This chapter *exposes* Cabinet to the *roughness* of the *real world*. By *setting out* the Cabinet for *a month* at *three design firms,* our main research questions are *addressed* in *practice*: how do designers interact with their collections of visual material, and how can new media tools support this?

This chapter is submitted to Design Studies. It explains the *methods*, *procedure* and *results* of a six month *experiment*. In this experiment our previous *expectations* were *validated* and other *effects* of Cabinet *observed*, resulting in *interesting* and sometimes *surprising* results.

We look from a *participatory design perspective* using our *prototype* to retake our results from practice and theory. From a *usability perspective* we critically *test* and *evaluate* the prototype in practice.

The first two sections *re-introduce* many of the subjects covered in the previous chapters. All of these serve as *ingredients*, *expectations* and *focus points* for the experiment.

This work was done in the first half of 2004 and resulted in coming *full circle* in this thesis.

ABSTRACT

This chapter presents an experiment conducted with a working prototype in the design practice. The working prototype, called Cabinet, supports designers in collecting visual material that they can use as a source of inspiration in their design process. Cabinet was set out at three different design agencies over a period of four weeks. From these agencies, one designer was asked to use it at their own initiative for their own current design practice. The goal of this experiment was to both evaluate the prototype and to find out what effect a new tool can have on the designers' collecting behaviour.

Though all three participating designers used Cabinet very differently, the prototype was able to withstand the test of three months in the field. The overall evaluation of Cabinet was positive with some valuable suggestions to the prototype's behaviour and functionality. The intervention led to changes in the designers' attitude towards their collecting behaviour, especially the role of physical and digital material in their work process. One surprising effect of Cabinet was that all the designers used it to both collect their source material and their design solutions in one collection.

This chapter is largely based on: **Keller, A.I., Sleeswijk Visser, F., Lugt, R. van der, & Stappers, P.J.** (submitted) Collecting with Cabinet: Or how designers collect visual material, researched through an experiential prototype. *Design Studies.*

6.1   Introduction

Designers intensively use a variety of visual material (McKim, 1980). In the last decade the computer has become an important and powerful tool for designers, streamlining many aspects of their work. Still, computer tools have been found to have shortcomings in supporting creative tasks (Goel, 1995; Kolli *et al.*, 1993). A provoking quote by Pablo Picasso – *"Computers are useless, they only give you answers"* – sums up the biggest problem in computers in creative use.

This same problem of computers in creative use can be found in how designers use existing material for inspiration and reference. In chapter 4 we saw that designers currently keep and maintain two separate collections of visual material: a physical collection of magazines, photos and objects and a set of digital images on their computers, CD-ROMs and the Internet. These two collections don't come together in the design process.

Cabinet is a collecting tool that bridges the divide between the digital and physical world. Cabinet does this on the one hand by easy scanning of physical material and on the other hand by offering a very tangible, visual interaction with digital images.

In this chapter a working prototype of Cabinet is set out in practice in three longitudinal trials. In this study we want to evaluate Cabinet as a tool in practice. By evaluating Cabinet we also evaluate what we found before in theory and practice. Cabinet combines our findings from theory in chapter 2 and practice in chapter 4 into a working prototype.

6.2   Background

First we briefly sum up the most important aspects from theory and practice in this research. In the remainder of this section they serve as the expectations for the experiment. In the last section we present the Cabinet prototype, which is used as our apparatus in the experiment.

6.2.1   Collecting for creativity

Creative processes make intensive use of *juggling with existing elements*. For example, try to create, as a creative exercise, a group of things to take on a trip. The result of this exercise is a goal-derived category (Barsalou, 1991). It consists of things taken from closets and possibly from a list, but it also contains things that may not be there and have to be bought or even invented. New ideas often derive from these kind of goal-derived categories.

Pasman further elaborated on organizing collections of visual material by designers as a creative activity (Pasman, 2003). In his research he found that organizing visual material resulted in making new designs that went beyond existing categories.

Finding 1. Collecting is an **ongoing activity**. The cuttings in this collection are gathered over time and collections are browsed rather than approached with a query for a factual question.

Finding 2. Designers **keep two collections** of visual materials, which never meet: a digital and a physical. The separation is exemplified by the stacks of magazines laying on the scanner but never scanned in.

Finding 3. Computer tools do not support **visual interaction**. The files in this screenshot are images gathered for collages. The display only shows the filenames and tiny thumbnails.

Finding 4. Designers organize their workplace to promote **serendipitous encounters** with earlier work. The yellow sticky notes are kept in the magazine even when they are not used afterwards.

Finding 5. Most new ideas come from **breaking the rhythm**. In computer tools, time is an underestimated design parameter and most work revolves around looking at the computer display.

Finding 6. Designers use visual material **socially** to support awareness and knowledge exchange with their colleagues. Images on computer displays do not allow for this fluent sharing.

1 The six findings form the contextual inquiry illustrated by observations from that study

Schön proposes a metaphorical thought of explaining where new ideas come from, by mapping one concept onto another, as a source of design creativity (Schön, 1963). New ideas come from extending and setting symbolic replacements where the metaphors don't fit.

The mechanisms described above rely mostly on cognitive skills, whereas designers find their creativity not only in their minds but also in the physical interaction with their tools (Candy & Edmonds, 1999; Hummels, 2000).

In the combined theory we see a strong case for collecting and organizing visual material as a creative activity for designers.

6.2.2 Collections in practice

In a contextual inquiry at five design agencies we found that designers keep and organize visual material in their workplace as a means to stimulate their creativity. The main theme of our findings relates back to the designer

2 Adding visual material to the collection with Cabinet
3 Organizing your collection with Cabinet

keeping two collections, a physical and a digital collection, each with different goals, uses and values. Figure 1 sums up the six findings that came out of this study explained more in-depth in chapter 4.

