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Facilitating participation has become one of the cornerstones of co-design, and a number of methods, techniques and events intended to inspire design participants and scaffold collaborative ideation and concept development have been developed. However, an aspect that is yet relatively unexplored in co-design literature is how different methods and techniques can be productively combined. This paper presents and discusses the dialogue-labs method, which provides a structured way of generating ideas through a sequence of co-design activities. The analysis of the method during 18 sessions, based on iterative reflection, focuses on its three key structuring aspects: the process of how dialogue-labs sessions are orchestrated, the space in which the sessions unfold and the materials that are employed. In addition to understanding the specific dialogue-labs method, this discussion of process, space and materials may yield insights into how other co-design methods are analysed and further developed or combined.

Keywords: design; workshop; innovation; ideation

1. Introduction

Practitioners from different fields of research and design have understood the importance of involving diverse groups of users in the generation phase of novel artefacts, products and services, and thus facilitating participation has become one of the cornerstones of co-design (Brandt *et al.* 2005). Underpinning this approach is the supposition that stakeholders, including users, can contribute productively through involvement in the design process since they bring privileged insights into the domain that designers are trying to address and the ways in which future products and services may fit into and affect that domain. This paper addresses how stakeholders can be involved in the ideation, concept development and early prototyping phases of co-design. Within this field, there exists a variety of methods, techniques and events intended to inspire design participants and scaffold collaborative ideation and concept development. Such methods include future workshops (Kensing and Madsen 1991), interaction relabelling and extreme characters (Djajadiningrat *et al.* 2000),

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metaphorical design (Madsen 1994), inspiration card workshops (Halskov and Dalsgård 2006), design games (Ehn and Sjögren 1991, Brandt and Messeter 2004), make tools (Sanders and Dandavate 1999), contextmapping (Sleeswijk Visser *et al.* 2005) and fictional inquiry (Dindler and Iversen 2007).

Many of these methods and techniques focus on discrete stages of the design process, e.g. the generation of a variety of ideas in brainstorming sessions or the radical rethinking of an existing design concept in the case of interaction relabelling. An aspect that is yet relatively unexplored in co-design literature is how different methods and techniques can be productively combined. This paper will present and discuss how this can be done within the frame of a particular co-design method, the dialogue-labs method (Lucero and Vaajakallio 2009), which provides a structured way of generating ideas through a sequence of co-design activities.

At its core, the dialogue-labs method has three key structuring characteristics: the process by which the method unfolds in time, the space in which it is set and the materials available in the lab setting. The authors' findings from extensive use of dialogue-labs during 18 sessions have shown these three factors to play an essential role in how co-design unfolds in practice. In addition to presenting the dialogue-labs method, therefore, these three structuring aspects will be discussed. It will be argued that this discussion can inform the use and contribute to an understanding of other co-design methods and techniques. Even though many co-design methods employ a variety of materials in order to scaffold the design process, the relations between process, the physicospatial situation and materials are relatively unexplored in academic contributions to the field.

Resulting from the methodological stance of the paper, the intended audience is both co-design practitioners who may be inspired by, adopt, employ or transform the dialogue-labs method in their design practice, and co-design researchers who may, in addition to the presentation and discussion of the specific dialogue-labs method, find inspiration in the discussions of sequences of concept development events (i.e. process), the role of physicospatial environments (i.e. space) and the selection of design objects (i.e. materials) in co-design. In this paper, the dialogue-labs are discussed from the design process point of view rather than looking at the specific product that is the outcome of the process. The product is taken into account in order to understand the potential of the method (e.g. as part of the evaluation, participants were interviewed to evaluate the resulting concepts), but it is the overall setup of the dialogue-labs method that is at the heart of the discussion in this paper.

The structure of the paper is as follows. First, it introduces related contributions in co-design that employ the notion of design labs or workshops as settings for design activities. It then explores in more detail what characterises the roles of process, the physicospatial environment and the design materials in such settings. This section primarily draws upon work in the fields of situated and distributed cognition in order to scaffold subsequent discussions of the findings. Then, the dialogue-labs method is introduced through its three main structuring characteristics (i.e. process, space and materials) and four empirical examples of applying the method in co-design projects are presented. Finally, the interrelations between the method's three key characteristics are discussed, followed by conclusions.

2. Related work: design labs and the role of process, space and materials in co-design

In order to situate this work on dialogue-labs and scaffold a discussion of the findings, first, an overview is given of related contributions related to the notion of

design labs. Then, a series of theoretical contributions is outlined that address the role of process, the physical environment or space, and design materials in co-design.

2.1. Design labs

The notion of labs in design has diverse connotations. In the field of human–computer interaction (HCI), there has been a tradition of setting up Usability Labs (Nielsen 1994). As the name implies, the main purpose of these labs is to test the usability of interactive technologies. The understanding of labs in this context is heavily inspired by the natural sciences, in which a lab is a controlled setting where the parameters of experiments and trials can be controlled, and in which the same experiment can be repeated. However, within the realm of design, labs often bear different connotations with regard to different metaphors used to describe co-design settings. According to Binder and Brandt (2008), metaphors such as workshop, studio and atelier all entail attractive characteristics for design research, but the metaphor of design labs is superior in terms of addressing the transparency of the process, experimentation and documentation. As such, design labs are often set up as creative spaces intended to scaffold inquiry and development for some or all phases of design processes.

