficult to sometimes find notes they have saved on small pieces of paper, because they easily disappear somewhere, like under a pile of other pieces of paper. Sometimes they will just forget where they put it, even though they are trying to organize their notes.

One way of organizing the notes could be to digitalize the post-it notes, as one of the informants had, on which he wrote down phone numbers, independent if there were temporary or not, this because he does not have a phone list in the computer.

Planning ones time can also mean that our informants write down to dos, which can be things to remember on one day but that are not depended on a fixed time. These to dos are often written down on some paper that is in hand and then being put on a place where it hopefully will be discovered before it is too late. Sitting at work this mean that the to do list might be written down on post-it notes, note pads or other loose pieces of paper and then being put on the computer screen or on the desk. At home the informants might write it down on some suitable paper like a post-it note, if the note is going to be put on the door and remind them if there is something they have to do before leaving home.

Information about meetings with friends, like dinners or birthday parties are often not been written down because these kinds of meetings will be remembered without having to enter them in the calendar. Although, if there are more formal get-togethers, like weddings and funerals, these might be put down.
Future Workshop

After reading about different participatory design methods we decided to have a future workshop as our second method in the assessment phase, since we thought we with this method could develop design ideas from our focus of interest.

We wanted as many earlier informants, from our work in the ethnography phase, as possible to join in this workshop, but unfortunately it was only possible for three of them to attend and neither of these were the ones who had participated in all methods in the ethnography phase (the medical consultant and the vice principal). One of the four participants in the workshop joined our study for the first time and was therefore introduced to our work in the beginning of the workshop.

Our participants had all different occupations (one software designer, one banker, one student and one senior teacher of a university), which we thought was an advantage in view of the fact that it could give us more general design ideas. In some way it might be a disadvantage not having the people we looked closer at in the ethnographic study, participating in the workshop since we started looking at the specific view and now got a more general one. Or might this be the right way to go from the specific to the general, which always is a necessity in the long run?

Before the workshop we prepared a note that would tell the participants about the workshop, it’s phases and how this method would be carried out. We also recorded some scenarios, which we had seen during our ethnography phase to give an insight into our work and also to inspire the participants of our workshop. Unfortunately we could not record it to an ordinary videotape because of hassle with the video equipment and had no possibility to show this video in the beginning of the workshop as planned. This was a setback, which for a short while dampened our confidence, but as soon as the workshop started we forgot all about this setback.

The workshop was to be performed after Löwgren’s and Stolterman’s model of Future Workshop. One exception from this method was done and it was to include also the advantages of today in the vision phase.

For each phase we had different colored post it-notes to write our opinions and ideas on, so we afterwards easily could see which phase was which, something one of us learned from a workshop her project group held during the IT-design course. From the start we wanted to have one large sheet of paper lying in the middle of the table to work around. As soon as someone would come up with an idea they would write it down and put it on the paper sheet. We wanted to have all post-it notes from every phase on the same large sheet of paper. It went very well to work around the sheet of paper, but we soon noticed that the sheet was not large enough and we had to use one sheet for the critique phase and two for the vision phase. We also used bright arrows to name the different groups of shortcomings during the critique phase and for ideas and today’s advantages in the vision phase.

The workshop ran out of time, which is why we never carried out the implementation phase. Limiting the time more than we did would according to us

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have meant a big loss of great ideas and we preferred to go through two phases more thoroughly than three phases carelessly.

The workshop was carried out even better than we thought. The participants were very active during the whole process and the activity escalated during the whole time. In the end everyone was standing up, moving notes and discussing the notes significance and which group it belonged to. The method could perhaps have been performed more organized with everyone putting one post it-note on the sheet at a time and might have made it more time effective, but we believe that it could have restrained the participant’s innovation.

Discoveries from our Future Workshop

From the Future Workshop we got a lot of stories of how planning and taking notes works today and ideas for how it could work in the future. Here comes our chronicle of the Future Workshop we held with four creative informants.

Many of our informants say that they have experienced having the information in the “wrong” place, which implies that they have it in the “wrong” device or in the “wrong” application. This is an access problem being caused by at least bad synchronization and interaction. The following scenario is not based on a told story, but taken from the collected experiences of several of our informants. It might not be an every day experience or something all of our informant has experienced but is as an example of what could happen with the technology working as our informants says it does today.
While being in school I get an email from a friend where she suggests links to use on my WAP-phone. While going by bus home I decide to try out the links my friend sent me, but unfortunately my WAP-phone is not compatible with my school account as it is with the computer at home. Finally at home I decide to use my FTP-program to access the information from my computer at home, so I immediately can add the links to my WAP-phone to be able to check them out while going to school the next morning. I have no troubles opening up my school account from home, but because the information was in a mail I have difficulties finding the information and finally gives up. I will have to do it the next day in school.

The scenario also illustrates the problem our informants told us about of finding the requested information when having many possible places for storing. This dilemma could possibly be solved by one of the following ideas or some of them working together like having all info in one place, or one device with everything in it, or by simple synchronizing of devices and information or making it possible for the information to interact. One way for the information to interact in a calendar with mobile phone could be that if your schedule says you are on a meeting your telephone would give a message saying that you are in a meeting and when you are believed to be back. Having eye or fingerprints identification could solve the security issues that arise with having all information in one place. Our informants were sick and tired of all the passwords they needed to remember. The banker told us about how it works when he logs in to some databases on the bank he needs a couple of different passwords every time and they are also constantly changed.

Sometimes they rely too much on that the technology can support their actions, like when the person in the scenario above believed that the WAP-phone would be compatible with the school account, since it was so with the computer at home. Since devices are not always compatible this question arose: If the information should be stored in the devices? Which all of our informants answered no to, also because if the device gets lost in some way the information would also be lost. They instead thought that all their information should be stored in one place and that they should have unlimited access to it.

A similar problem exists with paper notes you write, which means that they are hard to keep track of and also to remember to bring, but if forgetting to bring paper notes there are no other possible options for getting access to the information on them, as there is with information on computerized objects, except to go back and get the notes.

Apart from organizing your note it is also hard to organize what to write down. The software designer told us that she often has a lot of things she needs to do, but also that the things she should do create other things to do and so on until they become almost impossible to keep track of and she has a hard time deciding what to prioritize and write down. This should be solved by a simple way to categorize things to do after priority. It should also be easy to take notes with voice manipulation, voice recording and even automation of thoughts.

Sometimes when writing notes we do it in a hurry and/or carelessly, which makes them hard or impossible to read. This can be caused by them missing to write down words, being badly formulated or just untidy. An example could be
writing down a phone number but not the name. When looking at the note some time afterwards you do not know who’s phone number it is.

Usually notes are written on paper, especially while being in a hurry, since the handheld computer artifacts suited for taking notes by their mobility, are in fact hard to quickly take notes on. It might be caused by the need to have a special handwriting for it to become correctly interpreted by the handheld computer and by the need to press the number buttons in a natural way on the WAP phone. Before you can put down your notes you also have to open up the right application, which slows down the process a little bit more.

Meetings that hastily get decided on or those that are not quite time fixed are hard to fill in to your schedule because you do not know the time, what to write or where. The banker told us about when he booked a meeting hastily with a colleague. He was meant to book a room for that meeting, but since he did not have time to write it down he thought: “I will book the room in a while so I will not forget it.” Something different came up before he had the time to book the room and he forgot all about it. Maybe he would need to remind himself in some way. Visible things can often remind you of things like meetings. Paper notes are often used this way, but when they are placed on the wrong location or concealed by other things and are no longer visible they cannot possibly remind you of anything.

Nowadays our informant are available on many places and by many medias and this availability can actually lead to inaccessibility. Here comes a scenario for explaining this fact.

Peter is going to call Yvonne he has found her number to her work, home and mobile phone. He also has her e-mail address at work, her hotmail address, her icq-number and the address to her web page where she has a guest book. It is important that he gets hold of her immediately, but he has no idea if she is working, at home or somewhere else. Peter knows that she only turns on her mobile phone when being away from other phones, but he does not know where he can reach her now. He first tries to call her at work and during this time Yvonne is sitting in her car on her way to work and is available on the mobile phone. At the time Peter calls her at the mobile phone Yvonne has arrived to work and is now only available at the work phone. When Peter has tried every information mediator he has knowledge of he tries the phone at work again unfortunately she is now in a meeting and can’t answer the phone.

This could go on the whole day, but of course he could also be lucky and get hold of Yvonne at the first shot, however there is also a chance that you will win a million dollars on the lottery.

Having the different communication mediators interact could solve this if this solution worked and the above scenario could then look like this.
Peter is going to call Yvonne. He has found her number to her work home and mobile phone. He also has her e-mail address at work, her hotmail address, her icq-number and also the address to her web page where she has a guest book. It is important that he gets hold of her immediately, but he has no idea if she is working, at home or somewhere else. Peter knows that she only turns on her mobile phone when being away from other phones, but he does not know where he can reach her now. He first tries to call her at work during this time Yvonne is sitting in the car on her way to work and is available on the mobile phone. A voice is telling you that you will be connected to Yvonne’s mobile phone where she now is available and then Yvonne answers the phone. If the calendar also is interacting with the phones and Yvonne would be in a meeting when Peter calls no matter to what phone Yvonne’s personalized message, automatically taken from the calendar, would be played and Peter would be able to leave a message, which Yvonne gets in the next phone she turns on. It should also be possible for Yvonne to have all phones turned off, given that she sometimes want to be unavailable.

The possibility to choose what to see, when, where and how to be available is something all our informants seemed to need and this also makes it possible to suit the need of specific persons. During the workshop we experienced that some wanted both categories, like private and work to be shown at the same time in the view of a organizer and others wanted to have them separate. Some of our informants wanted to have all in one device, others wanted to be able to choose which parts to put together, as Lego –parts, in different situations to create situated device.

Everyone seemed to need some kind of organizer or secretary to keep track of his or her information and appointments etc. They also wanted to be able to get help by step-by-step instructions.

Something that would not be so hard to accomplish with the technology of today is the interaction between different applications and we could not but to wonder why we have not seen this by now, since there seem to be a great demand for it. This interaction could be a component in the proposals our informants came up with during this Future Workshop. It could be a way to collect a lot of our information in on place and to organize it in a way that made it possible to find it when you would need it like some sort of helper. You yourself would be able to choose what you want to see and what information to store where. The integration would also help your information and devices to get more synchronized.

**Mock-up**

Since we during our workshop did not have time to perform the implementation phase we decided to do this phase ourselves to later show the workshops participants a mockup.

We started out with summarizing the workshop and decided what we would focus on, since it would not be possible for us to develop every idea. To do this we wrote the categories of criticism and ideas on the whiteboard and tried to link them by relation to each other. After doing the same thing on a large sheet of paper with post-it notes, so we would be able to keep it for later. Since we did this more than a week after the workshop it was good to get an update and also to be able to see which ideas that could solve different problems. Before this procedure...
we had an idea of what we wanted to design and during this procedure we tried to look at what problems this design could be able to solve.

Then we wanted to see what already existed on the market, to check so that we would not design something that already existed. Unfortunately we were not able to find as much or install some program for testing as we had hoped and decided to start our design anyway.

We went up to the Mock-up room (a room on the school with a lot different materials as paper, scissors, rulers, knives, glue and so on.) and decided to create one paper mock-up each, to see if we had the same idea of what our design should look like and how it should work. When both mock-up ideas were done it was obvious that we almost had same opinion about the designs appearance and function.