6.2.3 Cabinet

To integrate knowledge from theory and practice, a tool was developed to support the collecting activity. The six findings from figure 1 served as design criteria. In chapter 5 the prototype and its development are described in detail; a popular presentation can also be found in Delft Outlook (Van Kasteren, 2004).

Cabinet is a table-sized workbench on which a computer generated digital collection is projected. Cabinet addresses the merger of the two collections by allowing the user to add both physical and digital images to the collection. Cabinet can capture physical visual material on the table by taking a picture and leaving a digital copy projected on the surface over the original (figure 2). Cabinet addresses the physical interaction of organizing and categorizing by allowing the user to directly interact with the images in large gestures (figure 3).

Cabinet is intended to be always on, readily available for use, and providing a continuous presence of the collection of visual material in the working environment. It supports the latter by continuously and dynamically presenting images from the collection when not actively used.

Cabinet combines the advantages of working with physical collections with the advantages of new media tools, by addressing the six findings from figure 1.

1) *Active collecting* is supported by Cabinet's readily availability and the possibility to add material without prompting for structure;
2) *Merger of the physical/digital collections* is supported by smooth scanning and physical interaction;
3) *Visual interaction* is supported by taking out all verbal clues in the interface;
4) *Serendipitous encounters* are supported by the continuous and dynamic display of different images from the collection;
5) *Breaking the rhythm* for inspiration is supported by the physical scale of Cabinet, which lures the designers away from their desks;
6) The *social use* of visual material is supported by continuously presenting images in the workplace and inviting collaborative use in table-sized interaction.

During its development we used the Cabinet ourselves and extensively demonstrated it to peers from the field of research and design. The positive reactions gave us confidence in Cabinet.

6.3   Experiment

To further generalize and extend our knowledge on Cabinet and collecting behaviour we set up a long-term experiment in the design practice, embedding the prototype in the actual work practice.

6.3.1   Research objectives

The goal of the experiment was twofold. On the one hand a further evaluation of Cabinet as a tool for collecting based on our previous findings from theory and practice. On the other hand the experiment aims to explore the effects of such a tool on the designer's collecting behaviour.

These effects are explored by finding out: 1) if the collections of physical and digital material actually merge, 2) to what kind of (new) uses this leads, and 3) whether this is felt by the designers as an improvement.

Cabinet was expected to make the implicit activity of collecting more explicit. In our contextual inquiry described in chapter 4, the results of the ongoing activity of collecting were found, but not the actual process that resulted in these collections. Both the actual use of Cabinet and the designers' perception of that use could make this activity more explicit.

On the other hand, Cabinet was expected to bridge the physical and digital

divide by resulting in a collection in which the user would collect and talk about digital and physical images with the same value and use.

6.3.2 Experimental design

The experiment employs a prototype, set out over four weeks at three design firms, where it is used in real design tasks. In the structure of the experimental design, the independent variable is the presence of Cabinet in the experimental group, as opposed to a control group which did not receive the prototype.

Research in such practical settings does not benefit from purely this experimental approach, therefore we approach the results of this study as a case study research (Yin, 1984). This means that the experiment has a largely open structure, looking at the effects of Cabinet in the work practice.

6.3.3 Participants

Participants in the experiment are three designers from three well-known design companies in the Netherlands. The designers were selected by their management on the basis of their experience with finding and using imagery in the design process.
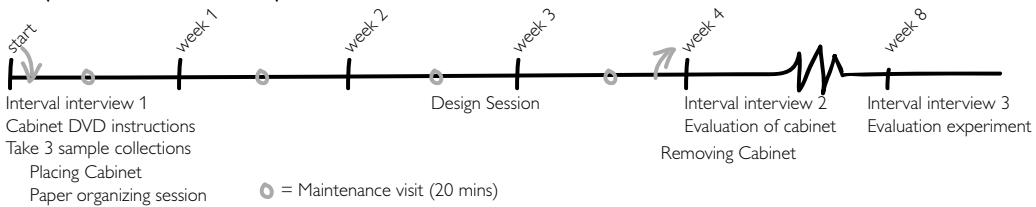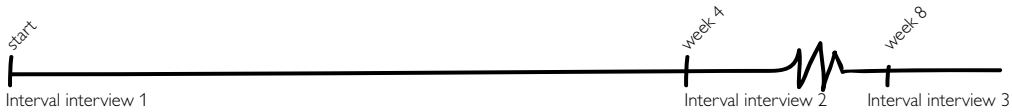
First run was from March 8 until April 2, 2004 at WAAC's, a design agency in Rotterdam with seven employees, working on product, packaging and interior design. The second run was from April 13 until May 7 at Fabrique, a design agency in Delft with over fifty employees, working on graphic, industrial and new media design. The third and final run was from May 25 until June 22 at Smool, a design agency with three employees working on concept, product and furniture design.

The control group consisted of three designers with similar backgrounds and employment. They were interviewed on their collecting behaviour parallel to the experimental group to avoid bias from external influences.

6.3.4 Procedure

Figure 4 shows the procedure that the participants went through. The participants did not see or try Cabinet before it was placed in their workplace. In a short session, they were introduced to Cabinet, and had it uninterrupted in their workplace for a four-week period. They were free to use it at any time.

At the beginning and end of this period, and four weeks afterward, they were given an *interval interview*. This interview contained specific questions on their collecting behaviour; its size, growth, usage and tools. This *interval interview* was also performed with the control group over the same period. These interviews provided a baseline measurement against which to offset the effect of Cabinet as an experiment, both over time and over the two groups.