As an example of this, the Design Collaboratorium (Buur and Bødker 2000) emerged as a way to overcome the limited notion of usability labs. This approach emphasises workshops as a vehicle for collaboration in which the real-use context is addressed, the emergence of use is studied, and where different stakeholders work together in an integrated design setting. However, because the main goal of the approach is to bring together the development team, user involvement varies greatly across projects, and in some cases users are not involved at all. Another example of the design lab metaphor is given by Binder and Brandt (2008, p. 121), who describe Design:Lab as 'a platform for a collaborative inquiry that is based on design experiments'. In other words, Design:Lab (Binder 2007) is a collaborative space of designerly exploration that takes advantage of a controlled environment and uses experimentation to go beyond observation in the real context toward prototyping possible changes. Design:Lab takes place in real context (e.g. factory), combining the existing work environment (e.g. production room) with more controlled areas (e.g. factory cantina). In Design:Lab, authorship is shared, meaning that lab partners have equal rights when it comes to authoring the design work. The lab provides a setting for exploring the design space with the people involved, and thus its outcome is not the final design but rather the ground to start the actual design.

There is another group of design labs that is set up in artificial contexts. In the Design Lab (Brandt 2006), users and other stakeholders engage in a conversational design practice based on a series of design events focusing on collaborative inquiry and participatory design. During the sessions, data from field studies (i.e. video ethnography and probing) are fed in the form of design artefacts (i.e. ethnographic video snippets in the form of cards) to bridge the gap between the lives and experiences of the different stakeholders. The sessions are driven by events, working with the design notions of 'staging, evoking, and enacting'. Johansson and Linde (2005) take a similar approach in collaborative design sessions where designers and future users build future scenarios using data from probing and video snippets as sketching material. In the Co-Experience Environment (Ivey and Sanders 2006), users were invited to co-design a physical environment for co-experience. A small

group of users with shared expertise were recruited to allow the research to evolve as an activity of equitable collaboration. For the Co-Experience Environment, participants previously worked on a probe package that later helped the designer to create two spaces. Users were invited to experience these spaces and give feedback on the overall experience. As such, in their case users were not actively involved in the design of the first two spaces but provided inspiration for the design of future co-experience environments. In addition, some studies have emphasised envisioning future opportunities with potential users in real context (e.g. in an office) and on the move (e.g. going to visit a client) while users perform their everyday activities in order to understand both what is and what could be (Iacucci and Kuutti 2002, Vaajakallio and Mattelmäki 2007).

2.2. *The role of process, the physical environment and design materials in co-design*

Although the above-mentioned labs have different aims and configurations, a common denominator is that the process of how activities unfold in them, their physical set-up or space, and the different types of materials that are employed in them are important factors in how they work. The same holds true for the dialogue-labs method discussed in this paper. For this reason, the role of process, space and materials as structuring elements in design will now be examined in order to bring together different perspectives that can inform this discussion of the dialogue-labs.

2.2.1. *The role of process*

The works of Schön (1983, 1988) have been highly influential in understanding the design process. In Schön's terms, design unfolds as a reflective conversation between the designer and the materials of the situation. Employing different types of materials and media, the designer explores potential outcomes; however, the materials of the situation speak back to the designer (situational back-talk, in Schön's words) and prompt the designer to reflect upon his or her moves. In this perspective, design can then be construed as dialogical, simultaneous processes of action (as the designer employs and transforms the materials and components of the design situation in order to achieve certain objectives) and reflection (as the situation speaks to the designer and prompts reflection upon both the designer's actions and the nature of the situation). This dialogue with the materials of the situation can take on many forms. A prominent example is sketching which, according to Buxton (2007), can be considered the quintessential design activity. In design, sketching is not only a question of representing an a priori formed concept, rather the process of sketching in itself becomes a way of exploring the design situation and potential future design concepts. This emphasises a processual view on design as a process of emergence and unfolding while the designer experiments and explores conceptualisations in action. Buxton's notion of sketching is not limited to paper-and-pen drawings, it also embraces the wider set of designer explorations through different media.

One aim of co-design is to bring in several perspectives to the topic under scrutiny, which often includes people who have no prior design experience, or who are unfamiliar with the topic that is being studied. Sleeswijk Visser *et al.* (2005) have stressed the importance of sensitising participants to the topic before the actual co-design session. They have focused on the process of setting collaboration and introduced a sequence of research steps that they call contextmapping.