The final mock-up was done in Power Point to more visibly show the functions of the design. We worked dynamically, which means that there were a lot of changes done during the work with the mock-up.

Making a mock up is not only good for the purpose of having something physical to show, but it is also a good way for the designers to get a real picture of their mental one to help them realize potentials and infeasibilities.

**Showing of our Mock-up**

The people we used in this session where three of the four people who attended at our Future Workshop and the vice principle who has been a part of our earlier methods.

The people from the workshop attended at the same occasion. One of the persons sat in front of the computer with our digital mock-up and the others sat around it together with us two. After some explaining and showing of the mock-up the person in front of the computer tried it out a bit. During this session all of them had remarks and questions and everyone was pointing at different parts on the screen. It was a mix of explaining (both by us and our informants), exploring and “redesigning”. The redesigning was merely done by the informants giving us new views and aspects of the design. The session with the vice principal was carried out in the same way as the one with the three persons.

This part of the work with the mock-up gave us a hint of the importance of letting future users try an early view of the design. We can see ourselves as future users but in the role of the designer it is very easy to go blind for some facts and consequences. As Ackermann declare:

> I believe that both “diving in” and “stepping out” are equally important in reaching deeper understanding. /.../ As the Chinese saying goes: “The fish is the only one who does not know that he swims” (anonymous). People cannot learn from their experience as long as they are entirely immersed in it.21

Thanks to this method the mock-up has been worked out more thoroughly since we got opinions from our informants. But we also think it is important to state that it is never completely possible to for-say how the future artifact is going to be

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used in real life situation and that is why you cannot say that the design is ideal just because you have done user tests. We state that user tests are not an answer to the perfect design but it will most likely increase the chances of doing fatal mistakes. This particularly when the user tests are carried out in early stages where the design not yet is fixed.

**Discoveries from the showing of our mock-up**

In the piece below our informants respond and opinions on the mock-up are described.

Regarding the to do list in the calendar we got rather much respond. The informants wanted to be able to make settings of different kinds on the to do. For instance it should be possible to make a setting for the feature “To do”, which would automatically move the task to the following day, if it not during the day has been accomplished. It also should be possible to decide whether the accomplished task should disappear or just fade a little bit in color when being put as performed, to disappearing the day after. The reason for wanting something to disappear when it has been performed is that they want to get rid of it when it is done. If one task has been removed it will also be more visible how many tasks there are left to do. But at the other hand there are times when it is good to see what has been accomplished and it is easier to see reduction of the to do list when the task is fading but still not removed from the list. For an example if there is just one task that has not faded among five tasks it will give you the feeling that: “I have been working hard today”.

The location of the to do-list were also discussed. Some of them wanted to have the list visible on the weekly view so when looking at the tasks they would also be able to see when there is time to carry out the tasks.

A feature we have in the calendar is the ability to be able to enter a visual reminder for preparations i.e. something you have to accomplish before a certain occasion. Our informants appreciated this kind of reminder because they have experience looking in the calendar and realizing that they have a meeting the next day, which they are not prepared for.

Something else that came up was that it should be very easy to move meetings and since digital artifacts possess properties that will make this possible, which we should take advantage of in our design.

One informant also desired a back and forward function allowing you to browse back and forward between the current view and previous ones in your calendar, just like in a web browser.
General methods

During the bachelor thesis we have used some methods that continuously has been going on during our work. In this section we would like to describe these methods and why we chose to use them.

Use of mobile computer artifacts

As a part of our work we have during this semester been using two different mobile computer artifacts (a hand-held computer and a WAP-phone), this to get a first hand experience with devices that are accessible on the market today.

One of us has been using the WAP-phone, Ericsson R320s, which Ericsson Software Technology in Lund, Sweden, has lent us. We were also sponsored with a subscription to WAP services of the department of Work Science and Media technology. The WAP-phone has been used both as a mobile phone and a WAP-phone. The WAP-phone also has a calendar, games, a phone list, a reminder function and much more. Especially the calendar, the phone list, the reminder function and the WAP-services have been used, since they have been in focus in our bachelor thesis.

The other one has been using a COMPAQ iPAQ 3630, which the department of Work Science and Media technology has lent us. The hand-held computer has a color screen and contains a calendar, an address book, some games, a mp3 player, the program Microsoft Word, the program Microsoft Excel, a reminder function, a sound recorder and some other things. The hand-held computer has mostly been used as a calendar and address book. The reminder function has also been used frequently.

This contribution has made it possible to explore the possibilities, advantages and disadvantages with WAP-phones and hand-held computers. It has given us more insight in to the techniques and the usage of them, which has been invaluable to us in our studies. In a study it is important to have a feel for the informants work and without some own experience it is hard to get. When we have been discussing design issues the use and experience of the artifacts have been of great help. Since we have first hand experience of this artifact you might say that we in some way uses ourselves as informants.

While we were not strangers in the world of mobile computer artifacts we had the same interpretation of this world as our informants.

Främlingen däremot, som närmar sig gruppen har inte tillgång till recepten. Vad främlingen har är sin egen hemgrupps receptkunskaper och han eller hon börjar tolka den nya sociala omgivningen enligt dessa.22

(The stranger however, who is closing in on the group does not have access to the recipes. What the strangers has is his own home groups knowledge of recipes and he or she starts interprets the new social surrounding according to these.) –Our own translation

22 Fägerborg E, 1997, Den första tiden. Fältarbete och arbetssocialisation, page 15
Discoveries from own usage of mobile computer artifacts

Down below we will give some insight into the experience of these mobile computer artifacts, how they worked and what it could become of them.

The WAP-phone had an acceptable design of interface and symbols, but we would like an easier way to make inputs of text. To add an appointment could take us somewhere in between 2 to 5 minutes depending on how much information we added. We had a hard time talking to other persons at the same time as making an input, all concentration had to be focused on the phone, which was frustrating since we usually were having a conversation while getting the information about the appointment we were adding. It makes the WAP-phone less useful in some of the situations it is meant to suit. The pressing of buttons to write texts is very time ineffective and even if you will become more accomplished it will still take longer time than on paper. Something that could make it more time effective is if it would be possible to copy and paste appointments in the calendar and also if words you had written many times before could pop up to be chosen when starting to write something similar.

The handheld computer had an exceptional good screen in the sense of resolution and color. It made it rather plausible to use. To enter information to the address book or the calendar was rather simple. When comparing writing down an appointment on the handheld computer verses writing it down in a paper calendar the different was marginal. It went a little bit faster to use the paper calendar. The copy and paste function where used a couple of times for moving appointments and it felt like a timesaving function but most of all it was a good organizing function to avoid a mess in the calendar.

Although there were occasions were we could not use the handheld computer for appointments since it did not work the way it should, which sometimes made it rather insecure to use. Sometimes when making an appointment the screen flipped out and it was not possible to add the appointment.

After trying out some WAP-services on the WAP-phone we believe we know the reason for why there is not many users of WAP-services. The services existing for WAP-phones today are too general and we believe that services in an interface as small as the WAP-phones should be small and selective, since it is hard to get an overview when scrolling down three pages. This is what the Nielsen Norman Group has to say about the same thing:

"Mobile services must target users with immediate, context-directed content. General services like shopping are less likely to succeed in the mobile environment."

We saw how much money we spent while using the WAP-services and we mean that the services must be time effective, so the users feel like they get their money’s worth. However we do believe that there is a future for the services if the companies developing them consider what the users would need, enjoy and use with such a small interface.

23 http://www.NNgroup.com/report/wap
To be able to surf with the handheld computer you need some other artifacts with a modem, like a WAP-phone. In an article with the headline “Framtidens telefon”24 ((The phone of the future) - Our own translation) it is announced that in the future the handheld computers are believed to be a combination of a computer and a mobile phone. For this combination there could be two different development tracks. One is a device that first of all has the shape of a telephone but with as many computer properties as possible. Ericsson R380 is an example of this. The other variant is a handheld computer where you build in the phone functions. The article states that the later variant is probably going to be the leading one, which we also believe. The reason for this is that we believe that the size of the screen and the way you enter things in the handheld computer are more suitable for many diverse services and tasks, which we think will make more people use them.

Cooperation with Sapient

Through our supervisors, Bo Helgeson and Kjell Persson we got in contact with Jeanette Blomberg, who works at Sapient’s department “Experience lab”. This is a company who works with web consulting and has lately found an interest in extending their business interest to other areas like mobile interfaces and this is why they found interest in our work. Another reason was also that they would like to know what kind of technical artifacts Swedish people use to get some inspiration and ideas.

The only person we have been in contact with at Sapient is Jeanette Blomberg. The idea from the beginning was that she was going to be our contact person and get us in touch with some other people at the company. Because of some trouble in the American economy, which also affected Sapient, our cooperation have not been as expected. Our cooperation has been carried out by mail, our website and personal meetings at the times she has been visiting our school. We got some information about methods, opinions about our report, website and our design of an organizer.

Under the circumstance it has been necessary for us to work more independently than we are used to in our education, which has been a valuable experience. It meant that we had few restrictions and frames to work within and instead had to create our own work situation. Unfortunately this has not only been an advantage since we have not got the possibility to experience working with restrictions and frames as we might have in our future occupation.

Our Website

At first our website was a way of keeping our cooperating company Sapient and our tutors updated, but later it was also about keeping ourselves updated. It was a way for us to push ourselves to analyze and reflect on what we had been doing every week. While writing this report it also helped us to remember what we have been doing and our thoughts about it.

24 Datateknik 3.0, no 2, 2001-02-08
We were supposed to write and summarize the week every Friday and also to update our timetable, but unfortunately it did not always work out that way. Sometimes we updated our website later during the following week and the last weeks we did not do any updating at all, because we were to busy with everything else. Instead we have been discussing our work together and made oral analyze of our work and discoveries from it. But writing is a way of processing your thoughts and we might have missed that the last week.

Processing our thoughts in relation to what we got done, we still think we did the right thing focusing on doing our work, but of course it would have been better if we had had time for both procedures.

On the website we have had a project diary in which we described and analyzed the previous week’s work. We also had our time schedule and timeline to show how we were going to work. Of course it also contained a description of our focus, a presentation of ourselves, our sponsors and the devices we used. To get some response on our website we also had a guest book, which we regretfully did not get any response in.

The homepage of our website.

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25 Perlby, M, 1998. *Om projektet (tillägg om skrivandets roll i projektarbetet)*, page 1
Communication within our group

In work between two people or more it is very important to communicate on a level that will make everyone understand each other. Communication is used to inform and inspire other people, but in our case it had a great importance for resolving our confusions. The two of us are from different places in Sweden, which sometimes appeared as misunderstandings between us, which were based on different interpretation of words and expressions. For an example we have sometimes had discussions were we thought we had different opinions on something, but during the discussion found out that we in fact were of the same opinion.

In an early stage we noticed this problem and had because of this in the following work more conversations and sometimes lively discussions to resolve the problems language games could cause us. Sometimes we think people around us believed that we were angry at each other while discussing, but for us this was merely a way to resolve misunderstandings. Due to this kind of communication we rarely had any confusions between us during the later work. This way to resolve misunderstandings will certainly only work if all parties are able to take and give criticism.
Concluding reflections

From methods in the work model and situations we have been guided through our work and they have given us signals on how to take the next step with consequences and random events. In the beginning we were open for all the signals the methods and situation gave us since we wanted the consequences and events to give us a narrower focus, which is why we chose methods like Interviews and Observations that could open this world for us and send signals that would catch our interest. After catching an interest we chose more selective methods for studying the signals of our interest to later getting closer to the core of the subject. The last methods were to help us put the signals and subject in a design context. A designer who do not get influenced by the hidden signals the methods and situations sends to him/her will probably fail with making a useable design.