EXPERIMENTAL GROUP

Interval interview 1
Cabinet DVD instructions
Take 3 sample collections
   Placing Cabinet
   Paper organizing session   ◐ = Maintenance visit (20 mins)

Design Session

Interval interview 2
Evaluation of cabinet
Removing Cabinet

Interval interview 3
Evaluation experiment

CONTROL GROUP

Interval interview 1   Interval interview 2   Interval interview 3

4   Timeline of the experimental procedure over a period of 8 weeks
       with an experimental and control group

Participants in the experimental group also had one interactive *design session* midway through the period, in which they were given a design task. After the Cabinet was removed, a separate researcher interviewed the participants in an evaluation interview.[1] The separate research was needed to avoid positive bias towards the researcher, who is also the developer of Cabinet and had facilitated the experiment for the last month (Nielsen, 1994).

INSTRUCTIONS
The participants in the experiment received an instructional DVD with a 7-minute movie that explained all the functionalities and features of Cabinet. They were asked to view this instruction at home or in the office before the Cabinet prototype would be placed in the studio. The DVD instruction was their first impression of Cabinet.[2]

PLACEMENT IN THE WORKPLACE
Cabinet was strategically positioned in locations in the design studios where social interaction or interaction with visual material could possibly take place (figure 4). The participants were first given a visual organizing task on paper to sensitize them to organizing visual material in general. After this, Cabinet was turned on and the participants could try out some of its features and ask questions if things were unclear. Detailed instructions were provided on the cover of a comment log book they were invited to fill in. In the instruction

[1] On http://www.forinspirationonly.net/appendix/ is a PDF of the complete outline of both interval and evaluation interview

[2] On the DVD accompanying this book the original and dubbed version of the instruction can be found

5 Cabinet placed at WAAC's, next to a workplace near to the entrance
6 Cabinet placed at Fabrique, on a separate table near the entrance and the water cooler
7 Cabinet placed at Smool, on the magazine table next to the printer

we asked the designer to turn the projector on in the morning and off in the evening, keeping the Cabinet active and available all through the working day.

MAINTENANCE VISITS

Each Wednesday (circles in timeline on figure 4) the researcher would come by for a short maintenance visit, to backup the log files and collections and clean and restart Cabinet. The maintenance visit also served as a chance for the participants to ask questions or report problems to the researcher and as a reminder on the experiment's progress.

DESIGN SESSION

In the third week, the participant was asked to present one of their active projects in which they had used Cabinet. Participants explained a design project they were working on using Cabinet. The participants were asked to perform some tasks on Cabinet to elicit use; for example they were asked to show on Cabinet in which direction the project was heading and to summarize the project with three images. This session was recorded with a camera pointed at the hands and the projection surface.

Table 1. Expectations of phenomena expressing the 6 criteria and the ways in which data are gathered

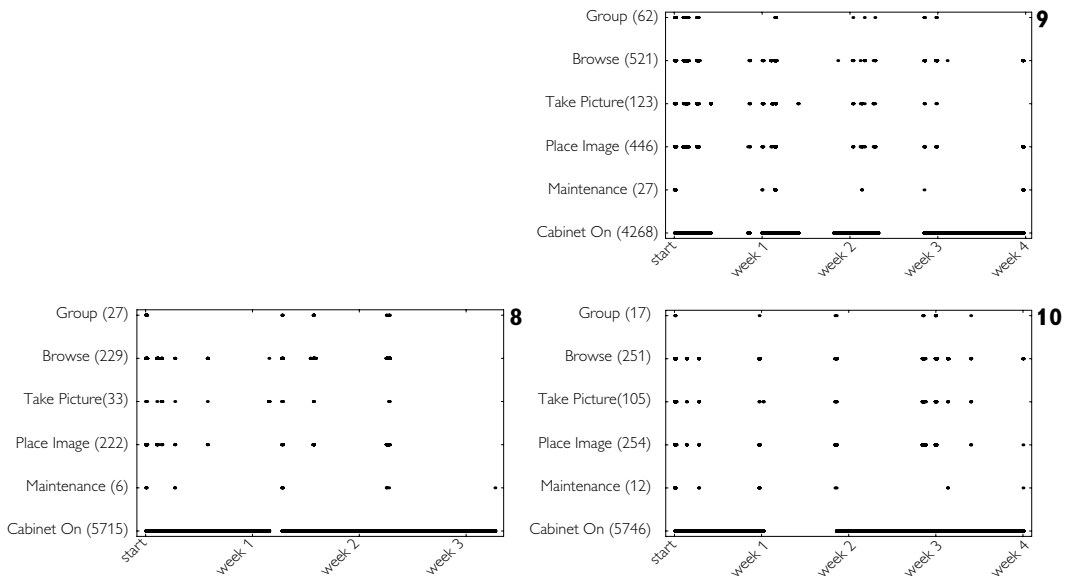| Criteria	Expectations	do	make	say
1) Active collecting	More use/value of physical images	CL		II, EI
	Short bursts in intervals during the day	CL		EI
	Physical collection will grow			II,EI
	Collecting will be more aware			II,EI
2) Merger of physical/digital collections	Physical and digital images used on equal footing	CL		II,EI
	The collection will be less rigidly structured	CL		EI
	The line between physical/digital collection will blur	CL		II,EI
3) Visual interaction	Participants can fluently interact with purely visual interface		DS	EI
	Story emerges from pictures and composition		DS	EI
	Composition is used for meaning-giving, classification, finding back	CL	DS	EI
4) Serendipitous encounters	Participants will stumble more often on images	CL		II,EI
	Screensavers and always on will be appreciated	CL		EI
	Serendipitous encounters in search session	CL	DS	
5) Breaking the rhythm	Breaking the rhythm for inspiration	CL		EI
	Creativity in motor skills		DS	EI
	Ad hoc categories, fitting in		DS	EI
6) Social use	Table will invite joint use		DS	EI
	Colleagues will know about Cabinet and its contents			EI
	Interaction with two people is fluent		DS	EI
CL = Log file, II = interval interview, EI = evaluative interview, DS = design session				

EVALUATION INTERVIEW

After four weeks the Cabinet was picked up and taken away. A few days after this, an independent researcher interviewed the participant to evaluate Cabinet and reflect on their attitude towards visual material in the design process after using Cabinet.