In contextmapping, co-design activities evolve from simple activities or exercises to more demanding ones (Sleeswijk Visser *et al*. 2005). By emphasising the process view, they highlight the role of a step-by-step process that allows participants to become increasingly aware of their own experiences. In conducting dialogue-labs sessions, the present authors have often sensitised participants to the topic of the design process by involving them in probes studies (Gaver *et al*. 1999) and contextual inquiries (Holtzblatt *et al*. 2004). However, end-user involvement has not been considered a prerequisite as the dialogue-labs method relies on the new associations evoked by the process and the given tasks, the particular set-up or space and the available design materials, with an emphasis on provoking future opportunities rather than developing complete concept designs or a holistic understanding of the users. The method can be employed without the involvement of potential future users, e.g. when developing a theoretical framework as presented in Section 4.2. However, end-user participation in dialogue-labs may be encouraged in different ways: directly as participants of previous user studies and as visitors playing the role of experts, or indirectly through user data and materials. In this way, the dialogue-labs method is set up to increase the likelihood that the users' perspectives will be embedded in the design concepts that emerge during the sessions. When compared to, for example, co-design sessions in the contextmapping study, where the created artefacts and stories related to them are the main inspiration for designers, dialogue-labs are more interested in the actual dialogue sparked while creating and envisioning alternative design solutions.

2.2.2. The role of space

Research into areas such as embodied, distributed and interactive cognition can yield insights into how and why design materials and the physical space influence the design work in practice. Embodied cognition (Wilson 2002) is an umbrella term for studies into cognition as it arises in the relations between the human body, mind and the environment. Different strands of embodied cognition abound, but a unifying tenet is that cognition is dependent on the physical body and the environing situation. Wilson (2002) highlights some of the consequences of this perspective, including the notions that cognition is dependent on our physical bodies and sensorimotor system, that cognition is always situated and dependent on the given context, that we offload cognitive activities into the environment in the sense that we overcome mental limitations such as memory by delegating cognitive work to artefacts that help us think (e.g. calendars and checklists) and that the environment thus becomes part of the cognitive system. These notions are related to Hutchins' work on distributed cognition (Hutchins 1995a), in which cognition is studied as an activity that takes place as interchanges of information across a system of human and non-human agents [e.g. one of Hutchins' well-known publications is entitled 'How a cockpit remembers its speed' (Hutchins 1995b)], rather than seeing cognition as a purely intramental activity.

In 'How designers work', Gedenryd (1998) develops the notion of interactive cognition to describe the work of skilful designers, denoting the interplay between mind, action and world. Examples of interactive cognition in design can be found in techniques such as sketching and prototyping in which the exploration of potential outcomes unfolds in the interplay between the designer's mind and actions and the design situation. These techniques enable the designer to (re-)create aspects of

potential use situations and experiment with them, making them, in Gedenryd's terminology, situating strategies that 'serve to make the world a part of cognition' (Gedenryd 1998). These techniques often rely on so-called inquiring materials which are intended to scaffold design inquiries: 'An ''inquiring material'' does not function as an end product of design, but as a means for the inquiry that design is' (Gedenryd 1998). In some cases, designers even go a step further than appropriating the materials at hand and develop new tools and technologies intended to facilitate specific design explorations, so-called inquiring instruments (Dalsgaard 2009).

What these perspectives emphasise, their differences notwithstanding, is that the physicospatial design environment and the materials employed in design processes are crucial to the way that design processes unfold in practice. The design environment and materials serve to support not only pragmatic action (Kirsh and Maglio 1994) – manipulating things to carry out a specific task – but also epistemic action – exploring and understanding the situation at hand through action and manipulation of materials. The motivation for bringing these perspectives to the fore is that the dialogue-labs method relies heavily on specific configurations of space and materials; the discussion of how and why dialogue-labs work will therefore draw upon these perspectives.

2.2.3. *The role of materials*

When addressing aspects of design materials in dialogue-labs, Agger Eriksen's (2009) classification of the materials into basic, predesigned, and field/project specific can be useful. According to her, basic design material consists of ready-made objects such as pen and paper, clay, disposable cups, etc. They are brought into the co-design gathering without specific meaning and the meaning is attached to them through reinterpretations according to particular needs. Predesigned materials have been especially selected and created for the co-design session such as printed images, video clips, foam and paper models or mock-ups. Both basic and especially predesigned material can be either general or field/project specific. This classification is relevant to dialogue-labs as the method includes all three material types in a mixture of generative tools, videos and prototypes.

In co-design literature, there are numerous examples of how diverse design materials such as video, paper documents, mock-ups, prototypes and posters can be employed. For instance, Inspiration Card Workshops (Halskov and Dalsgård 2006) are centred on collaborative concept generation using cards that represent various aspects of the use domain and different technologies that may be employed in future design solutions. In a related method, although directed at analysis rather than ideation, Buur and Soendergaard (2000) employ Video Cards – still images of video segments – to scaffold collaborative video analysis and thus inspire and inform the design process. In some co-design methods, the design materials are framed in a certain way in order to highlight specific characteristics or to direct specific types of design actions. For example, in the Fictional Inquiry method (Dindler and Iversen 2007), different materials and artefacts are used as props that support a fictional framing of collaborative workshops. This framing is intended to help participants to transcend their preconceptions of the use domain and existing technologies and spur their imagination so they may transcend these fixations. An example of how materials can influence design is found in Kelley's description of the IDEO Tech Box (Kelley 2001, p. 144), which is a shared repository of physical artefacts and materials

that can inspire design projects. Generative tools such as Make Tools (Sanders and Dandavate 1999) are another example of how tangible design materials can allow ordinary people to express their ideas through building simple mock-ups or collages. Brandt (2005) has described these types of materials in co-design as things-to-think-with.

