MAKING SENSE OF BRAINSTORMS: SOME 'NOOTS' TO REFLECT ON

JELLE VAN DIJK
Eindhoven University of Technology &
Utrecht University of Applied Sciences
jelle.vandijk@hu.nl

CATHERINE E. BROUWER
University of Southern Denmark
rineke@language.sdu.dk

ABSTRACT

Through video-materials of use-in-practice we present and discuss NOOT, an interactive tool that supports sense-making during creative sessions. The project investigates how 'cognitive scaffolding' may support such sense-making.

INTRODUCTION

We are interested how *sense-making* develops within the situated, embodied practice of a *creative group session* (more on which below). Sense-making, in its most general sense, refers to the process by which human beings create meaning through their ongoing interactions with the environment (De Jaegher & DiPaolo, 2007). Our question is how people's embodied interactions with the physical and social environment may provide 'cognitive scaffolds' for sense-making.

COGNITIVE SCAFFOLDING

Andy Clark (1997) explains how, courtesy of their continuous embodied interactions with the environment, people come to use elements and configurations of the environment as *scaffolds* for thought. Clark thereby expands on the original notion of 'scaffolding', as introduced by Lev Vygotsky, who showed how in a setting of cognitive development the social interactions with parents or teachers provide 'scaffolds' for learning, allowing the child to make developmental steps that could not have been achieved without this social structure present. According to Clark, inter-action with physical structure, reliably present in the environment, may also function as a cognitive scaffold (Clark, 1997). For example, the organization of items on a desk may help a worker plan his course of action and certain easily recognized landmarks in a city (the church-tower, a big square) help people navigating without a map (Clark, 1997; Kirsh, 2010).

Clark discusses the notion of 'deictic referencing' as a basic form of scaffolding. When communicating, one may point to certain relevant elements in the environment that are available as a shared visual reference. For example, in figure 1, taken from one of our observations at a product design bureau, the two men at the table have certain opportunities for creating shared meanings that the person at the wall has not, even though all can hear what the speaker says. This is because the verbal utterances of the speaker on the left are scaffolded by his gestures operating on an external prop (here, a product sketch), which are only available for the two men at the table.

David Kirsh (2010) expanded on the notion of cognitive scaffolds showing how people themselves *create*, via what he calls 'epistemic actions' scaffolds for thought. For example, in the scene above, both men might add to the sketch, and such additions would come to serve as scaffoldings in the ongoing conversation. In fact, design sketching is known to be not the mere 'externalizing' of a designer's thoughts: the sketch itself influences further design thinking as well (Van der Lugt, 2002); This is just one example of how, in general, sense-making and cognitive scaffolds co-evolve and become *coupled* in action (Dourish, 2001).

RESEARCH APPROACH

Our approach has been to iteratively design an interactive prototype, called NOOT, intended to support and enhance cognitive scaffolding during creative group sessions. By reflecting on our design process and observing the use of the NOOT prototype *in situ*, we intend to gain a more thorough under-
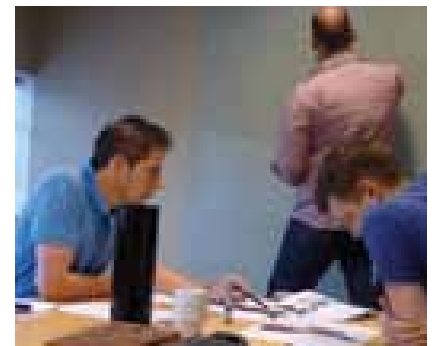

Figure 1: Deictic referencing in a design meeting. See also Episode 2 in the video.

standing of how scaffolding may aid sense-making.

THE CONTEXT OF PRACTICE

Our collaboration with partners provided access to the following settings in which creative sessions regularly take place: 1) design education (the video sample is drawn from this context); 2) a large product design bureau (figure 1 is drawn from this context), 3) a government 'future-centre' and 4) a company offering brainstorm rooms. We also held collaborative sessions with several professional 'facilitators'.