In the evaluation the participants were asked to describe what Cabinet is, how they used it, what their collection on Cabinet looked like, and how it influenced their collecting and design behaviour. This kind of reflection on a product can result in a very rich and valuable evaluation on design concepts (Gaver *et al.*, 2004). During the interview the participants were also asked to invite a colleague in the studio for some questions. The colleagues were asked to describe Cabinet as a product and to describe an image in the collection.

6.3.5 *Expectations*

Table 1 lists the different expectations grouped by the criteria by which Cabinet was developed as described in chapter 5. Table 1 also lists three categories of data gathering, and their appropriate form for each expectation. For observable behaviour *(do)*, the prototype keeps a *log file* of all user actions, and the primary researcher has notes and photographs of the workplace. Two types of interviews *(say)* are used to record participants' opinions; short factual questions in the *interval interview*, and an elaborate *evaluation interview* at the

8 WAAC's log file visualization: Cabinet was active *(Cabinet On)* almost all the time with 5 *Maintenance* visit. The log files further show four active uses outside the maintenance visits.

9 Fabrique log file visualization: Cabinet was inactive *(Cabinet On)* often with 6 *Maintenance* visit. When working, it was used intensively *(group, browse, take picture* and *place)*.

10 Smool log file visualization: Cabinet was inactive *(Cabinet On)* for one week with 6 *Maintenance* visit. In the 4 active uses outside the maintenance the log shows many activities of *Take picture.*

end with the participants working with the prototype. Finally we had the observed task in a *design session*, in which reflection and action concur *(make)*.

6.4   Results and discussion

6.4.1   Results

The whole procedure resulted in several sources of data, which have been analysed and matched according to our expectations. The Cabinet prototype had produced log files over the four weeks of all activity that influenced the collection. These were visualized (figures 8 to 10) and tested for patterns. The three collections the participants had created over the experimental period were also part of our dataset.

The richest source was the transcript of the evaluation interviews combined with observation notes. The evaluation interview resulted in 20 pages of transcripts from the three sessions, from which excerpts were cut out and independently grouped by three researchers into 18 themes related

Table 2. Results of interval interviews

How many images are in your collection?

physical	t1	t2	t3	digital	t1	t2	t3
p1	63	300	200	p1	225	250	500
p2	9250	50	250325	p2	20000	2000	503250
p3	1000	3000	1900	p3	1175	1540	1300
c1	35000	500	350	c1	500	2000	100
c2	4100	1000	875	c2	3000	2000	4950
c3	900	1000	2000	c3	1500	960	1800

For what do you use your collection?

physical	t1	t2	t3	digital	t1	t2	t3
p1	1	5	4	p1	5	4	6
p2	1	3	2	p2	1	3	5
p3	2	2	2	p3	3	5	1
c1	1	1	2	c1	1	0	2
c2	2	2	2	c2	1	1	2
c3	4	2	3	c3	1	3	4

The results of 2 out of 12 questions we compared for differences in experimental group (p1,2,3) and control group (c1,2,3). On the two tables on the right the answer to the question "How many (physical and digital) images are in your collection of visual material?" asked at three different 4-week intervals. The patterns within the two groups – and even within participants – are incomparable.

to our expectations (see table 1) in a post-it session. An independent facilitator moderated this session and led the discussions on the differences between the researchers. The analysis resulted in 112 separate quotes categorized over the six main themes of the expectations. These quotes were evenly distributed over each theme, with at least 12 quotes to each theme.

Our interval interviews containing questions about the participants' use of their collections were quantified and analysed for differences in the experimental group and control group. Though we didn't expect these interval interviews with six participants to give us exact and solid data, we did believe that setting out a baseline at the start, and a control group over the period, would give us some insights in the effects of Cabinet relative to our control group. The resulting data gave us such a variety in answers over time and within groups (table 2) that we will not present these results in-depth in this article.

The question in the first table in this interview, for example, was to make an estimate of the size of their collection in amount of images, both physical and digital. We asked all our participants to base their estimate on the same strategy, where they would first make a rough estimate, after which a small sample was taken, and finally to make a calculation of the amount of places where images were stored times the amount of images in each of these places.

The variation between participants and within participants over times shows that the definition of collection and images is not stable for participants even over time. This could be due to the fact that participants don't look at their collection as a whole but as an activity, and that these collections are not objects with fixed value. Though this may be a reason, the results from these interviews were not used for validating our expectations in table 1.

Finally we had video observation material on interaction with Cabinet in *design sessions* (DS in table 1). The researcher and co-author analysed the videos independently looking at the expectations in table 1.

6.4.2 General observations

Technically the Cabinet prototype was able to withstand the long-term exposure in practice. The Cabinet was technically functional 94% of the time and the three participants encountered in total only five technical breakdowns while using Cabinet. These breakdowns did not result in total abandonment of their commitment to use Cabinet.

All participants actively used the Cabinet over the whole experimental period (figures 8 to 10). All participants worked readily with the size and style of the prototype. This is remarkable because Cabinet's interaction style, with its large interaction area, minimal interface and tangible computing, are typical for research models, but very unlike the tools currently used in practice.

In their evaluation the designers reported in total 19 suggestions, featuring requests or bugs, but these reflected mostly on details in interaction or appearance and did not affect the overall concept of a collecting tool or the interaction style as a whole.

In their descriptions of Cabinet all the participants talked about the contents of Cabinet − *"it is a kind of collection of images"*, *"a photo thing"*, *"like working with photos"*. Next to that they would describe its goals − *"storing visual information ... and organizing"*, *"an organizing thing"*, *"an ACDSee folder"*, *"an image management tool"*. Two of the participants also mentioned the collaborative aspects of Cabinet − *"a meeting tool"* and *"a brainstorm tool"*. Finally none of the participants described the technical components of Cabinet, but they did describe what you could do with it as a whole − *"a desktop to scan images"*, *"scanning in 3D objects"*.