2.3. Summary of the related work

The dialogue-labs method presented in this paper was inspired by the design lab metaphor. There is a lack of studies that focus on the relations between the process, the physical arrangement or space and the variety of design materials in co-design events. A number of contributions have addressed the role of design materials (e.g. Sanders and Dandavate 1999, Binder and Brandt 2008) and process (including timing and roles) in design (e.g. Sleeswijk Visser *et al.* 2005). Building upon this earlier work, in this paper the aim is to take aspects of process and materials and integrate them with space into an overarching structure.

3. The dialogue-labs method

The dialogue-labs method was originally developed for the 'Augmenting mood boards' case in 2007 to establish a creative space for dialogue among researchers and end users (i.e. industrial designers), to jointly generate ideas for interactive support tools and to develop them further together into concept. In the 'Augmenting mood boards' case, the physical space of the dialogue-labs was designed to look and feel like a design studio, setting the scene where end users and researchers would engage in discussions during co-design activities. Hence, the authors started to call the method dialogue-labs (Lucero and Vaajakallio 2009). The method, as is discussed in this paper, has been applied for the last four years altogether 18 times in four different design research projects conducted both in academic and industrial contexts (see Table 1 for an overview).

Dialogue-labs are primarily used in the middle stages of the design process to support researchers and designers in creating ideas and concepts for future designs together with relevant stakeholders and end users. The scope of the dialogue-labs method as it fits into how co-design processes are typically orchestrated is presented

Table 1. Overview of the four dialogue-labs cases.

Case	Context	When	Participants	Sessions
1. Augmenting mood boards	Academic	August–November 2007	12 designers 4 researchers	7
2. Playful interactions in mixed reality	Research	February–April 2009	7 researchers 3 designers 1 programmer 1 manager	7
3. Playful social interactions	Industry	October 2009	4 designers, 2 researchers 1 manager	2
4. Playful services for growth economies	Research	April 2010	6 researchers 1 manager	2
Total			42	18

in Figure 1. The findings from user studies that take place in the Problem–Analysis–Research–Specify stages of the design process (e.g. probes, contextual inquiries, interviews) usually provide the content for the dialogue-labs.

To clarify the dialogue-labs method and its characteristics compared to other workshop methods, three main structuring aspects of the method are highlighted and discussed: process, space and materials. The focus is on these three aspects because dialogue-labs presents a specific assemblage of the three that has proved fruitful in practice; in a broader perspective, this also opens up a wider discussion of how these concerns can be understood and addressed in design research and practice. In dialogue-labs, the process and materials emphasise the means of approaching problems from different angles and of facilitating different designerly inquiries through the use of tangible props and design materials in the collaborative design dialogue. Space links the dialogue-labs method to a Design:Lab (Binder 2007) type of approach but in which the physical surrounding, a meeting room, has temporarily been transformed into a design studio with sofas and coffee tables to create a relaxing, creative and inspiring environment. In the original 'Augmenting mood boards' case, this set-up mimicked the specific context where the future design solutions would be used. However, apart from a few modifications, the original physical arrangement has remained mostly unchanged in the following dialogue-labs sessions as it successfully accommodates distinct locations within the space. The three structuring aspects (i.e. process, space and materials) in practice form an intertwined structure and atmosphere for dialogue-labs; however, for the purposes of presentation in this paper they are discussed separately in the following subsections.

3.1. Process: sequences of design action and reflection

The dialogue-labs provide a clear step-by-step process to make sure that time and available resources are well spent, and the results documented accordingly. Participants move within the room according to prearranged design spaces where different tasks can be found at each location. This creates overall frames for the two-hour session with specific time limits, i.e. eight rounds of 15 minutes. Inside this frame there is freedom for participants to reinterpret the tasks given to find a meaningful focus. The strict time limits resemble brainstorming; it encourages creativity and obtaining a large amount of ideas without careful evaluation. The sessions are planned for a total of two hours, with a five-minute break in the middle, and consist of the following parts (Figure 2).

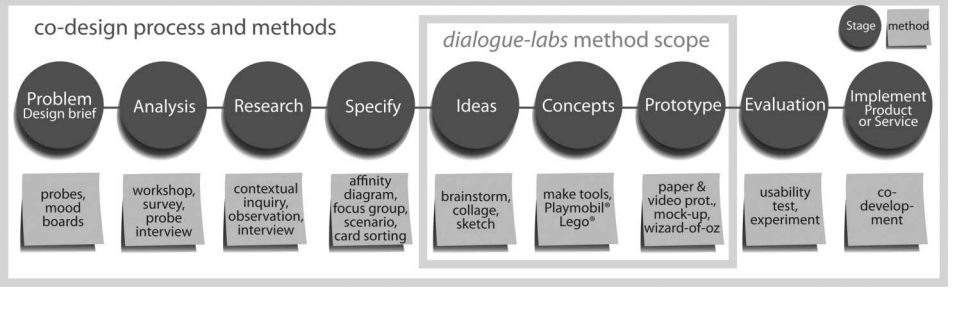

Figure 1. Stages and methods of a co-design process. The scope of the dialogue-labs method covers the Ideas–Concepts–Prototype stages.