WHAT GOES ON IN CREATIVE SESSIONS

In the classical brainstorm, the goal is to come up with creative solutions to solve a set problem. However creative sessions are often used with less focus on 'problem solving' and more on exploration of a theme (Yilirisku et al, 2009) often aimed at a better understanding of the user context (e.g. in *context-mapping*; Sleeswijk-Visser et al, 2005). In participatory sessions, multiple perspectives may be contrasted directly through face-to-face encounters. As we observed such sessions are also the place to get to know each other, to create commitment (get people 'on board') or to try and enforce decision making. Creative sessions, therefore, usually contain a pragmatic mix of facts, possibilities, perspectives, stakes and politics.

SENSE-MAKING IN CREATIVE SESSIONS

In creative sessions people do not engage in creative acts alone, i.e., idea-generation proper. At particular moments, somebody might think beyond the problem as stated and wonder: "What is the *real underlying* issue here?". Or when a video from a user group is shown, one might want to know "What are the relevant *meanings* behind these events?". There will also inevitably be moments where the group expresses thoughts like: "Why are we stuck?" or "How move forward from here?". Especially concerning so-called 'wicked' problems (Rittel & Webber, 1984), *analysis* is hard to distinguish from *generation*. Instead, people reflect *in-* as well as *on* action (Schön, 1983) and sense-making is thereby subtly 'woven into' instances of generation and creation (Ingold,

2000), see also (Brouwer & van Dijk, 2011) for a discussion of these issues from a conversation analysis' perspective.

MINIMAL INSTANCES OF SCAFFOLDING

In creative sessions, typical candidates for scaffolding are printed pictures, sketches, writings on post-it notes, carton mock-ups, a whiteboard, the table surface and walls, all used to present and discuss ideas. (See Nevile, 2011, for a discussion on the value of prototypes as cognitive scaffolds). Think of pointing at a post-it while talking in order to get shared focus; creating an overview by listing words on a flip-chart or creating a mind-map on the whiteboard; ordering cards in groups under headings (using colored cards to represent different categories) and so on. Consider also less 'explicit' activities such as putting 'my ideas' close to my body on the table; rejecting ideas by shoving cards 'aside', holding a card up while shouting 'what about this one?' and so on.

The practices we investigated mostly engage in rather conventional brainstorm practices, in which one mostly uses talk, sketch and text, supported by a whiteboard, post-it notes, flip-charts, walls and table. The purpose of this paper and video therefore is to explore *minimal* instances of 'cognitive scaffolding' and discuss how the prototype NOOT may aid in supporting a conventional brainstorm. In the end, however, we shortly discuss how NOOT may also be used (perhaps even with a stronger effect!) for more 'embodied' forms of group work such as tinkering sessions or 'acting out' exercises (see Vaajakallio & Mattelmäki, 2007; Jensen et al, 2005, for examples)

NOOT

NOOT was designed to support cognitive scaffolding during creative sessions. The aim is to *enhance* existing
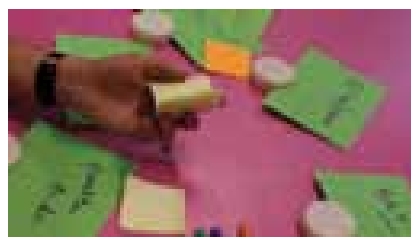

Figure 2. Some NOOTs on a table, connected to paper notes.

practices. This means we want it to be an integrated part of the existing physical-social space, not create a digital 'virtual world' (as in most systems) that would replace, and therefore be disconnected from, the everyday world we inhabit (Dourish, 2001).

HOW DOES NOOT WORK?

From the moment a session starts, a computer continuously records the entire session in audio. With a set of tangible objects called NOOTs (see figure 2), users can literally 'connect' a certain moment in the audio to a physical post-it or sketch. In order to do so, one simply clips a NOOT to a post-it, and at that same moment a wireless signal is send to the central computer, which puts a time-stamp in the audio-recording connected to that NOOT. (See 'episode 4' in the sidebar). When that NOOT is later on touched (not shown in video), one hears the part of the conversation that was actually going on at the time the NOOT was clipped (starting 10 seconds before and continuing 10 seconds after the time-stamp).