During the time we spent working with the these methods we have seen how different designs of artifacts can influence their usability in different situations associated with taking brief notes and scheduling. The size and shape of artifacts for scheduling and taking notes makes them useful for different situations and purposes.

Everywhere around us there are artifacts of different sorts and in our studies it was apparent to us that most of them where in paper. Almost all available paper artifacts are some times used for taking brief notes and scheduling since their availability makes them useful in these purposes. Often when taking brief notes they are made in an instance and the things available are what you use, which we in our study have seen frequently is some kind of paper artifact.

People still use many different paper artifacts for different purposes, but often in combination with computer artifacts. This occurrence leads to the same information being stored and written on many different locations. It is important that the information connected to brief notes and scheduling, can be transferred between different sources of information to get it organized. It is easier to organize the information if you have it on one place, which only is possible if the transferring goes automatically or at least by simplicity. In our studies we have seen that the calendar sometimes is a place for gathering brief notes and scheduling. Even if the information associated with brief notes and scheduling is stored at the same place we have not observed any interaction between the different kinds, which we think would help people get more organized. Temporary information may never end up getting stored since these notes according to our informants are quickly thrown away after they have been taken care of the one time they were needed.

People of today are usually occupied by all the things they have to do and they need reminders to signal things that are of highest priority at a specific instance, which they do by placing things strategically to make them visible enough to remind them.

From our discoveries we have come about some ideas of how organizing of brief notes and scheduling could be made easily by making the different sources of information interact. What our design should look like depends on what we find out when comparing paper to digital objects in the next part.
Part 2: Design of properties
Part 2: Design of properties

In our study we have looked at how the advantages and disadvantages with paper and digital objects affects the design of artifacts for taking notes and scheduling. The purpose with this chapter is to describe the properties of paper and digital objects, which are relevant to our focus (organization of notes and scheduling) and to bring these two materials up for a discussion. When discussing these digital objects we will also include some technology, which is of importance while describing its properties.

We will take up positive and negative aspects, based mostly on what we have seen in our study. The purpose is not to make generalizations but to discuss the properties of these materials on the basis of our informants and our own experiences. In the end we will also discuss state of art developments, which are meant to support or replace paper, from the perspective discussed in the other parts in this chapter.
The properties of paper

Though paper was created already in the year 100 A.D. it is still a highly used material although new technologies have tried to substitute it. The reason for why it not yet has been replaced might be that the qualities of the material offer possibilities that no other existing material does. If there were no disadvantages with this material would we still try to replace- or support it, or is it just a desire to apply the new technology?

Mobile and flexible material

One reason for why paper yet is irreplaceable could be its mobility with which we mean that paper is easy to bring because of its light weight and flexible size. We have ourselves experienced tearing a piece of paper from a notebook when we wanted to bring the information on it somewhere. With flexible size we also mean that we usually have different sizes of paper somewhere around us, and even if we only have paper in large sizes they are foldable, so they can become of another size. Going shopping the two of us have knowledge of usually wanting to bring a shopping list and have sometimes only had access to large pieces of paper. In these cases we have folded the piece of paper or torn it to smaller pieces and then put it in a pocket on our pants or jacket.

We believe that the mobility and flexibility supports the ability to take temporary notes, which you can easily through away when they are not needed anymore. The medical consultant has a notebook in her car and at one occasion we could observe her writing down a phone number to a restaurant. After calling the restaurant she threw the note in the slot on the car door, which she cleaned out when she came home later in the evening.

The ease of throwing paper notes is not only a good quality, but could also be a disadvantage in the perspective that you by mistake could throw away valuable information. This disadvantage can lead us to the occurrence where we save unnecessary paper notes, which could cause an unorganized chaos. The vice principal has notes with phone numbers, reminders and settings for his computer written on small pieces of paper on his desk, which he rather not throw away since he have told us that he thinks he might need them in the future. We think this can result in him having lots of notes, which he has no use for and it is somewhat contributing to the mess on his desk.

Tangible

The tangibility of paper offers many extremely valuable advantages and one of them is the ability to catch some of its properties with other senses than the sight as Gunnel Andersdotter writes in “Att göra det osynliga synligt”(To make the invisible visible (-our own translation))\(^{26}\). An example of this is when you hold a pile of paper and get an idea of how much text there is in it. Usually the increase of text on paper also means an expanding amount of material, which can be a disadvantage while needing a lot of storage space. For an example when putting

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\(^{26}\) Andersdotter, G, 1999. *Att göra det osynliga synligt*, page 10
more and more information in the calendar you might need extra notes to get all the information with you, which might make the calendar thicker and thicker. In this way it could become less mobile because the enlargement makes it ungainly to carry with you.

To deliver something tangible you often put it in the receiver’s hand, which makes you certain that it has been delivered to the right person. When delivering you also get the chance to say something to the recipient about the delivered information, which will diminish the chances for misunderstandings.

In this example the information on the piece of paper could just as well have been sent by e-mail, but this way the person delivering the paper also got to explain certain things about the information by pointing on parts of it, which we think is an advantage with delivering it in person.

In the extract above we wrote that Björn puts the paper on his desk, which means that it will be a visual reminder of what he should do with it, as long as no other paper has been put above it. This is an example of how the visual and tangible aspect of paper will trigger your memory.

We imply that post-it notes have even better properties than ordinary paper for the ability to remind us, because of the ability to attach them to other objects, which we assume is the reason for why our informants are using them a lot in this purpose. In the Dialogues around the scenarios the banker told us about a scenario where he uses post-it notes. He is on the phone talking to a client and gets an assignment to find some information, which will take some time to get hold of. While waiting for the information he puts the client on hold and takes another client waiting on line. This client wants to talk to his colleague sitting next to him, who is not available at the moment, so he takes the second clients name, phone number and writes it down on a post-it note, which he puts on the colleague’s computer screen. By doing so he is certain he will not forget to tell the colleague and the colleague will surely not miss the note.

**Simple to take notes on**

The scenario above with the banker also shows the simplicity of taking brief notes on paper, which is another advantage with paper as a material. With simplicity we mean that you almost effortlessly and time effective can write notes. The reasons for the simplicity of writing brief notes on paper is that you can write in the way you have done since you learned how to and also that you immediately can write

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27 Extract from our observations with the vice principal
down your notes without any need for other preparations, like finding the place to write it on or browsing through a pile of papers to find the right blank paper to write on. This advantage in combination with the great access of paper artifacts makes it the most accepted way of taking brief notes among our informants today. With great access we mean that everywhere around us there are different paper artifacts, like newspapers, advertising sheets and notebooks, which lie there for no specific reason and makes them available and useable for taking of brief notes.

**Mediating material**

The shapes and colors of paper artifacts are almost unlimited, which also makes it useable for different kinds of notes, scheduling and organizing. From our observations with the vice principal we have seen him carrying a small notebook in the breast pocket on his shirt and he uses this small notebook for brief notes, like thoughts, ideas, phone numbers and “to dos”, while moving around at work.

Without this notebook he himself thinks he would forget this information before he would be able to write it down. We believe the size of this notebook to be the most important property for making it mobile, which means that he without difficulty can carry it with him everywhere (in his breast pocket).

While having a conversation with him in his room we also noticed how the coloring of his folders affected him. We were talking about a subject and he wanted to show us a paper connected to it. He could not remember where he had put it, but while looking for it among the folders in the bookshelf he remembered that it was a red folder. He only had two red folders, so because of his color memory he could easily find it.

The vice principal also uses two different paper calendars for different situations, one rectangular calendar showing each month on one page and a smaller one, which shows only one week per page. The larger one is used for the scheduling of a course he is responsible of and he applies it in this purpose because it gives a great overview, so he can see if the course has an even distribution. He uses the smaller calendar for scheduling his personal time at work.
and in his spare time, for the reason that there is more space for writing under every day and it also gives him an overview of the week, which is what he needs for his personal planning.

We create our own handwritings with a pen on paper and the handwriting alone can trigger the remembrance of certain related memories. The vice principal told us that other people sometimes write in his small notebook and because of their handwriting he can connect a memory of the instance to the note. One time he had a phone number in this notebook with no name attached to it. He could see that it was another persons handwriting, which made him think about the instance when it was written down and then also remembered who the phone number belonged to.

**Editable**

In making preliminary editing paper is a very useful material, since it is easy to work around and make notes of what to edit in the margins before a final editing on the computer.

Pappersbaserad dokument fortsätter dock att spela en viktig roll som en kraftfull teknologi i revisions- och redigeringsarbete på åtminstone två sätt: som ett medium i vilket kollegors dokument recenseras och kommenteras och där möjligheten att anteckna på dokumenten under denna process är ett vitalt inslag 28

(Paper based documents still continue to play an important role as a powerful technology in the auditing- and editing work in at least two ways: as a medium when colleagues documents are reviewed and commented on and where the possibility to take notes on the documents during this process are an essential element)- Our own translation

We ourselves have during writing this report been printing out the documents and made preliminary corrections with the pen on the paper to later discuss them and decide what to change in the final editing. Another reason for us printing the documents is that we think the paper version gives a better overview and is easier to read. The reason for why it is easier to read from paper might be it’s “mobile flexibility”. With mobile we aim to describe how paper documents can be read everywhere and all the time without any need for other artifacts. Flexibility signifies the possibility to hold it in your hands while reading or put it on a table. It is also possible to read it by yourself or to work around it with a couple of other people.

For final editing though, we consider paper not to be the best material since we have heard from our informants and we ourselves have experienced, that after some changes it usually gets messy and unorganized. One of us used a paper calendar last semester and this is how it sometimes worked:

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After getting my schedule for the next month in school I wrote it down in my calendar with a pen. The next week the schedule was changed and I had to change it in my calendar too, which I did by using my pen to cross out the times that were not correct any more and then added the new times for the lessons. Two weeks later the schedule was changed again and I had to make some more changes in my paper calendar in the same way as I did before. Finally I could not stand looking at the mess in my calendar and could not easily tell what my schedule looked like each day. The situation made me quit using my calendar and instead relying on friends and the schedule on Idenet (the school’s intranet).

The only way to avoid messiness is to write it once more on another paper, which also is the fact when wanting to move the information for other reasons.

Addresses and phone numbers she will need more than a few occasions she writes down in her address book (in paper), but not in the paper calendar’s address book, since she changes it every year and then would need to write the addresses again each time.)—Our own translation

Place dependent information

The above scenario shows that Elin will not be able to access the information in the address book, while not carrying it with her. She says that it would be desirable to be able to update this information in the calendar more easily, since she almost always has her calendar with her and then the information would be more accessible. This is usually a problem with information written on a piece of paper since the information can only be read from that piece of paper, which also means that you cannot access the information on other places than where that piece of paper is located.