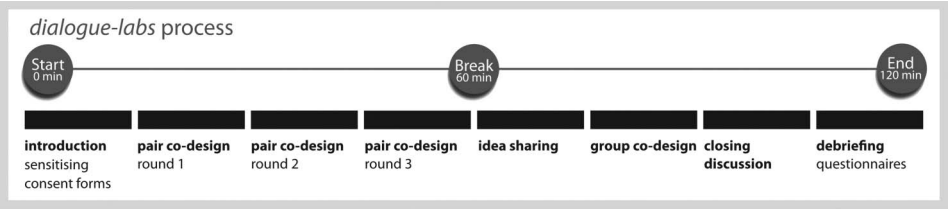

Figure 2. The dialogue-labs process. Two-hour sessions are structured into eight rounds of 15-minute activities (with a 5-minute break after 1 hour), involving work in pairs as well as with the complete group.

3.1.1. Introduction (15 minutes)

To create a comfortable and relaxed atmosphere, participants are greeted and introduced to each other when they arrive as if they were coming to our home. As in every workshop, it is essential in the beginning to explain the main purpose of the session. The session begins by reading together a summary of the main findings from previous contextual studies. The purpose of introducing these findings is two-fold: first, they act as frames by providing the main contents of the sessions. Second, they allow us to create empathy with end users, as they are the experts in the specific domain that is being studied, who find the topics discussed in the sessions familiar. The summary of the findings from previous studies may come in the shape of a definition, a visual diagram or a PowerPoint presentation. The presentation of the findings is followed by a short discussion to build a shared understanding of the main theme of the session. Finally, all participants must read together and sign a consent form to allow the organisers to further work on the ideas generated during the sessions.

3.1.2. Co-design rounds in pairs (3 × 15 minutes = 45 minutes)

Each dialogue-labs session involves between four and 10 researchers, designers, stakeholders, managers and potential end users, plus one or two people to facilitate the sessions. Participants work in pairs, which allows the main challenges of group dynamics to be overcome; it is easier for two people to reach equal participation compared to groups of three or more. Thus, the authors recommend having an even number of participants that can be divided into pairs. The end-user participants can be experts in the specific domain that is being studied and have ideally participated at previous stages of the research (e.g. as participants in probes or contextual inquiries), thus providing knowledge on the current situation and the future possibilities. However, this is not a prerequisite, as was mentioned earlier. If there are enough end-user participants involved in the session, the participants form pairs so that there is at least one domain expert in each pair. Based on the previously defined structure of the session, each pair is asked to think of new ideas, scenarios or concepts in relation to the main purpose of the session. Each pair spends on average 15 minutes in each of the three locations they decide to visit. This relatively short 45-minute co-design part typically results in various ideas.

3.1.3. Idea sharing (15 minutes)

Participants are called together as a group to share some of the ideas that emerge after visiting three locations and discussing in pairs. The group may decide to go

through each pair's ideas in order. However, often it occurs that as one pair is presenting their idea, another pair naturally jumps in and continues the presentation by introducing an idea of their own that complements the original idea.

3.1.4. Group co-design (15 minutes)

The complete design team elaborates upon and evaluates some of the proposed ideas. In some sessions, idea sharing (Section 3.1.3) and group co-design are combined into one long discussion that takes a full half-hour. The structure proposed here is flexible enough to support whichever strategy fits best with the design teams. As mentioned previously, some teams will naturally prefer to separate the sharing of ideas from the co-design of new ideas, while others will prefer to maintain the flow of a long discussion that seamlessly transitions between idea sharing and idea generation.

3.1.5. Closing discussion (15 minutes)

To round up the discussion, the complete group sits together around a coffee table for a final activity on what would be an ideal solution that might summarise the best ideas that emerge during the session. Physical mock-ups (e.g. Playmobil®) and Play Acting can provide support in the process of presenting, discussing and modifying ideas.

3.1.6. Debriefing: questionnaires (15 minutes)

Finally, all participants fill in a questionnaire to assess the quality of the ideas that emerge from the session by rating them on a seven-point Likert scale (where –3 is very bad, 3 is very good and 0 is neutral). Beforehand, participants must collectively agree on which idea to rate (one per location) by writing its name down on the questionnaire. Filling in this questionnaire provides the facilitators with an indicator of what participants felt were the best ideas, which may help the facilitators to focus their next design steps.