In their use of Cabinet one exciting new pattern emerged that was beyond our expectations. All three participants spontaneously used Cabinet not only to put in existing visual material from their collections, but also to add their digital or physical sketches of design solutions. These images were not just added for archiving or presentations, but also for their creative processes. With two of the participants, the solutions were also mapped next, or even in the compositions of source material for comparison or analysis. This unexpected result presents an exciting opportunity for enhanced use of visual material in the design process.

6.4.3 Observations at the three agencies

The three participants had three distinctive ways of using Cabinet. This had a reflection on their use patterns, their collections and their evaluations. The differences and description of the cases themselves are presented first, followed by an analysis of the results based on the different criteria and expectations.
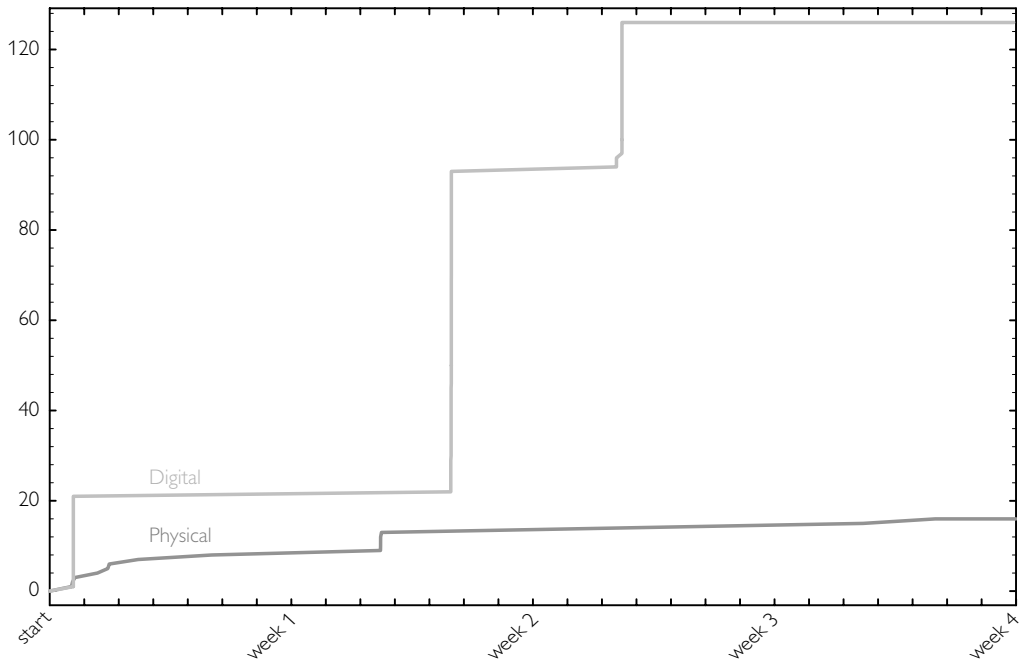
11 An impression of the studio of WAAC's
12 Cabinet export of a composition of web cam renderings at WAAC's
13 Still from the *design session* in which Roy presents the process of making these renderings

WAAC's

The first participant, Roy Gilsing, is an industrial designer at WAAC's (figure 11). He used Cabinet to organize handmade sketches of web cam designs and translate them into computer renderings (figure 12). These renderings were to be used on the company web site.

Roy was very fluent with the interaction and used Cabinet a couple of times for presentation to visitors and colleagues. In his compositions he made a distinction between sketches and renderings. The renderings were organized very neatly in straight, organized grids (figure 13). These kinds of static compositions are not explicitly supported in the expressive interaction of Cabinet, allowing images to be easily rotated and moved.

14   Timeline of physical and digital images added at WAAC's over time

Over the experimental period Roy added mostly digital material to Cabinet (figure 14). He added 18 physical images, evenly distributed over four weeks. The 123 digital images were added in three bursts of activity Roy started out enthusiastically and open, but the problems with making straight, aligned compositions strongly influenced his opinion regarding Cabinet. He didn't trust many of the features of Cabinet without trying or comparing them with his current tools and techniques.

In the evaluation interview, Roy described Cabinet as an *"image management application"*. In all his suggestions for Cabinet he emphasized the possibilities of presenting images to clients, and shared use of Cabinet in brainstorms.
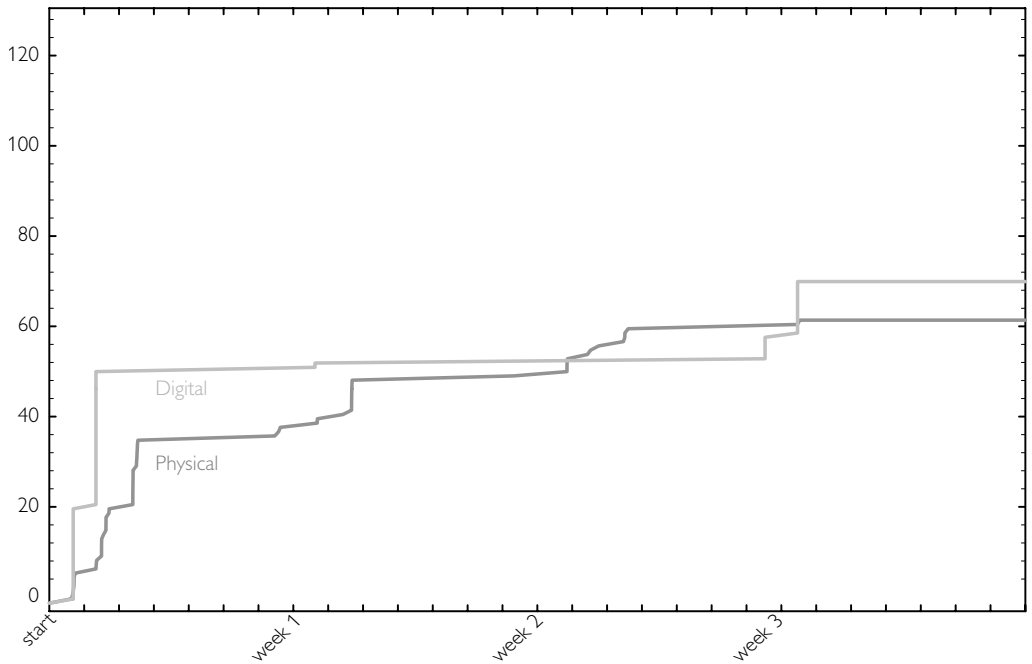
15 Panoramic impression of the studio at Fabrique