Another disadvantage is that paper as a material is very fragile and can easily be damaged, which when only having the information written on one piece of paper makes it unreliable. The mobility can actually also be an unreliable disadvantage, since this property also makes it easier to lose. If writing down valuable information on a piece of paper and carrying it with you it could also be mistaken be destroyed or lost. Having a note in the pocket in your pants, which are easy to put in the laundry and then by mistake also wash the note. The note will be destroyed and the information on it will be lost, which can be frustrating if the information was valuable.

Depending on the use of your hands

To put something down on paper you always have to have your hands free, so that you can use them.

29 Extract from our dialogues around scenarios with the student Elin
Samtidigt som hon kör letar hon i filofaxen. Ringer upp telefonnumret som hon hittade i filofaxen. Där skickas hon vidare. Sedan pratar hon med en läkare för att bekräfta ett lunchmöte imorgon. Hon frågar även läkaren om hon vet någon restaurang i närheten där hon kan hämta mat. Hon får ett namn och telefonnummer, som hon skriver upp på ett block som hon tar från ett fack (...). Allt detta sker samtidigt som hon kör.\(^\text{30}\)

(At the same time as she is driving she is looking in her organizer. She calls the phone number, which she found in her organizer. She is sent forward. Then she talks to a physician to confirm a lunch meeting for tomorrow. She also asks the physician if she knows any restaurants in the neighborhood where she can pick up food. She gets a name and phone number, which she writes down in a pad that she takes from a compartment (...) All this happens while she is driving.)- Our own translation

During Camilla’s work she drives a lot and have a need for getting things done while driving, but she tells us that it also makes her a traffic hazard since she can not possibly keep her eyes on the road and on the paper at the same time. Neither can she keep her hands on the steering wheel at the same time as she is writing. Unfortunately the only way to write on paper is by using your hands to control the pen or the typewriter.

\(^{30}\) Extract from observations with the medical consultant
The properties of digital objects

Ever since the computer was invented, more and more things have been computerized and the progress has been more rapid than other technological developments. In fact, most things in our society today is computerized and some believe this is the future while other’s are afraid of what is happening. The computerization is in some cases an improvement and in other ones an impairment. It is important to see where the properties of digital objects suit the needs we want to support to not only make changes because we want to apply the new technology. In this piece we will describe the properties of digital objects to be able to see where digital artifacts could be used, especially the mobile ones.

Editable

One advantage with digital objects, which is used a lot today, is the possibility to easily edit the information (texts and pictures etc.) without needing to rewrite everything. We think that this property is something to really take advantage of when designing digital artifacts, like handheld computers and WAP-phones, that will support the organizing of scheduling and taking notes. Comparing the two mobile computer artifacts we used during this study, we saw the importance of this quality, which unfortunately the WAP-phone to some extent lacked. On the handheld computer you can take advantage of earlier written information but in the WAP-phone you often have to rewrite everything over and over again.

To illustrate this, here are two scenarios from us using our mobile computer artifacts to set an appointment and later setting another one of the same kind at a different time. We are going to schedule a meeting with our tutors 8.00 am on Monday morning and are going to have the meeting in our tutor Bo Helgesson’s room. We later also decide to have another meeting with them on Wednesday 9.00 am the same week on the same place. With the handheld computer:

I am in the calendar and I choose a new meeting by pressing the pen on Monday and then choosing new by pressing on the choice new in the menu. To select a subject for the meeting I choose “meet with” in the choice menu and then add our tutors by writing it with the pen in the character recognizer. Then it’s time to choose location and I press the pen against that line and then write Bo’s room in the character recognizer. Then I choose the start time and the end time by choosing 8.00 in the start time choice menu and then I do it in the same way to choose 9.00 am as the end time. Then I go to the reminder choice and choose none because I think I will remember the meeting by myself. I go to the choice menu for attendees and press on it, which make the whole contact list show up. Then I press the pen on the contacts Bo and Kjell. Then I press ok, which makes the appointment information show up and then I press ok again to save the meeting. On Monday we decide to have another meeting that Wednesday at 9.00 am. I am going to add a new meeting, but with the same info as the earlier one. I step into the week view and press the pen on the previous meeting until a menu pops up in which I choose copy. Then I press the pen on Wednesday 9.00 am, which is the time I want to add the copied meeting to, until a menu pops up in which I choose paste. Now the meeting is added.
With the WAP-phone:

I am in the calendar and I browse down to the week view with the arrows on the phone and I press the yes button. That day pops up with the choice “Add new” and I press the button yes, which makes the “Add new” menu show up. Then I get to choose the start time 8.00 am by pressing the number buttons on the phone and accept the meeting by pressing the button yes. Then I choose the duration 1 hour by browsing with the arrows and then press yes. Now I should write the subject of the meeting by pressing the number buttons a different amount of times depending on what letter I want to print, like I do when I write a SMS message. I write “GUIDANCE MEETING” and press yes. I write the location “Bo’s room” in the same way as the subject. Then I choose if I want to have a reminder or not, since I think I can remember it by myself I choose “No reminder” by browsing with the arrows and pressing yes. Now the meeting is added. On Monday we decide to have another meeting that Wednesday at 9.00 am. I am going to add a new meeting, but with the same info as the earlier one. I am in the calendar and I browse down to the week view with the arrows on the phone and I press the yes button. I choose Wednesday and press the yes button. That day pops up with the choice “Add new” and I press the button yes, which makes the “Add new” menu show up. I choose the option “Meeting” by pressing the yes button. Then I get to choose the start time 9.00 am by pressing the number buttons on the phone and accept the meeting by pressing the button yes. Then I choose the duration 1 hour by browsing with the arrows and then press yes. Now I should write the subject of the meeting by pressing the number buttons a different amount of times depending on what letter I want to print, like I do when I write a SMS message. I write “GUIDANCE MEETING” and press yes. I write the location “Bo’s room” in the same way as the subject. Then I choose if I want to have a reminder or not, since I think I can remember it by myself I choose “No reminder” by browsing with the arrows and pressing yes. Now the meeting is added.

When reading the scenario with the WAP-phone we want to mediate the feeling the person adding an appointment, with the same information as in a earlier one, experiences, which is: “Oh no, do I have to do this again”. The copy and paste function is a useful advantage in digital objects so why not use it? In the WAP-phone this quality does exist in some extent, it is possible to edit and move a meeting, but not to copy one, as we would have liked in the above scenario.

Complex to take notes on

Another reason for wanting the copy and paste quality in the scenarios above is that adding some information to these mobile computer artifacts is rather complicated and time consuming. Having a dialogue with the software designer, Anna-Maria, she said this about using her Palm pilot for writing down phone numbers:

Denna info sägs snabbt och om något blir fel, vilket det lätt blir och hon måste sudda, hinner hon inte med att skriva ner det när hon antecknar i Palmen

(This info is being said quickly and if something goes wrong, which it easily does and she has to erase it, she will not manage to write it down while taking notes in the Palm pilot.)– Our own translation.

31 Extract from dialogues around scenarios with the software designer, Anna-Maria
This scenario shows why handheld computers rarely are used for brief notes among our informants. After using our mobile computer artifacts for some time we have learned how to feed them with information, which makes it less time consuming but still not as quickly as it is done on paper.

**Less mediating materials**

We believe that when information is fed to digital artifact it is usually clear, which means it is quite easy to read and interpret i.e. the text’s linguistic interpretation cannot be misunderstood since a digital A always looks like an A. However there is still room for figurative misunderstandings. A clear text can also be meaningless since there usually is more than the text itself, which mediates messages to the reader like how the text is written, where and on what.

Information can be fed to digital artifact in other ways than writing, for example by voice recording, voice manipulation and inserting photos. We think this property is an advantage since it can make information more meaningful in view of the fact that the information now can exist of more than only text, which will mediate messages that the text alone cannot.

**Usable without hands**

The potential with other input options creates the possibility to feed the artifacts with information without using your hands, which could be something for the medical consultant to use while driving.

**Easy to distribute**

Information in digital artifacts has the possibility to be easily distributed and it is also easy to supply the information to people, which it concerns. We have seen that people are taking more and more advantage of this quality for an example at the software designer’s work, where they are going to make all the employees’ work schedule public on the intranet. Intranet is also getting more usual at the companies of today for supplying the employees and other parties concerned with for them relevant information. Information can also be shared by mail and FTP-programs, but then only if you choose to.

The potentials to easily distribute information will also make digital information very mobile even if the artifacts storing the information are not. Mobile information in this case means that you will not need to carry it with you physically, but still will be able to access it from every other digital artifact connected to Internet, which is a condition for this kind of mobility.

**Hard to effortlessly synchronize**

A dilemma with mobile information is the synchronization of the same kind of information in different places. Today this synchronization has to be done consciously. The software designer told us about her concern about forgetting to synchronize the information in the calendar on her stationary computer at work and in the one on her Palm pilot. As she expressed it herself she thinks this
concern have made her very careful and that might be the reason for her not having experienced this more than she has, but still it has happened.

One Friday Anna-Maria forgot to bring her Palm pilot to work. During the day she talked to a colleague and they decided to have a meeting on Monday next week at 1:00 am, which she wrote in her calendar on the stationary computer. During the following weekend a friend of her called and asked if they could get together for lunch on Monday at 1:00 am. Anna-Maria had forgot all about her business lunch on Monday and when looking in her Palm pilot she could not see that she had a meeting and thought she was available. The misunderstanding was exposed first when she arrived at work on Monday.

Possible to access from many places

One way to avoid the dilemma with synchronization is to have all information stored on one location, which is accessible from all places and is automatically updated when changes are done. This might not yet have been developed, but we think that this is a potential with digital artifacts.

The catch with having everything in one place can be that the information will be difficult to organize in a way that will make the information easy to save on the right place and find. Otherwise searching for specific information among a lot of digital one is a quite undemanding task. Searching for a specific document, you only have to type the name (assuming that you know the name) in a search file and the application will find it.

A thing that worries a lot of people today is the information security on digital artifacts and storing all information in one place may make them feel even more insecure. That is why storing all information in one place requires a lot of security measurements like backups, passwords and writing in cipher code. Our informants told us that they would like to use other ways of identifying themselves than passwords, like fingerprint and eye identification.

Sound reminders

Digital artifacts have the potentials to remind you of an activity with a sound signal. Since we have seen that our informants sometimes have a hard time remembering appointments this is valuable property to take advantage of. Still there are dilemmas with these reminders, like you have to carry the digital artifact with you to be reminded by the signal. Other problems with the reminder are that people only get reminded by sounds and not visually. During our studies we have seen that visual reminders have better affordance, which means that the reminder will directly mediate to you what it was going to remind you about. The sound reminder will only remind you of that you have something to do, but not what.

Invisible and intangible

The invisibility with digital documents is sometimes a problem, since you do not see them they cannot remind you of what you were going to do with them. To see things on a to do-list on digital artifacts you actively have to open up the to do-list to be reminded on what to do. What we found out during our Future Workshop
was that our informants needed to be effortlessly reminded of what to do. A similar problem is also that digital information is intangible, which means that you cannot really see what happens to the documents when you have for an example saved them. Humans often feel insecure if they do not see how their action affected the object they were working with.

Even if you cannot see what physically happens to the information you often get feedback on what you do. Direct manipulation is a design pattern, which prescribes a design that lets the user get immediate visual response on their actions and is often used with digital objects to give a visual response on actions, which otherwise would be hard to catch.