3.1.7. Extra: interpretation

Immediately after each dialogue-labs session, short interpretation rounds are conducted. The interpretation team usually consists of one or two facilitators. In this interpretation the main ideas that emerge during the sessions are summarised by means of sketches on A3-sized sheets of paper. Keywords are placed next to the sketches to describe the main ideas behind each concept. These sketches allow facilitators to have an initial overview of the quantity and quality of the ideas. Each A3 sheet and the ideas are coded to identify the co-design session, and the number of the idea.

3.2. Space: configuring the physical design environment

The second key characteristic of the dialogue-labs method is space, which allows aligning content to different locations, providing an inspiring space and moving around the room. A large room or office (e.g. 5 m × 6 m × 3 m) is used to allow

for different locations to be set up within the dialogue-labs space, each of which correspond to a specific activity in the process outlined in the previous section.

As previously mentioned, the basic content for the dialogue-labs consists of findings from user studies conducted in prior stages of the co-design process. Hence, activities and locations of the dialogue-labs environment are aligned to set the space according to these findings (Figure 3), which can be the stages of a process (e.g. the 'Augmenting mood boards' case in Section 4.1), categories of a theoretical model (e.g. the 'Playful interactions in mixed reality' case in Section 4.2) or other structures based on the available findings (e.g. the 'Playful services for growth economies' case in Section 4.3). While the basic idea of having several locations or design spaces within the dialogue-labs remains unchanged, the content used to provide the structure is project specific and must be defined anew every time. Providing this basic structure encourages discussion around specific relevant topics for the design process or ongoing research. Each design space (Figure 3) has a corresponding location within the room, materials and task that is formulated in an abstract enough way that inspires participants to think beyond the status quo. In each location instruction cards are available as reminders of the situation, the materials and the task.

Dialogue-labs establish a spatial frame akin to a theatre stage, in which the physical environment supports specific situations, dynamics, dialogues and creative outlets. The general setting and the furniture are chosen and arranged with two things in mind: so that they inspire and stimulate participants, and provide enough room to accommodate different design locations. In addition, setting some of the design stages by an open window can help participants to transport themselves beyond the physical space of the dialogue-labs. For instance, many participants have found inspiration from observing nature during a dialogue-labs event. The effort put into preparing this space is later rewarded by the participants' dedication while participating in the sessions.

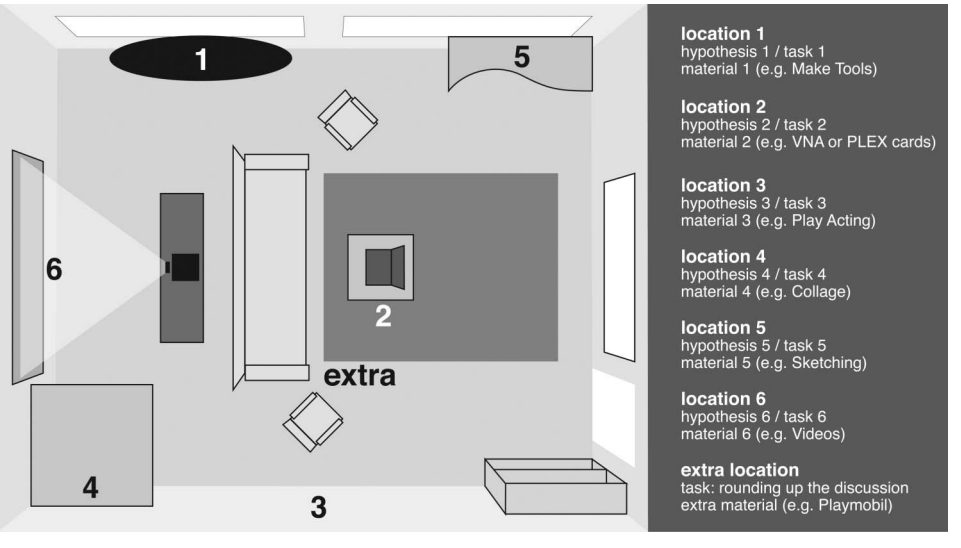

Figure 3. A typical spatial layout for dialogue-labs sessions. Hypotheses, materials and tasks are aligned to different locations. The hypotheses are based on the earlier findings and thus can be stages of a process, categories of a theoretical model or other structures.

The dialogue-labs provide a dynamic structure with several distinct locations that encourage participants to move about the room during the session. This results in opening up the design problem and tackling it from a different perspective without breaking the overall creative flow of the session. These forced transitions every 15 minutes also provide breaks to approach a new task with a fresh mind. Having a combination of moving around the room, standing up and being comfortably seated at a couch in different parts of the session invites participants to keep the kind of dynamic and active attitude needed during the session compared to being stationary for 45 minutes.

3.3. Materials: shifting between different tasks and modes of inquiry

The third and final quality of the dialogue-labs is the use of different materials (and tasks), which allow participants to build a common design language and provide them with different entry points to the design problem. The selection of props typically includes some that are reminiscent of real objects, such as magazines, postcards or red eyeglasses, as well as more abstract 'building blocks'. Videos and prototypes are also introduced as part of the design materials. Scattering the props around different locations in the room allows versatile provocations to be introduced without overwhelming the participants with a large selection of props available all at once.