16 Cabinet export of Renate's analysis of a magazine

17 Still from the *design session* in which Renate points
at elements she can use for her designs

FABRIQUE

Renate Frotscher, a multimedia designer at Fabrique (figure 15), was the most
intensive user of Cabinet over the whole experimental period. In two projects
she used Cabinet to analyse graphic designs. The project she presented during
the *design session* dealt with the translation of the style of a company magazine
onto their web site. She scanned in different spreads of the magazines, and
analysed them regarding layout, use of photography and illustrations (figure
16).

In the beginning, she invited her colleagues to use Cabinet, but found them
messing up her collection. After these disturbances she only used Cabinet for
herself, not for presenting to clients, colleagues or managers.

18   Timeline of physical and digital images added at Fabrique over time

Renate added both physical and digital material in equal proportions, and in the same tempo. She added 66 physical and 75 digital images. She used Cabinet many times, in irregular intervals over shorter and longer periods. At the end, she was very enthusiastic about Cabinet and its value.
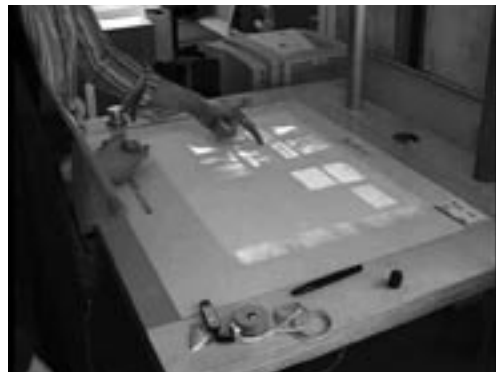
In the evaluation interview Renate described the Cabinet as *"an ACDSee folder"* (a photo management application). In her further remarks on Cabinet she stressed the importance of overview and using Cabinet for analysing images.
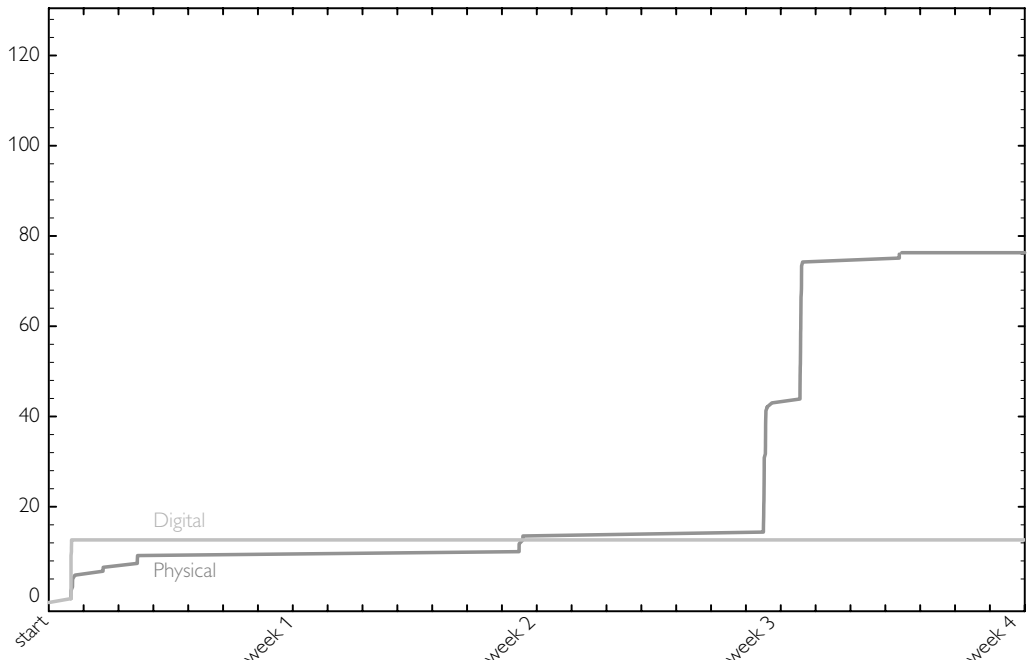
19 Impression of the studio at Smool
20 Cabinet export of Renée's combined use of magazine images, sketches and word labels
21 Still from the *design session* in which Renée points at source material next to her sketches

SMOOL

Renée Schuffelers, industrial designer at Smool (figure 19), used Cabinet to organize her own sketches in relation with source material or reference designs from magazines. By cutting out her sketches, and composing and organizing them with collage material she looked for new patterns and directions in her own solutions (figure 20).

After making the organization, she labelled each pile by scanning in handwritten notes with Cabinet and placing them below the piles. Renée presented the result of this exercise to both the researcher and to her colleagues in a collaborative design session.

22 Timeline of physical and digital images added over time at SMOOL

Renée used Cabinet merely for adding physical images (89 physical images against 16 digital images). Almost all the physical images were added in two lengthy sessions at the end of the experiment (figure 22). She did not use, and could not appreciate, adding digital material to Cabinet. At first she was quite hesitant to start using Cabinet, which was extended by Cabinet breaking down on first contact. In the final weeks of the experiment she started using Cabinet more intensively.