NOOT thus offers 'conversation context' to the post-it (and in effect also to the post-it's physical location in space). This way, audio-context enhances the cognitive scaffolding power of the physical configuration of post-its in space. In particular, NOOT may provide access to parts of the conversation that are usually forgotten - parts difficult to jot down on a post-it, for instance. Think of details from personal anecdotes, examples of end-user practices as presented by experts, or a complex discussion of conflicting views, of which only a few participants really understood the essence at that time.

DISCUSSION OF THE VIDEO

Detailed descriptions of the five video episodes can be found in the green sidebars (Figures 3 and 4). We first see how post-its on the whiteboard provide external scaffolds used as an aid for the ordering ideas into categories (Episode 1). We also see the facilitator making deictic references to the walls and table in order to support his speech (Episode 2).

In Episode 3 we see how NOOT *could* have added to the group's sense-making, if it would have been used. Rich content in the verbal discussion is lost in a way typical to most sessions: a

NOOT IN PRACTICE
Conceptspace, Utrecht, Netherlands
May 2010; Session 6 of 7 sessions with NOOT.
Short videosamples from a 1.5-hour session.

ABOUT THE SESSION.
In this video participants discuss ideas for an online game for children, for an external client. The goal of the game is to seduce children into visiting a famous national reserve park in the Netherlands. The participants have had a short workshop on brainstorming. Facilitator F tries to provoke creativity as well as empathy for the target-group in this mostly engineering-oriented group of media-technology students. Meanwhile, F is also exploring the use of NOOT, a new tangible tool linking audio-samples to post-it notes. (see main text for main discussion)

EPISODE 1: External Scaffolding
On the whiteboard, two categories are present in the form of coloured cards, one marking '6-9', the other '10-12'. These represent two age groups of potential users. F. explains some more about the groups: "On the right you have group seven and eight [of primary school], on the left you have groups..." the participants fill in: "group 2,3 and 4" [muddled talk]. F concludes: "That's about lower-half/upper-half one could say, right?"... From this moment on, the two areas on the whiteboard 'are' the two user groups, and in order to discuss and contrast the two groups, the physical lay-out on the whiteboard is often used as a point of reference.

EPISODE 2: Deictic Referencing (shared attention)
Using spatial elements as a reference helps to create shared attention. This episode is quite subtle: A participant earlier mentioned pocket-money. Others think it irrelevant. F. says "Well, when you take what you know of the target group" (points at the wall behind him) "...and use that to create the game" (points at the wall to his right where the ideas for the game are collected) "...in order to get children to come to the park" (focus back on the table: the main design challenge, for the group, has just been stated) "...then 'it' does become relevant" (looks at the participant that mentioned pocket-money which is what 'it' refers to) "... since children don't have that much money and parents have to pay for the entrance fee..."

EPISODE 3: Changing meanings.
In this episode WhiteShirt knows something that children like: "Doing Monkey Business". "Good, write down", says F. Then, various participants associate further on this theme. Some are suddenly reminded of their own youth, jokes are made. The group goes on to discuss childrens' emotions and whether they are sensitive to 'hypes'. The phrase 'feelings of anxiety' is uttered. Interesting conversation that for the first time seems to put the participants in touch with the target group. Yet the only thing that gets written down on the post-it is: 'Monkey Business'.

EPISODE 4: Marking the Moment
The group discusses kinds of games they loved as kids. Participants are engaged. The age difference between the participants themselves is explicitized using certain games as a reference point. Whiteshirt:" First marbles came, then Flippos".
Ponytail "I never did 'Flippos'"
Whiteshirt "No? O come on! Well, you did secondary education, so that figures" [meaning Ponytail is younger than WhiteShirt, who attended technical education first]. Ponytail "Yeah, you guys are 'Generation Flippo'"
It would be difficult to write down in one word what this conversation is about. But it does arouse good empathy towards the target-group and focuses on age differences and toy-trends, which are meaningful topics for the ideation phase. The facilitator grabs a NOOT, listens for a bit, and then 'marks the moment' in the midst of a rich part of the conversation.