The intangible objects may offer things that tangible objects do not. They can offer the possibilities to easily make the design of an artifact your own. To make a design your own we mean that a user of an artifact can make some adjustments on the appearance after his own needs, which only is possible if the design of the software allows it. The restrictions consist of the context in which the artifact is being used and the designer’s ability to make a flexible design without making the customization and the use of the artifact too complicated. What we want to illustrate is the possibilities the intangibility of this material can offer if we know how to take advantage of it. In the computer science area they are talking about this subject as tailoring.\(^{32}\)

**Stored in inflexible materials**

A disadvantage with digital objects today is that it must be written with the help of and read in digital artifacts, which have rather large and ungainly hardware (screens). When it comes to mobile digital artifact like handheld devices, this weakness becomes even more visible. The material of the hardware interface cannot vary in size and shape, which limits their field of application because the word handheld implies that the user is going to be able to have it in the palm of his/her hand and the use of the handheld devices is therefore restricted of the physical appearance of the hardware.

WAP-services are one example of how the content not having adjusted to the size of its interface. There are services for WAP-phones but, as we already have mentioned, there are hardly any people using them. The speculations of why are many and vary. One reason could be that there today are not many services created to suit the kind of interfaces WAP-phones possess and the size of the interface puts restrictions on what information to show and how. The point of handheld devices are that they should be portable so you without trouble can carry them with you, but if the interfaces are very small the usage will be restricted and the field of application will change. It is a well-known problem in this area and we believe that the inflexible size restricts the use of handheld computers, because they need a small interface to be mobile but it conclusively also restricts their field of application.

Paper verses digital objects

In this piece we will compare paper to digital objects by putting their properties against each other. We will also bring up our own design ideas where we take our thoughts and experiences from both of the materials properties into consideration.

Flexibility and mobility

The material paper is light and flexible in size, which digital artifacts are not if you consider only one piece of paper verses one digital document stored in a mobile digital artifact, which originally are larger and more inflexible than paper. The strength with digital artifacts is while carrying a large amount of document or information it will not become larger or ungainly, which a large amount of paper will. When needing to bring just a little bit information the paper is more mobile than digital information, but when bringing a larger amount of information, digital information actually becomes more mobile than a huge pile of paper.

The medical consultant had a lot of diverse information on different pieces of paper, which she stores in a couple of places like her attaché case, paper calendar, the backseat of her car, the glove compartment and the trunk of her car. When she comes to a visit she has to look around in the car to find all the pieces of paper she needs for the visit. She also needs a bag to carry them with her.

Access

Some of the information on the pieces of paper has been printed out from the medical consultant’s database of customers, because she thinks she more easily can reach the information by looking on the paper. When having it on paper she does not need to start her laptop to get access to the information. This occurrence shows how paper sometimes can be easier to get access to because of its flexibility, which in this case means that you do not need another artifact to read the text on the paper since the information is physically there, which digital information is not.

However, digital information is usually more accessible because of the fact that it is not physical, which means it is easy to distribute. This in fact makes the information more mobile, since you do not physically have to bring it, but still will be able to access it from different places and easily send a copy to other people. Information on paper needs more processing to be distributed to others and usually needs a physical delivery. Physical information can be left behind and then you have to go back to get it, while you do not have to be afraid of leaving the digital one behind, when you have made the settings to get access to it from other places where you have a computer. The settings on the computer only have to be made once and is easier to do than needing to bring the information every time you leave, which will mean that you will not have to take any actions to not forget it. The fact that you do need a computer makes the digital information less flexible, since you cannot get access to it without the help of other artifacts.

Another dilemma today is also that if you have the same digital information stored in a couple of diverse devices, like the handheld computer, the stationary computer and the laptop, they all have to be synchronized, which is not totally
effortless. When the information is not synchronized the access to the updated information is also limited.

All-in-one place
We believe that having all your information stored in one place, which automatically will be updated when changes are done, could be a solution to the synchronization problem. This solution brings other difficulties like security and organizational issues to the surface and still it is no solution to the flexibility problem of no access to the digital information without any computer artifacts.

The all-in-one-storage place can only be used for digital information, which demands that if indeed all information should be stored there, all existing information should be digital. The fact that we still are using a lot of paper artifacts limits its function.

However there seems to be a lot of development going on in the area of supporting the transaction from paper notes to digital notes. One example of this is the “Anoto pattern”33, which is a pattern to be printed out on almost all kinds of paper (allowing 1000 dpi resolution) in any size and shape desired to be able to transfer the note on the paper to a digital source. This technology supports our belief that the size of a piece of paper is conclusive for its use, which also is the case for digital artifacts.

Changeable size
Unfortunately there are today no computers with changeable size to fit the different fields of applications. The interface of a handheld computer is well suited for reading brief notes and also for carrying it with you while moving around. The interface of stationary computers and laptops are more suited for reading large documents, but are not quite as mobile as the handheld computers.

An interface that easily can be changed in size and shape depending on the field of application in every situation and in this way imitate these properties of paper is what we believe would be an incredibly useful interface.

Usability for taking brief notes
From our observations and other methods we have found out that handheld computers are not well suited for taking brief notes, especially not when being in a hurry or given some quick information. Ever since we were taught to write we have had a handwriting suited for paper, but to write in a character recognizer on handheld computers we have to adjust our handwriting so that it will interpret the letters we write correctly. After doing something in your whole life it is often hard to adjust it. We wonder how it would work for someone, who has written his or her whole life on a handheld computer, to write on a piece of paper.

When writing brief notes on computer artifacts you have to switch on the computer and find the right location for the notes before starting to write, which we also think is a reason for why it is easier to write them on a piece of paper.

Jotting on pieces of paper has never really gone out of fashion. After all, desktops, laptops, palmtops - you name it - are rarely the first choice when you need to make quick notes or take urgent messages. Or, for that matter, when you’ve just had a brilliant idea and you need to get it down on paper - fast.34

This is how “Anoto” is trying to market their product Anoto pattern and we think that the actions they are trying to support has a wide field of application, since we have seen that our informants primary uses pieces of paper to take brief notes on, just like the quote above implies. A handheld computer usually takes a shorter time to switch on than a laptop or a stationary computer, which makes it more useable in the above kind of situations even though it does not make it any easier to write on.

**Mediating properties**

A paper note can mediate messages, which digital notes do not, like its position, size, material, shape and appearance. The post-it note sitting on your door immediately sends you the massage that there is something you should do. Putting it on the door you are trying to make sure you will not forget to bring or do something before leaving and this way you are sure to be reminded of it before walking out the door. Paper can this way have the function of a visual reminder, which digital artifacts have a hard time copying. Digital reminders usually send out a sound signal when it is time to do something, but do not tell you what to do.

There are two different aspects to a reminder: the signal and the message. Just as in doing an action we can distinguish between knowing what can be done and knowing how to do it, in reminding we must distinguish between knowing that something is to be remembered and remembering what it is. Most popular reminding devices provide only one of these two critical aspects. The famous “tie a string around your finger” reminder provides only the signal. It gives no hint of what is to be remembered. Writing a note to your self provides only the message; it doesn’t remind you ever to look at it.35

We believe that Norman is right saying that the written paper note itself do not signal you that there is something to do, but by positioning the note on a place where you can not miss it can in fact also be the signal. To increase the mediating prospects of a sound reminder we think it would be possible to categorize the things to be remembered and create signals connected to these categories. A future scenario could be going to a sport event and the sound reminder for this would play a melody connected to sport events like “We are all the winners”.

Another advantage with visual reminders is that they are constantly present without frustrating the person, who is to be reminded and they are usually not depended on the stroke of the clock. The digital reminders are generally time fixed and have a hard time reminding without being frustrating. To have visual reminders on a computer, a handheld or a stationary, might be hard to accomplish

since it is required to be visible without being annoying and the risks are that you either make it so visible that it overlaps something you want to see or that it disappears among all the other symbols. The sound signal is meant to be aggravating because of its time fixation and it is supposed to send you the message that it is important to do the task right that moment. The time fixation and the annoying signal are also reasons for why it is not suitable for the same purposes as the visual ones. Another limitation with the sound reminder is also that you have to be in the presence of the digital artifact to hear the reminding signal.

Storing and organizing

The physical reminders are easier to remove when you have been reminded than the digital ones, which also is the case with notes of these kinds. The simplicity of throwing away notes is not only of good nature, but can also be a disadvantage since you easily can throw away a note you really wanted to keep by mistake. While throwing away digital information you mostly get the question if you really want to throw it away, which can prevent you from throwing away information by mistake, but is also more time consuming.

Temporary information seems to be something we do not want to store in digital artifacts like WAP-phones, handheld and stationary computers, which we have experienced during our study. One of our informants, a student, told us that she only writes down temporary phone numbers in the calendar at the days she would need them. She did not want to save them in the phone list on her mobile phone for a couple of reasons. These being that she did not want to occupy memory space with number she only would use once. After using them she would then need to intentionally delete the numbers from her phone list. When she has lots of unimportant phone numbers on her phone list she would have a harder time getting an overview of the list since it would become excessively large. We believe by designing a phone list with the potential to organize the phone numbers in categories could help her getting a better overview even if the phone list is large. The effort of adding a new number is quite time demanding to waste on a number you surely will use only once. This is also a reason to why she would rather write it in her calendar, where it will only be taking space on the day, on which she is going to make the call.

If not getting through to the receiver of the phone call the day she was meant to, it is easy to turn the pages to the past week when trying to dial it again. This is an advantage with paper calendars according to our informants because the ability to turn the pages makes that information easy to find in a natural way, which means that it is an approach they have grown accustomed to over the years. They also feel that they get a better overview of the information this way, which also is one of the reasons for our informants preferring to read texts on paper.

Editing

Another reason for favoring texts on paper is to be able to make preliminary editing on them, which is easier on paper than on digital texts, since you can write
between the lines and in the margins on the paper. The final editing is more easily made in digital objects since you do not need to rewrite everything once more, but simply delete or edit the words and sentences required, by merely using copy and paste.

**Techniques for input**

When writing on paper you use your hands and consequently need to have your hands free for this purpose. When entering information to digital artifacts there are other techniques then writing like voice recording and voice manipulation, which means that you can have your hands free and sometimes also quicker make the input. Having your hands free is used in some ways with mobile phones, but we think this quality could be used more in many other situations. Our informants told us that they sometimes are too lazy or busy to write down some notes and therefore avoid writing them down, which sometimes leads to them forgetting the information. They told us that they desire a way to effortlessly save the information, they otherwise write down, and thought that voice recording possibly could be the way to do it.
Artifacts supporting or replacing paper

Given that we have discussed the properties of paper and of digital objects in the above pieces we think it is on its place to also introduce some new technologies, which are meant to take advantage of the qualities of paper as well as of digital objects. We will also discuss how we think they succeed today and will succeed in the future with this aspiration. Unfortunately we have not been able to try out these products and are merely discussing what we have read about them verses the experience we have of other paper and digital artifacts.

Digital paper

The companies Xerox and E-ink are separately developing two kinds of digital paper for showing and writing information on, but they are developed with different techniques.

Xerox is developing a product called “Gyricon”\(^\text{36}\), which consists of tiny two-colored plastic balls, which are electronically charged. When writing on the Gyricon the balls are exposed to positive or negative electronic charge, which will make them show either the white or the colored size.

The E-ink product\(^\text{37}\) consists of transparent hollow microscopic balls, which are filled with special blue ink and white particles with an electronic charge. Just as with Gyricon the balls are exposed to positive or negative electronic charge, which will make the white particles either move to the front or the back of the balls when loading information to it.