In the evaluation interview Renée described Cabinet as an organizational tool, with the power to mix sketches and reference material. She also described it as a tool to discuss designs. In her final remarks, she was very positive about the possibilities of scanning in 3D objects.

23 Reference material found in Roy's Cabinet collection
24 A rendering from the collection of Roy Gilsing

6.4.4 Discussion by findings

ACTIVE COLLECTING

From the log files we saw that our participants used Cabinet 3 to 4 times
a week with small short bursts. They all had 2 to 3 longer sessions in the
four-week period. Their own estimations in the evaluation interview were
close to this as well. The participants did not really say that the role of their
collections or visual material changed after using Cabinet. Roy did refer to
the role of visual material though – *"I now realize that I am working with visual
material daily ... but I knew that in some way already"*.

The unconsciousness of collecting is illustrated by Renate when she talked
about images that she didn't *put into* the Cabinet, but images *ending up* in
there as part of her design solutions.

Though Cabinet aimed to make the implicit aspects of collecting explicit, the
collecting behaviour was still mostly an unconscious stream. For example,
Roy was asked to tell if he used other visual material for inspiration in the
design process. He could give no examples, saying that the project was not
really creative, just an engineering or computer task. When the researcher
pointed at a specific image in his collection on Cabinet of a sewing machine

(figure 23) Roy explained – *"O, that … I kept it because I like the lighting effect in this photo resulting in double shadows. It is very dramatic. I used it in my renderings of the web cams as well …"* (figure 24).

MERGER OF THE TWO WORLDS

All the collections on Cabinet contained images from both the physical world and digital sources, where Roy's collection had an emphasis on digital images and Renate's collection was mostly physical. With Renate, the merger was most balanced and in her evaluation Renate talked about one project in which she *"was able to use the complete span of Cabinet".* In another project she described a similar merger – *"I designed a leaflet, printed it out, made photos of the leaflet [with Cabinet] in different stages of folding, and used those pictures in the CD-ROM".*

The merger became more apparent in the evaluation interviews when confusion occurred over the real and physical world. Two of the participants said they missed a *"waste basket"* which should be *"bigger"* (Renée) or should be *"like a physical waste basket"* (Renate).

Roy made a distinction between computer material and handmade sketches in his compositions in Cabinet. He also did this without a real conscious choice: *"A computer rendering is more exact, so maybe that's why I might have preferred them neatly organized … These sketches are, well more messy, so I found it OK to put them like this".*

One anecdote at Fabrique illustrates the merger of physical and digital. On the company intranet Renate had invited her colleagues to come by and try out Cabinet. After one week her colleagues had messed up her collection so much that she couldn't use it anymore. She solved this problem by making a special stack in her collection that her colleagues could use (figures 25 and 26). She physically labeled this stack with a pink sticky note bearing the text *"start here".* In the digital collection she repeated her instruction with a sticky note she had captured with Cabinet reading *"that means here!"* (figure 27). The physical and digital sticky were stuck on top of each other creating a seamless integration of physical and digital sticky notes.

The integration between digital and physical images had gone further than just seeing both types of images in one tool. For all the participants the line had blurred in their perception of and interaction with their collections.
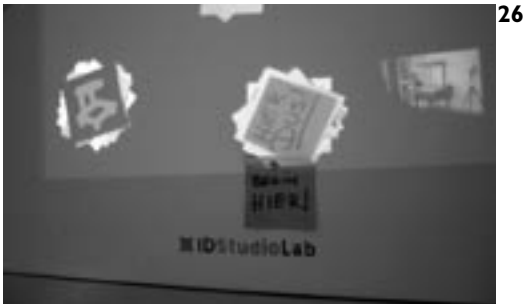
VISUAL INTERACTION

Cabinet offers a completely visual interaction, with no verbal clues or labels in the interface. None of the participants during or after the experiment reported real problems with the lack of verbal input and complete visual interaction. Two of the participants appreciated having an overview and not being required to enter labels all the time. When asked for suggestions,

25 Cabinet at Fabrique with a physical pink sticky note
26 In close-up we can read "start here" on the physical sticky note
27 Digital sticky note with "that means here!"

two of the participants did mention adding verbal input as an added feature, but it was never regarded as a requirement.

The fact that the designers had strong visual memory was supported by all of their ability to draw out their collections from memory, a week after the Cabinet was taken away.

In the design sessions the participants interacted with Cabinet fluently, allowing them to talk about the images in their collection without being distracted by verbal clues. Making mistakes, such as enlarging the wrong image or opening the wrong stack, did not break the flow of the conversation. During the design sessions two of the participants improvised and explained their design process with the material visible on Cabinet. Roy had used Cabinet to prepare a presentation of his design process. When asked for his future direction of the project, Roy had to make a change to his composition to make his point. He immediately afterwards restored his composition to make the composition more logical and supportive of his presentation.

Though the purely visual interaction was regarded as positive, it was also most criticized in its details in interaction. In the evaluation, the designers talked about missing the ability to scale or align images and the annoyance

of new images added to the collection rotating in the centre, ruining the composition of their images.

SERENDIPITOUS ENCOUNTERS

All the participants described serendipitous activities, which were seen as positive though useless. For example, when asked whether she would miss her collection on Cabinet, Renate played down the importance of the images in Cabinet by saying that *"These pictures in Cabinet are still in project folders and my personal collection are things I am surrounded with, things I want to have available at hand in case I want to use them, or that I occasionally run into. So they are in the back of my head and I don't really need them."*

The fact that Cabinet showed images randomly while not used was described by two of the participants as *"pleasurable, aesthetically pleasing"* (Roy) and *"a fun way to bring out new thoughts"* (Renée).