According to the authors' experiences from employing the method in a range of projects, providing a wide range of materials for expression allows participants to find a common dialogue style that is appropriate for them in that particular situation. In the context of co-design activities, building a common design language may help participants to reach a relaxed and creative mood since they are not forced into any specific work or design mode. Thus, the material should have varying abstraction levels, ranging from abstract props such as Velcro-covered shapes, Playmobil (Figure 4, left) or Play Acting, to the more concrete collages (Figure 4, right), videos and sketching. As an example, a Playmobil scale model was placed on a coffee table during the closing discussion (Section 3.1.5) to stimulate playfulness with physical elements (Figure 4, left). The Playmobil can be arranged to depict a given situation or can be left in the box for participants to start exploring. Using the physical figures, one participant may present an idea, which another participant can change or elaborate upon by bringing in a new figure into the scene, or by taking the same figure used by the first participant and explaining how the original idea changes.

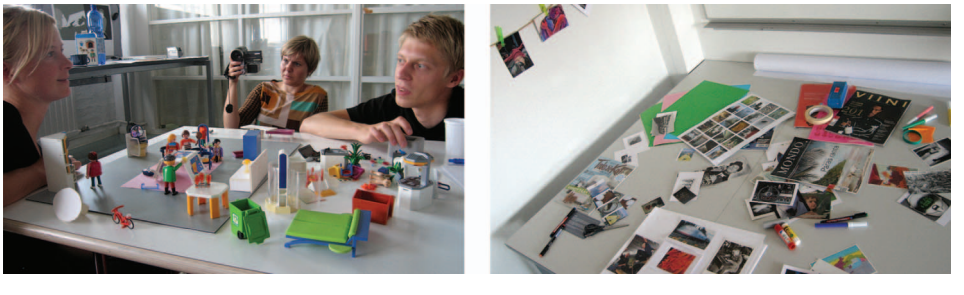

Figure 4. Materials used in dialogue-labs and their varying abstraction levels: discussing around a table using abstract props such as Playmobil® (left); building a collage using concrete images from magazines (right).

By engaging in activities that rely on visual and tangible materials, the complete design team is able to approach a given design problem from different entry points and thus come up with novel design concepts. The aim of having these different entry points is to find something that will trigger participants and motivate them to begin the generation of ideas. Participants may feel inspired by the overall dialogue-labs set-up, by the materials or tasks available at the different locations, or perhaps more importantly by the ongoing conversation with the design partner.

The materials in dialogue-labs can support the design dialogue in several ways. Besides working purely as inspiration, the props are sometimes appropriated in the enactment of design ideas solely on the basis of their visual characteristics to communicate and negotiate design ideas. They also provide access points to shared situations, which in turn scaffold joint idea development. Finally, experimentation with tangible props provides a means to test vague thoughts before they are clear enough to be verbalised.

3.4. Summary of the dialogue-labs method and its three main structuring elements

This section has presented the three main elements of the dialogue-labs method (i.e. process, space and materials) and how they form an overarching structure for co-design events. The process provides a clear step-by-step procedure for a two-hour idea generation session in which participants work in pairs. The space is carefully crafted to align content to different locations, inspire participants and encourage them to move around the room. Finally, the materials are the means for participants to build a design language of their own and to provide different entry points to the design problem. Having discussed these three structuring elements separately in this section, we will now analyse how they work intertwined by means of four cases where dialogue-labs have been applied in practice.

4. Four examples where dialogue-labs have been applied and the relations between process, space and materials in practice

The dialogue-labs have been used in four projects (Table 1) as part of research activities in both academic and industrial contexts, namely at the Eindhoven University of Technology in the Netherlands, at the University of Art and Design Helsinki in Finland, and at Nokia in Finland. In total, 18 sessions have been conducted and studied within these four cases between August 2007 and April 2010, in which 42 people have participated with varying education level, age (between 22 and 46) and gender (24 male, 18 female). In all these cases, the dialogue-labs were applied in ideation activities for future designs.

Designers' and researchers' participation in dialogue-labs has taken on different forms. During the sessions the authors' role as design researchers has ranged from being facilitators (cases 2, 3 and 4) to being active co-design partners with a heavy involvement in the entire design process (case 1). The dialogue-labs provide a flexible enough framework to support these different roles. When taking the facilitator role, dialogue-labs provide a framework that invites participants to take new standpoints thanks to the sequence of activities (process), the physical setting (space) and the props employed (materials).

Judging by the authors' experiences with conducting dialogue-labs events across these four cases, the method represents a productive combination of the three

structuring aspects of process, space and materials. In order to examine this claim, concrete examples will be provided of how these three elements are aligned in the different locations of each dialogue-labs environment. Although only one example is provided for each case, the combination of these should provide an idea of how they work together (e.g. videos and collages were used in all four cases). These four cases will now be presented.