Gyricon is described to not feel like ordinary paper, but it still has the flexibility and pliability as ordinary paper. However, we believe that the feeling of the Gyricon can possibly affect the usability, with which we here mean is the simplicity to write on the material. The glossy surface the Gyricon appears to have might make the pen slip away when writing, but even if it does we could maybe by some minor adjustments in our handwriting get used to this fact.

The digital paper is estimated by Xerox\(^\text{38}\) to be more expensive than regular paper, but on the other hand it will last a lot longer and the material is reusable i.e. the information on it can be changed over and over again.

An advantage with the digital paper is that it in the future will be shaped as books and newspapers to be browsed in, which we during our studies have seen to be a desired property as in these objects of paper. A digital quality is also being used in the perspective of being able to choose which information to load on it. Unfortunately we have not been able to find out how or if information can be saved on it or transferred from it to other digital objects, but we assume that it should be possible.

The digital paper is also meant to be flexible in terms of being able to read it from different positions and contrasts like in the sunlight without using any electricity. It is also just like regular paper light, thin and flexible.

\(^\text{36}\) http://mikrodatorn.idg.se/guides/md0010/teknik 2001-05-09
\(^\text{37}\) http://mikrodatorn.idg.se/guides/md0010/teknik 2001-05-09
\(^\text{38}\) http://mikrodatorn.idg.se/guides/md0010/teknik 2001-05-09
The paper is now only made in one color and when written can only change to one other color, which makes the mediating prospects less than with regular paper. But the developers are trying to find way to create other colors for the text.

**Anoto pattern and digital pen**

_The Anoto input device is just a piece of ordinary paper on which proprietary pattern has been printed. For the eye this pattern is perceived as a slightly off-white color._

The pattern described in the quote is called Anoto pattern and consists of small dots, which are illuminated by infrared light making them visible for only the camera in the digital pen. The Anoto pattern and pen are mutually dependent on each other, since only the lines of pens can catch the properties of the pattern and without the pattern the pen is just a regular ballpoint pen.

The pen’s camera catches digital snapshots at a rate of 100 per second of the pattern. The exact position in the proprietary pattern is calculated by the image processor, which while processing images also compares snapshots and gather and store information about how the pen is held. The memory stores the information loaded from the image processor and can store several fully written pages. When a message has been written and completed a mark in the Magic box will trigger the pen to establish contact with your computer or handheld device with the Bluetooth transceiver to transmit the information stored in the memory either directly to your computer or via a relay device, like handheld devices. A Magic box is a pre printed square assigned for the above purpose.

The pen looks and feel likes a regular ballpoint pen and like them also has an ink cartridge. Writing with the pen you should be able to see what you write, which is the reason for the pen having ordinary ink.

The pattern and the pen can be used for sending emails, faxes, SMS, transferring information to yourself, other people and organisations etc. from an ordinary piece of paper. For an example it should be possible to in an advert directly order some of the advertised products. Together with some companies like Filofax end Esselte, Anoto is going to develop a digital calendar with the Anoto functionality. This calendar will be on the market next year.

We believe this to be the most useable products of those we mention in this chapter. The reason for our opinion is that the Anoto pattern and pen supports most of the good qualities of paper and still makes it possible to transfer the information to a digital artifact, where we can use this material’s advantages, without compromising the advantages of both materials. Giving a future scenario it would still be possible to write something to remember on a post-it note and use it as visual reminder along with being able to transfer this information to the

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reminder program on the handheld computer in order to also get a sound reminder. In this way we would have the ideal reminder according to our interpretation of Norman’s words:

The ideal reminder has to have both components: the signal that something is to be remembered, the message of what it is.41

The Anoto concept also support the need for having paper of different size and shape we have experienced in our study, since the Anoto pattern can be printed on almost any paper independent of the size and shape of the paper.

However, there are some disadvantages with these products. One reason being that you still has to print the Anoto pattern on the piece of paper and which means that you cannot use any paper lying around, but if in the future, the Anoto pattern would be printed on all paper this of course would not be a dilemma. Another disadvantage is that you have to have access to a relay device or your computer to transfer the information stored in the Anoto pen.

C-pen

C-pen 80042 is a product that looks like a large pen, but have another field of application. You cannot as with an ordinary pen print text on a piece of paper, but instead you can scan of text with the pen. You could say that the C-pen is a smart handhold scanner, since it has several other applications. It is possible to scan of the text and save it as a file on the pen or directly send it to the place where you want it in the text. It does not only have to be a string of text, but also an address, a phone number and an e-mail address to put or look up in the address book of your computer, given that it can work together with Microsoft Outlook. With the pen you can also write, but without seeing what you write, it is the movement, which the pen recognizes as numbers or letters.

This product has a lot of potential, but right now it is not our most favored product. One reason is that the pen is too large and ungainly, which makes it less mobile than we think it should be and also makes it harder to write with. It is great that you can transfer already written text to wherever you want in digital documents and also write new text, but if you would like to write text on paper as well as in digital form in one step it runs into problem. To have information both on paper and in digital is something we feel we have experienced the desire for in our studies, since we believe that paper and digital artifacts both have qualities to take advantage of. With the C-pen you first have to write the text with an ordinary pen on paper to then scan of the text and transfer it. We like the fact that you can scan off any paper available, which supports the advantage with paper being available in many different sizes and shapes. For brief notes this pen could work well, but for longer notes it will probably create a “C-pen arm”, but we do believe that it is meant for only brief notes. We think this could be a great product

42 http://www.cpen.com 2001-05-23
to help to synchronize the paper calendar with the digital calendar, but unfortunately it does not work the other way around.

Adobe Acrobat Capture
Adobe Acrobat Capture is a program that together with a scanner can transform paper documents to searchable PDF-files and also be able to add comments in the file. When these digital documents are stored in PDF-format they will be independent of the operating system and you will also be able to distribute the document to others.

We believe that this can be a good way to easily distribute documents that originally are in paper format. In some way this can also support a continuing use of paper. When you later store them as digital documents you can take advantage of the qualities of digital objects. However we do not think this tool have a future in the area of taking brief notes and scheduling since it does not offer support for these kinds of activities. For an example it demands that you always have to take your notes to the scanner to store on digital artifacts and you cannot update a schedule.

Placeless documents
This is a project going on at Xerox Parc and the objective of the project is to find unifying model for organizing and manipulating their information i.e. “Placeless Documents”. According to participants in this project documents are today sorted and managed by location and with Placeless Documents they are instead being sorted after their properties.

Document properties can be things you already know about your documents, like that they’re published, or notes, or about the budget, or drafts, or source code, or important, or shared with your colleagues, or from manager, or big, or from the web, or... whatever suits you. Document properties can also be things that you want to be true about your documents, like that they are backed up, or replicated on your laptop, or can be purchased for a small fee.

The point of organizing and managing after properties is that you will be able to find documents in many different places, you will not have to put it in strictly one folder like you do in the now present filing systems. This means that one document could for an example be found under three “properties”, like drafts shared with colleagues and update every week. It should also be possible for the properties to automatically update the same document in another device, or every time you change a document make a new updated backup, or send a copy of the documents to a colleague every week.

The organizing and managing of documents should concern documents from many sources like storing places like WWW, mail, file
systems, and devices like scanners, video-cameras, television, phone and dynamic processes like workflow, search engines, source code management systems.

When reading about this project it does not seem to be all clear how this will be done, but we think the idea is a step in the right direction, which at least will accomplish an interaction between different kinds of information as requested by our informants during the workshop. This could perhaps also be used in our own design of an organizer. Unfortunately they do not say anything about how they should handle paper documents, which they seem to see the importance of organizing with digital documents.
Concluding reflections

When designing something for taking brief notes and scheduling it is important to be aware of the disadvantages and the advantages of both paper and digital artifacts to not remove the qualities while designing something to remove the shortcomings. Since both of the materials are of relevance when taking brief notes and scheduling their properties are important to discuss in this report.

Even if a lot in our society today is computerized the availability of paper is still larger, which makes paper more accessible for taking notes on than digital objects. However, on digital artifacts the information is more accessible since you can reach it from other places than where the storage place physically is located. Digital information intangibility makes it possible to create a design, which will be specific for specific persons and situations. The intangibility can also be a disadvantage since you cannot see the action made to it and invisible objects cannot be visual reminders of things to do as paper notes can. Different shapes, sizes and positions of physical reminders can mediate what should be recollected to do.

Different shapes and sizes also make artifacts suited for different situations and fields of applications. The size is also conclusive to the mobility of the artifact and the information on it. Digital information never becomes larger than the artifact carrying it and in fact it can be non-existing since you sometimes do not need to physically carry it with you to get access to it, like from a location where all the information is stored and has unlimited accessibility. A piece of paper on the other hand increases in size when the amount of paper is increased. Paper artifacts can change size and shape, which today’s digital artifacts cannot, but we think a mobile digital artifact with a screen, which can easily change size, would be the invention of the future.

Digital information is easy to edit since you do not have to rewrite the information being edited like you do with information on papers. Copy and paste is a function on digital artifacts that makes the editing easier, which can be needed since it is quite hard and time consuming to write on them, because of their unnatural and unfamiliar ways of input.

There are several new products, developed or in process of being developed, which support the collaboration between paper and digital objects. Some of them are trying to replace and imitate paper and its properties and others supporting and taking advantage of the properties of paper. The new products supporting paper and its qualities are the ones, according to us, so far most successful. We believe that both paper and digital objects has properties that should be seen for their worth. We state that it today is not possible to substitute paper artifacts with any computer artifact since paper has valuable properties that are irreplaceable. Instead we believe in artifacts that support the collaboration of paper and digital artifacts since we think they are best complimenting each other.
Part 3: The Digital Interactive Organizer
Part 3: The Digital Interactive Organizer

When we started our work with the bachelor thesis we did not know if our effort would be a concrete design visualized in a mock-up or prototype, or if it only should be proposals to a design. Findings from our work are what finally lead us to this design, presented in this part.
Design description

In this chapter there will be an overview of the design describing the surrounded functions around the Digital Interactive Organizer visualized in our mock-up and we will thoroughly discuss our design decisions and how our design works. We want to illustrate how we used the ethnographical material for the design of our mock-up by pointing out the connection between the design decisions and the findings. We will moreover describe discoveries from our field studies that we do not think this design can support and the reason for it.

Design overview

Our mock-up is made in the application Microsoft PowerPoint and is visualizing a part of our organizer, which is the calendar and its functions. It has the form of a handheld computer with two screens and it is also a mobile phone. Handheld computers and mobile phones are believed to be integrated in the future. This integration already exists on the market today but only in a small amount. We have seen the need for this integration in our own use of our mobile computer artifacts. The reason is partly that the handheld computer cannot load down information without the help of a mobile phone or a stationary computer, which in fact does not make it very mobile. The mobile phone has very lengthy routines around taking notes and the interface of it is not suited for surfing on the Internet or reading documents, and these problems do not exist in that extent on a handheld computer.

Our thought with the organizer is to store the information in a global place and not on the handheld computer, since it offers unlimited storage of information and also gives the possibility to access the information from different devices without needing to synchronize them. The need for one large storage place of information, like this have during our study been visible to us. For an example it would facilitate the access to all your information without being forced to remember to bring the information with you. We have seen how people write down small notes or bring floppy disks to carry the information with them. One problem with access to all information will not be solved by merely this solution since we still get information in paper format and these will not be stored in the same place as the digital information. Although, looking at the progress of today’s technology we might have digital paper all around us, leading to the disappearing of this dilemma.