EPISODE 5: The 'nature' discussion
Long episode. First we hear Whiteshirt again: "Little children like animals more than the older ones do". "Good!", says F. "write that down". Then this idea is disputed by the group "Perhaps 10-12 year kids also?". In the discussion that follows, the group settles on a difference between liking (family farm) animals, versus being into 'nature', as in, 'joining the boy scouts'. The conversation itself is not marked with NOOT. A post-it with 'nature' is put with the 10-12 group by Whiteshirt. Blackshirt writes one with 'animal farm' for the '6-9' group. We can see how the post-its do not capture the essence of the discussion when Greyshirt, who apparently has missed part of the talk, sees Whiteshirt put up the post-it and says [2:52] "Huh, now you put it the wrong way around?". People laugh. "No", says Whiteshirt, "He [pointing at Blackshirt] is doing 'animal farm'. "O", says Greyshirt, unconvinced. "But what's 'nature' then?" [3:01] The clarification from Whiteshirt is minimal. [3:08] "That was, like, 'animal farm', and the other one, like, 'forest'. Only if you already knew what that cryptical explanation referred to, would it be of any help. The fact that Greyshirt doesn't understand what's going on might hinder him in reconnecting to the group process, and it might also cause confusion for others in the group. F was not in a position to reflect and listen, since he was actively involved in clarifying and explaining the topic. We speculate this is why he only grabs a NOOT when the 'dust has settled', at the end of the episode. NOOT is, as we see it, a tool that works well to support a 'reflective stance'.

Figure 3: Details of video of a session where NOOT is used (1).

Figure 4: Details of video of a session in which NOOT is used (2).

post-it hardly captures the richness of the conversation, which is easily forgotten later on, or the post-it is misunderstood (Episode 5).

As explained above, we intended to hook up the NOOT system with the post-its. The 'scaffolding' power of the post-it would then be strengthened with audio-context. Originally we thought NOOT should be used by a person shouting and jotting down an idea and then clipping NOOT to it. In fact NOOT was not used that way. This can be seen in Episode 4, where the facilitator does not try to capture one particular 'idea' in audio, but, while standing aside and listening, captures 'a moment' during a lively discussion. NOOT is not added to a particular post-it, but rather seems to be a scaffold for 'marking *this* moment' in general. This 'moment' is then linked to a physical location only later, in the form of placing the tangible object on the whiteboard or on the table.

Most importantly, marking a moment is something one does while standing outside of the immediate action, taking a reflective, listening role. This can be seen in Episode 5. In that episode we first see how one of the participants has missed an important step in the group's thinking. A NOOT-moment available would have saved a lot of the confusion that follows. The reason that the facilitator did not make a NOOT-moment, we speculate, is because he was himself actively involved in the discussion. Only at the end does he make the mark. We conclude that NOOT may best be seen as a tool that helps in *reflection* on ongoing action (Schön, 1983).

NOOT IN ACTIVITIES OF MAKING

Recently, creative sessions developed to include more 'embodied' forms of group activities. For example, participants are asked to explore themes and concepts through creative engagements with prototyping materials (e.g.Vaajakallio & Mattelmäki, 2007). There have also been various experiments using 'acting out' exercises (e.g. Jensen et al, 2005). We think NOOT may especially contribute to such activities of making, since NOOT may provide an explicit link between *experiencing-by-doing* (the activities themselves) and r*eflective conversation* (par-

ticipants talking *about* what it means). Using NOOT, one may literally connect discussions around (the evolution of) a certain mock-up, to the mock-up itself. Some of the sense-making that *creating* the mock-up provided, may in this way be preserved for later. Likewise, when users are asked to play-act a scenario the scene may be 'tagged' by the spectators using NOOT, to mark significant events in the spectacle. This way, embodied explorations and reflective conversation may become strongly connected.

THE DESIGN OF NOOT
AS A SCAFFOLD

We end by observing how our own insights changed with the evolving prototype. For example, seeing NOOT as a tool for the reflective listener only recently emerged from analysing the current video. In other words, NOOT provides us with a cognitive scaffold for our own sense-making efforts as researcher-designers.

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