INSPIRATION BY BREAKING THE WORKFLOW AND USING MOTOR SKILLS

The log files show many short uses by Renate. In the evaluation interview Renate reported using Cabinet *"when my anti-RSI software would force me to stop"* so that she could *"mess around with images ... making larger gestures"*.

We did observe the motor skills in the design sessions where the designers would use both hands and larger gestures, even without actually pointing at the images with the pen. Two participants pointed at empty spaces in the composition to point at new idea directions.

None of the participants attributed a specific new idea coming from using Cabinet. Only one participant (Renée) mentioned using Cabinet for getting new ideas: *"The most interesting areas were switching between the different groups"*.

SOCIAL INTERACTION

The colleagues that were brought in during the evaluation interview (see section 6.3.4) provided surprising results. Considering that Cabinet had been showing images during the last 4 weeks in that design office we expected all colleagues to recollect at least one image they would have seen while passing by. To our surprise none of the participants were able to recall one image; they all mentioned something, but they were all wrong. Then again, these colleagues were able to describe Cabinet's functionality and purpose.

The participants often described Cabinet as a collaborative tool, such as *"a brainstorming tool", "a table to present images to colleagues"*. Though all the participants mentioned collaborative use as a positive feature, only Renée actually reported using it to share her work with colleagues. The *design session* with the researcher was not seen by the participant as a collaborative session.

The fragility of social interaction is also illustrated in the anecdote described in figures 25 to 27, where Renate had to tell her colleagues not to mess up her collection. After putting up the sticky note on Cabinet no colleague ever dared to touch her Cabinet anymore.

6.4.5 *Evaluation of the prototype*

The participants provided 19 suggestions and features that could to their insights improve the interaction with Cabinet. These varied from improvements in efficiency, *"allowing two crops to be made from one scan",* to changes in physical appearance, *"making it a more elegant device".* The most valuable suggestions were directed at the interaction with the collection itself, allowing for *"temporary compositions", "clearing the centre from incoming new images",* and *"being able to label groups".*

6.5 General Discussion

The prototype was set out in practice as both an evaluation of the prototype and an intervention to gain knowledge on designers' behaviour.

The overall result of the evaluation is that the prototype was able to attract the designers into using a new tool and adapting it to their use. We had categorized our findings into six categories, for which our expectations were set up. Three out of these six findings were really supported by what was found in practice. The biggest success was the merger of physical and digital visual material that took place with all participants. Furthermore, all participants were fluent and positive about the purely visual interaction with Cabinet. The social interaction with visual material could not be validated in practice and for inspiration we found that Cabinet did break the rhythm and involved the body in the interaction, but this gave no relation to getting new ideas or insights.

One unexpected and remarkable merger came out of this experiment. All our participants used Cabinet to organize existing visual material together with their own design solutions. In our experimental setup and prototype this effect was not taken into account at all. The possibility of adding sketches and renderings was foreseen, but not the notion of using composition and grouping in Cabinet to compare and organized design solutions directly with source material. An unexpected, but very interesting result.

6.5.1 Discussion of the method

The method of having a prototype in such an open setting as a form of evaluation did work in giving confidence in the appropriateness of Cabinet. Probably harder evidence of specific usability issues with Cabinet could be found in a laboratory setting, but these tests could never give us the confidence in Cabinet as a whole.

The experiment stayed very close to practice, with a realistic task and a working tool with real users. The prototype was expected to elicit different kinds of use, work methods and attitudes towards collecting. Though Cabinet had an effect in the collecting behaviour, the open-ended structure of the experiment led to many different uses and interpretations by the participants. A predescribed procedure might have given us more answers on the designer's behaviour, but this would come at a cost of evaluating the prototype's inherent value and its effects on new uses.

By staying so close to practice, the validity of these results are ensured, this comes at a cost of reliability of our measurements. In the method we measured in several different ways, of which many did not yield reliable measurement. The experiment did however provide results with richness of meaning.

An unfortunate and typical example is the fact that our interval interviews with both the participants and a control group provided incomparable results and patterns. The evaluation interviews and the design sessions provided interesting results that were relevant to the different criteria and expectations.

6.5.2 Conclusions

This experiment has been a no-compromise reality check for both tools and theory in practice. By setting out Cabinet, a working prototype of a tool, in real world practice over a longer-time period we have gained much confidence of its function. At the end of the experimental period two out of three designers valued the prototype as a positive addition to their working methods, and even wanted to have Cabinet back after four weeks to use it on further design projects. During the experimental period Cabinet's use was instigated by the designers own initiative and the participants were not guided by experimental procedures. Given the work pressure in design studios and the stability of the working prototype, these are promising results.

In the evaluation the Cabinet prototype worked convincingly in bridging the gap between the physical and digital divide. All the participants readily accepted the size and scale of the interaction on a tabletop. The lack of verbal feedback in the purely visual interface was not seen as a problem. Many

of Cabinet's virtues were not explicitly mentioned during the evaluation interviews, because they did not cause friction in the designers' interaction. Sometimes the lack of complaints can be seen as a compliment for the design.

6.5.3 Directions for further research

This experiment makes a strong case for doing research through prototypes in practice. Cabinet has a lot of potential to be used for different experiments in practice.

One approach could be to take a similar case study approach, but to embed the prototype over a longer period in the designer's workplace. This will make it easier for designers to really make Cabinet part of their working method. To get reliable and valid results this would not necessarily require more participants. Possibly an experiment with just one designer or one design agency could be enough. In such an approach, the log files can provide reliable data on the change of the behaviour and patterns of uses over time.

Another approach could be to take some more control over the conditions in practice by moderating the use of Cabinet. In moderated workshops or weekly sessions a design process could be observed in relatively controlled conditions. This approach is especially interesting to explore the effects on other areas than mere collecting. The interesting behaviour that emerged during our experiment, in which all three participant used Cabinet to combine both existing visual material for image generation with their design solutions, is an interesting area for further exploration.

Acknowledgements

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