Our idea is about the Interactive Organizer being a part of a concept, consisting of the organizer and a pen. The pen would look like an ordinary pen with normal ink, so you will be able to see what you have written. When writing, the hand movement would be interpreted into letters by the pen, like with the C-pen which would make you able to write on any paper artifact. When finished the note you can choose to save the words written temporary on the pen to later be able to transfer them by the Bluetooth transceiver, like the Anoto pen, to the global storage place via the organizer or another computer with access to the Internet.
The difference between our organizer and the ones we have seen is that the different parts, like the calendar and the address book, in our organizer interact with each other in a much more increased way, which we think would be a simple solution to some organizing problems.

A close related occurrence to preliminary meetings is, what we call, “loose meetings” or “loose appointments”, which indicates that a fixed time cannot be decided. One might say: “Let’s meet some time during the afternoon”. During the observations with the vice principal we could see that there was a lot of informal appointments that were decided in the corridors or in the cafeteria and these appointments were often of the loose kind. Extract from our observation notes:

Medan vi står där kommer en kollega till honom (Jan) som vill träffa honom senare under dagen (Björn har ingen kalender med sig). Ingen precis tid kunde bestämmas för Jan visste inte riktigt när han kunde förutom att det var tvunget att bli före lunch.

(While we are standing there a colleague of his (Jan) comes by and says that he wants to meet with him later during the day (Björn does not have his paper calendar with him). No precisely time could be settled because Jan did not know when he was available, just that it would have to be before lunch)- Our own translation

These kinds of appointments are something that our design does not handle. The nature of these events is very hard to capture and we do not think that it always is necessary, since they usually are not as important as the fixed events. In the scenario above the appointment were not especially far away in the future, which we believe loose appointments seldom are and it does not make it hard to remember. Since the involved people were located close to each other it would not be hard to pass by the other person’s room if one would forget.
In the following pieces there will be descriptions of the functions in our mock-up and they are divided into two categories: “Interactions possibilities” and “Design features”.

**Interaction possibilities**

When it was time to make a concrete design, we decided to do an organizer with interactive parts. Calendar, address book, telephone, mail and documents would work interactively. You might ask why this should be so desirable and what issue would it solve? In the following pieces we will try to describe this along with a description on how this interaction would work.

**Appointments**

An appointment is something time restricted that you add to your calendar to remember. The time restriction is also the reason for us having a reminder function connected to the appointments. The thought is that this reminder function should have a sound, which will mediate what kind of appointment it is by a sound connected to this kind of category appointment. The reminder is supposed to be heard from both the organizer and the pen. The reason for having a reminder in the pen is that when choosing to only bring the pen with you, you will still be able to be reminded.

A part of the integration means that you easily should be able to add contacts and documents to every meeting and use them in this context.

“Contacts” in the calendar are people or companies that are connected to a specific appointment, which you might want to reach. If there are contacts related to an appointment this symbol will be shown after the appointment text. By merely a fast click on the symbol the contacts with mail and telephone number will be shown in the passive screen (the one not being used at the moment).

These contacts are added to the specific appointment while adding it or also by choosing to edit one. How it is done is not shown in our design, but the thought is that you only write the name and the address book will then automatically look up that specific contact in the address book. If the contact do not exist in the address book it should at that moment be possible to add it as a new contact.

To call up a contact, for an example Eric Ericsson, you will only have to click with the pen on the phone number and to send an email will function likewise. A future scenario when adding an appointment and later calling the person you have set up the appointment with, could be:
Mary is calling her physician to make a doctors appointment. She is writing down the subject “doctors appointment” and also the name of the physician “Eric Ericsson”. When writing down the physician’s name the organizer would automatically attach Eric’s name and phone number to the appointment since Mary already have him in her address book. She chooses the date and time for the appointment and then she presses the ok-symbol when she is done with writing the appointment and wants it to be added in the calendar. At Monday, the same week as the appointment, she looks in her calendar and sees the appointment with the physician and gets reminded of that she has to call him to ask about a medicine. She is entering her calendar and chooses “Today” which will show the day with all the meetings. She clicks on the “doctors appointment” on the left side screen and the physician’s name and phone number will show up on the right side screen. Now she clicks on the phone number and the number is being dialed.

If we go back to where Mary wrote the name on the physician and imagine that the physician is not already added in her address book, which it were in the scenario above, this one could look like this:

Mary writes, “Eric Ericsson” in the calendar and it pops up a question that asks if she wants to add the person to her address book. She chooses yes and the address book is shown and she starts entering the information about the physician. When she is finished, the view where she were before, which are the view for entering an appointment, turns up.

“Documents” stands for documents connected to an appointment, which appears with the symbol 📝 after the related appointment in the view of a week. The document can either be a document from your personal file or a post-it note look-alike with something to remember for the meeting. By a fast click on the symbol the passive side of the interface shows these documents. To open the documents chosen from your file you just click on the documents name.

These documents are attached when an appointment is being added or also by choosing to edit one. How it is done is not shown in our design, but the thought is that you should be able to browse and look among all the files of your information database and choose the files to add.
The reason for having contacts and documents in the calendar is to have all information in the same place to get organized for every appointment. To have something to remember for the appointment on the post-it look-alike means that it will be right were you need it, just like a regularly post-it being a physical reminder. The medical consultant had lots of different notes in her calendar, this to have all information at the same place and without it getting messy, which is what we also are trying to accomplish, but for us it is also important that it is without being forced to go through many different views. With some computer artifacts you can be forced to go through many steps before coming to the view you need, which makes it time ineffective.

When making appointments and adding contacts and documents we are aware that it will take some extra time, but the adding of contacts and documents can be done after setting the appointment. We also think you will save some time before appointments not having to look up phone number and documents, which will make your work more organized.

Moving of meetings and appointments

In our study and by own experience, we have noticed that changing of appointments and meetings are something that occurs frequently. The medical consultant has a secretary of reservations and she often calls him on her mobile phone in the car while being on the road. In the visual storybook she describes how she calls the secretary of reservations to tell him about an appointment she has made with a physician, this so he can enter the appointment in the scheme on the computer. At the same occasion they decide to try to change a reservation with a doctor, because they could see that the rest of the appointments that day were at a totally different location.

Preliminary bookings of meetings can be another reason for wanting to move appointments. We have not observed these kinds of bookings but we have talked about it with our informants and found out that it is not a rare occurrence. You might want to meet with a person and the two of you decide a time but it all depends on if you have had the time to finish a certain task, so you might have to get together on a later occasion.

In paper calendars it does not take much time to move a meeting if the notes are short, but there are some disadvantages. The calendar can become messy and it is not without effort you have to rearrange the notes in your calendar, which is a disadvantage with using paper and pen. Editing, in the sense of the simplicity of being able to move data, is one advantage with the digital, which we wanted to take advantage of in our design. There are calendars for stationary computers and laptops that support this feature today like the drag and drop function. We cannot use these methods in our design, since we are working under different conditions, for an example the smaller size on the screen and no possibility to use a mouse will put some restrictions to our work.

When you want to move a meeting or appointment in our Calendar you will easily be able to move everything connected to the meeting with some few clicks. When you click with the pen on an appointment, no matter in what view (the weekly or the daily), there will be a choice on the menu that will say, “Change
time”. When you have made that choice, a view of the week will occur on the passive screen. You will easily be able to choose another week by clicking on an arrow that points forward. The view will show the days and the time in the week, like a diagram. The days will lay horizontal on top of the screen and the time will lay vertical on the left side of the screen. To move the meeting you click on the time and day you want to move the meeting to and after confirming the meeting all information will be moved.

We will take the above story about the medical consultant, Camilla, calling the secretary of reservations to make a future scenario of how to move an appointment in our calendar. The secretary of reservations calls Camilla back and tells her that the appointment with the client has been changed to Wednesday the week after the original scheduled one. This is how it could look like when she reschedules the appointment:

Camilla enters the calendar and gets the weekly view. She finds the appointment and presses the pen for some few seconds on the head of the appointment. A small window pops up asking, among some other things, if she wants to move the appointment. She presses the yes square and a weekly overview shows up on the passive side of the screen, which is the right one since the meeting is located on the left side. The weekly overview looks like the above description. She clicks on Wednesday 9.00 am to where the appointment is rescheduled. There will be a confirming message asking if she wants to move the meeting from Thursday the 29th of April 10.00 am to Wednesday the 4th of April 9.00. She chooses yes.

Another advantage that the digital material offers is the possibility to tell the calendar if it is a recurring meeting, which means you only have to write it down once. This is something that already exists in today’s digital calendars and also in ours. The people with handheld computers we have talked to, told us about this as a truly good possibility. This prospect is something that is not possible with a paper calendar.

**Browsing through**

In our research study we have found that with a paper calendar you can easily find or browse between days and weeks, which is considered to be a great advantage. This is not something that is easily done in a digital calendar. But one thing we think can facilitate the orientation in a digital calendar is a back and forward function that works like the same one in a web browser. To use a web browser is something that most of us have grown accustomed to and we believe that when adding new features it is an advantage to use already existing metaphors.

If you for an example, are looking on the schedule for the following week in the calendar and a colleague calls you asking if you can help him with a presentation in three weeks, which will make you change view for the week in question. When you are done you will easily be able to go back and finish what you started by just pressing the arrow button pointing to the left.

This is a feature that we have not seen in other calendar on handheld computers. The browsing that exists today consists of going back and forward
between weeks and days but not between the resent visit view and the one standing in, at the moment.

Design features
In this chapter we will describe features of our design that are not directly connected to the interaction and the integration in our design, but were included in the design since we in our studies have seen the necessity of them.

Free choice of views
To be able to choose different views makes it possible for the user to adjust the organizer after his/her situation and needs. We have chosen to include three period views of five in our mockup: one for showing the whole week, one for showing a day and one for showing today. The difference between the “Today” view and the “Day” view is that the Today view only shows a list of appointments in time order while the Day view shows a line for every hour in the right screen. By choosing Today in the menu only the day, which presently is today, will be shown, so you can easily see the daily appointments of today. The day view makes it easier to add appointments, since you can click on the line for the stroke of the clock you had in mind.

By pressing the pen against the date located in the menu on the right screen, a menu where you are able to choose what period view you want to show. The choice Day is not included in the menu, since you with a pen cannot click on two places at the time, which makes it hard to know what day you would like to see. This will be explained further in the following scenario.
The period view week is shown and Harry wants to look further on what he is doing on Wednesday this week. In this design it is possible to choose day in the menu, but since Harry can not press on Wednesday at the same time as he chooses “Day” in the menu first day that week shows up and he has to browse to Wednesday.

Clicking on the specific day and date can instead show the day view, which we also feel is more natural since the day is visible all the time in the calendar and the menu is not.

Appointments for both spare time and work mixed are visible in the view “Integrated”, only work appointments in the view “Work” and only spare time activities in “Spare time” view. Next to the word Calendar the name of the activity view, used at the moment, will be visible in the menu in the left screen and by pressing the pen against that activity name a menu will show up where you can choose what activity view you want to see.

Melanie is at work and knows that if she has a personal appointment during work hours she sets the reminder to give her a signal when it is time, so while being at work she doesn’t have to worry about it. While being at work she wants to concentrate on work activities and her schedule should only show work related appointments. She clicks on “Integrated” in the left menu in the calendar and chooses “Work”. Now she only sees appointments categorized as Work.

For the view of the week we have two alternative views, which are “the single view” and “the double view”. The single view will show the whole week, without the symbols for contacts, documents and to dos, in the left screen and the to do-list in the right screen. The reason for this view is that some informants told us that they like to see the to do-list and schedule at the same time to be able to see when there is time to perform the tasks listed in the to do-list. The double view will show the week in both of the screens with all the symbols. The advantages with this view is that it gives a better overview over events of the week and it immediately mediates if there are contacts and documents connected to one appointment and to dos connected to the specific days.

John always has a lot of things to do, but they are not often time fixed. It is more important for him to keep track of what he has to do than seeing if he has documents connected to a meeting, which he rather look at when checking at a specific day. This is why he has made the choice to have the single-view and week view as the default.

With these different views we have tried to give the users possibilities to choose a view, which will fit their way of working with a calendar. They can decide themselves which views to be their default views, which means the views that automatically show up when you start up the calendar. You can also choose to have the setting, which will show the views you used the last time in the calendar the next time you use it. An advantage with digital artifacts compared to paper is in fact that you can choose your own settings if the design has these potentials.
To do

“To do” is a list over tasks to do, which can be date defined and some without date restrictions, since we in our studies have seen that both do exist.

Those that are date restricted will only appear on the day they are restricted to with the symbol “To do” on the double view for the week. If you click on the To do-symbol the list of the tasks will appear on the side of the interface, which do not show the chosen day and only with the list of the certain day’s to do. We have during our own use of a handheld computer noticed that it can be disturbing if the to do-list will take the calendars place and make it invisible, which will make it hard to keep track of what appointments you have during that day. On the single view you click on the day, which also is possible from the double view, and the day will appear with the to do-list on the right side of the interface.

On the right side of the interface, on the double view, a menu, like this is placed and if you click on it, the single view will appear in which the general to do-list is shown in the right side of the interface. To go back to the double view, you either choose the back arrow or go to the menu and choose the double view. The general to do-list will have the today’s to do’s first, which also will be marked by a star like this * instead of a dot. The to dos are also sorted after relation to work or spare time, which will make easier to separate these two, which we both have seen a need for in our studies and have been expressed by our informants. Our informants has told us that they want to be able to see the whole week and the to do-list at the same time, so they can check where they would have the time perform the things written in the to do-list.

To show a to do-object as performed you simply press the handheld computer pen against the object and a menu comes up with the choice “put it as performed”. When this choice is made the object will be removed or get a lighter color to first be removed the day after, depending on what settings you have. The second setting is there to give people feedback on what they have got done, which we have seen as a desirable affordance with paper piles.

On Monday Tom looks in his calendar, in which he has the single view as a default, to plan how to structure the duties and appointments of the week. The first duty in the to do list says: Call mom, it is her birthday and is marked with a star, which he knows is a duty to be done this day. He immediately calls her up by pressing her name on the list with the pen, since the duty says call mom. He talks to her for a while and during that time presses the pen on the duty until a menu pops up where he chooses “Put as performed”, which makes the color of the duty fade in color since he has chosen this setting for the reason that he wants to be able to see what he has accomplished during the day.

It is really hard to know how to show to dos, for some people it can be stressing to see everything you have to do, for others it is pleasing to be able to get both the calendar and the to do- overview. This is one reason for why we have made two views one with the overview and one where the do-list is hidden.
Preparations

Preparations signify preparations that should be made before an appointment, which has been written down in the calendar. This was made since we know that people usually do not look at the appointment before the day of the appointment and because of this sometimes forgets to make the preparations that should have been made. For an example, one of our informants once booked a meeting with another person and it was decided that our informant was to reserve a room for it, but first on the day of the meeting was reminded about this task by the other person.

The preparations are in our calendar symbolized by this clock, which changes to this when it is more pressing and to this when you are really in a hurry to do the preparation. This is to make the preparation and its priority visible at the first glance since this clock will be perceptible in the calendar all the time there are preparations to be done. We also think the clock is a great symbol for preparations since it for us often symbolize that our time is ticking away.

The thought is that when you add an appointment you should be able to choose how much time before the appointment you should start preparing and when you have to have it done. Then the calendar should automatically change between the different colored clocks after priority. When you have many preparations for the same day there should still be only one clock showing and it should have the color of the most prioritized preparation/s.

Eve is adding a presentation of a product, which the company she works for has developed, to the calendar. She knows she needs to make preparations before the meeting, like writing presentation materials and notifying people, who has announced an interest for the product. Two weeks, she estimates that they will take, which she writes when adding the information. Four weeks later it is only two weeks until the presentation and the clock shows up in the space of every day, which makes it possible for her to see when it is really emergently pressing.
Concluding reflections

The idea with our Digital Interactive Organizer is that the different parts of the organizer should interact as one to help structure notes and schedules. We have seen the need for an organizer like this, but do not know of any existing ones for mobile computer artifacts. Our design is not only the mockup, but also the ideas around its functions like the belonging pen, global storage and it being an integrated handheld computer and mobile phone.

The calendar with digital paper, based on the Anoto concept, we consider is state of the art today. The calendar with digital paper is being developed at the moment and will be released in the beginning of the year 2002. The main difference between the calendar with digital paper and our Digital Interactive Organizer is that the calendar with digital paper will not have the different parts interacting as our has, but it will be possible to send emails, via a relay device, from the calendar. It also lacks some of the qualities offered by digital artifacts, like sound reminders and free choice of views.

With our pen it is possible to write the information anywhere, but with the Anoto pen you can only write on Anoto patterned paper to be able to transfer the information to a digital artifact. With the Anoto calendar it is possible to transfer information from the calendar to a computer artifact, but not the other way around. When writing directly in the calendar the Anoto creation offers the same ease of writing as with a regular pen and paper. When our organizer breaks down you are not able to see the information in our Calendar, which you can in the Anoto one, since the information is physically there. The Anoto calendar offers the possibility to browse between pages as in a regular paper calendar, which our informants told us was an advantage with paper calendars.

In our design we have tried to take advantage of some qualities of paper and support others, which we believe are not available in other digital calendars today, except perhaps the calendar with digital paper, like the visible reminders of preparations and the ability to write information on pieces of paper available to update the information in the calendar.
Conclusive summary
Conclusive summary

Taking mobile computer artifacts and information handling as a starting point in our work we chose methods, which would give us a deeper understanding of how mobile computer artifacts are being used and how information is integrated in the lives of current people. We were introduced to the world of mobile computer artifacts by looking into this area and the techniques used. To get knowledge of whom the users of WAP-phones and handheld computers were and how the information followed people around in their daily lives we had interviews and later observed some selected persons from this perspective. The reason for the observations was to get insight in how people handle their daily information and from the insight be able to find interests to narrow down our focus on. What we found interesting was that our informants used many different paper artifacts and that they also wrote down notes and stored the information in many different places and because of this our focus became how mobile computer artifacts can support organizing of brief notes and schedules. For some more detailed information on how notes are taken, schedules are made and the artifacts they used for it, we used the more selective method, “Visual storybooks”. Choosing a careful approach from ethnography to design, we were able to put ideas and experience in a design context with dialogues around scenarios, which were meant to give us knowledge of how design affects the choice of artifacts in different situations when taking brief notes and scheduling and why. To develop discoveries into design ideas, we chose to have a “Future Workshop”, which resulted in more ideas than we could implement. We chose the Digital Interactive Organizer since we believed it was an easy solution to some reoccurring difficulties to organize brief notes and schedules, which we then visualized in a mock-up.

In our study we have seen that brief notes can be information like phone numbers, addresses, names, appointments and to dos. When taking brief notes or scheduling our informants use many different artifacts, both paper and digital, but when the brief notes are made in an instance, which they often are, the most used ones are paper artifacts of different kinds, like small pieces of paper, post-it notes, notepads, envelopes or advertising paper, in fact whatever is in hand. We believe this occurrence are a result of the accessibility of paper, almost at all times there seems to be some kind of paper artifact nearby. Paper artifacts are also preferred when notes need to be written down rapidly since paper offers a quicker technique to enter notes than mobile computer artifacts and they are also preferred for visual reminders, which can be placed on tactical locations to remind of what should be done.

The visual reminders work well as long as they are noticeable. If another piece of paper is placed above the note or if the note is put in a pocket of the pants or jacket, the paper note is not visible and it cannot be a signal for a task, which then will not exist in the person’s mind.

Those of our informants that possess a mobile digital artifact, mostly use and prefer this artifact when writing down appointments with fixed times and to store information, which are believed to be needed many times or at least more than once. The reason is that it offers possibilities, like sound reminders and the ease to
edit the information and it offers the possibility to store a large amount of information without having the calendar increased physically, which makes it possible to store a lot of information in it, without restrict the mobility.

We have seen that some of our informants are daily using their calendar and are thereby almost always brings it along. These persons are using their calendar for a gathering place where all sorts of brief notes and schedule are being entered.

When our informants schedule their own time or others, they uses different artifacts depending on the design i.e. the possibilities the artifact offers. If needing an overview some use a paper calendar, which offers overview and when needing to store rather much information for every appointment they might use a calendar that offers one day per page or a note book with almost unlimited space for taking notes, all to support the character of their need.

Some organizing problems that our informants experience are the occurrence of having the same kind of information stored in different places, like on their mobile phone, handheld computer and on paper. This can cause confusion when needing to look at diverse places and it is frustrating when just bringing the mobile phone and discovering that the phone number needed for the moment are not stored in the mobile phone but probably in the hand held computer.

Since paper originally was the material used for taking brief notes and scheduling and still in many ways are, to make a digital artifact to either support or replace the paper artifacts of these kinds we first have to look at the properties of paper in context to the properties of digital objects to decide what to take advantage of in the design of our Digital Interactive Organizer. We wanted to support paper in some ways and replace it in other ways.

The large availability of different paper artifacts and the fact that people seemed to use them by choice for taking brief notes and scheduling is something we want to support, since we believe that there for a long time will be nothing to replace the availability of pieces of paper and we do not have a clue to what it should be. We support this occurrence by making a pen for writing down notes, which at the same time stores and transfers the information being written, which also supports the collaboration between the paper and digital artifacts. We have seen that collaboration between the two kinds of artifacts is a part of almost all actions associated with scheduling and taking brief notes and it seems like they facilitate each other even if there are some problems to solve like synchronizing the artifacts between them. This problem is solved by having all information stored in one place and by automatically synchronizing every time something is changed in any device and with the pen information on paper notes updates the information in the storing place. Storing and organizing information is also easier if having the information available in one application, which we take advantage of as a main property of the organizer. If all the stored information interacts it is also easier to find the documents you are looking for. Some visual reminders are also put in the calendar copying this property of paper in a way, which we hope will be satisfying and visual, without being annoying.

When looking at the qualities of paper we have tried to see which could be replaceable by digital artifacts and which that where irreplaceable, to imitate the
replaceable in the digital organizer and to support the irreplaceable. We think the “Digital Interactive Organizer” could be a support for our informants to structure their notes and schedules.

If we would have had more time for this project we would have developed the design of the imagined pen connected to our Digital Interactive Organizer as well as how the information should be stored and what it should look like in a global storage location.
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