4.1. Case 1: Augmenting mood boards

The 'Augmenting mood boards' project explored ways in which new technologies such as augmented reality could provide support for professional users (i.e. industrial designers) in their work. In the dialogue-labs event, participants explored the following task: how would you keep track of and make connections with the different contents you have for a mood board? Prior to the dialogue-labs, a series of contextual user studies with designers was conducted using a diversity of methods such as probes (Gaver *et al*. 1999) and contextual inquiries (Holtzblatt *et al*. 2004). Based on the findings from the previous studies, dialogue-labs were organised, which consisted of co-design activities with practising designers to develop future ways of creating mood boards with augmented reality. Activity and process were aligned by setting the physical space according to the six stages of the mood-board making process (i.e. collecting, browsing, piling, building, expanding and presenting), which had previously been identified in the aforementioned user studies. As a result of applying dialogue-labs, two interactive prototypes were implemented and evaluated with end users: the Funky Coffee Table (Lucero *et al*. 2007) and the Funky Wall (Lucero *et al*. 2009). A detailed account of the 'Augmenting mood boards' case can be found elsewhere (Lucero and Vaajakallio 2009).

Regarding how the three main structuring elements of dialogue-labs were aligned in the 'Augmenting mood boards' case (Figure 5, left), one of the six locations was related to the process when designers select, group, pile and make connections between the contents for their mood boards. A scenario cube was created, measuring 20 cm on each side, which represents the following situations where people connect things: (1) A DJ browsing different sounds, deciding which tracks make for a better mix; (2) a naturalist (e.g. Charles Darwin) adding a new specimen to their collection; (3) a cook with a rack full of different spices and flavours; (4) dancers and the set of movements that make a dance piece; (5) a tailor touching different fabrics for their

Figure 5. Aligning process, space and materials: discussing with the scenario cube in the 'Augmenting mood boards' case (left); prototyping ideas with Make Tools in the 'Playful interactions in mixed reality' case (right).

latest design; and (6) a librarian visually keeping track of the available books. The purpose of the scenario cube was to trigger discussions based on the examples contained on its six sides. This location was set on a wall that was covered with white paper and Post-it® notes that varied in colour and shape.

4.2. *Case 2: Playful interactions in mixed reality*

The 'Playful interactions in mixed reality' project explored the creation of playful user experiences and interactions in the context of mixed reality. The Playful Experiences (PLEX) framework (Arrasvuori *et al*. 2011) is a categorisation of playful experiences based on previous theoretical work on pleasurable experiences, game experiences, emotions, elements of play and reasons why people play. Researchers working on the PLEX framework were trying to understand the role of playfulness in the overall user experience of a product or service. Dialogue-labs was used as means to test the relevance and applicability of the PLEX framework in the design and evaluation of interactive artefacts. Participants of the dialogue-labs event explored the following task: based on the PLEX categories 'sympathy', 'control', 'completion', 'submission' or 'simulation' and using the Make Tools found on the table, build prototypes of devices that create playful experiences from the perspective of 'spatiality'. Twenty PLEX categories were assigned to different locations, activities and materials in the lab context. Hence, participants began their idea generation by using one of the PLEX categories as a starting point. The MAA prototype (Reponen and Keränen 2010) was discussed during these sessions.

Regarding the alignment of the three structuring elements (Figure 5, right), two main topics were identified to guide the exploration: 'spatiality' and 'social interaction'. These dialogue-labs sessions included four locations, so each topic was assigned to two locations. Abstract physical materials (i.e. Make Tools) aiming to stimulate the participants' thinking and allow them to prototype their ideas were laid on a high table by a window.

4.3. *Case 3: Playful social interactions*

The 'Playful social interactions' project was the result of a collaboration between Nokia Research and Maemo, the former acting as facilitators and the latter as stakeholders. The Maemo team wanted to create novel application concepts in the domain of augmented reality that would evoke playful social interactions between users. Dialogue-labs sessions were organised both to foster idea generation and to continue the work on the PLEX framework. In these sessions, PLEX Cards (Lucero and Arrasvuori 2010) and its two related idea-generation techniques were introduced as new materials for use in dialogue-labs sessions. The cards were created to communicate the PLEX framework categories to designers and other stakeholders who wish to design for playfulness. One of the outcomes of these sessions was the Collecting Faces video concept (Holopainen and Ollila 2010).

On the relations between the three structuring elements (Figure 6, left), participants were asked to generate ideas from the perspective of three PLEX framework categories: fellowship, exploration and thrill. The participants were given the following task: using these PLEX categories, think about how new services or interaction concepts could create playful social experiences. Three videos were shown from a laptop set on a coffee table while participants were seated on a couch.

Figure 6. How process, space and materials were aligned: watching a video in the 'Playful social interactions' project (left); creating collages in the 'Playful services for growth economies' project (right).

These videos were presented without sound to prompt reactions and inspire the teams to explore beyond the content of each video. The intention here was for participants to assign new meaning to these videos as they were watching them. The PLEX categories were presented to the participants by means of the PLEX Cards.

4.4. Case 4: Playful services for growth economies

The most recent use of the dialogue-labs was the 'Playful services for growth economies' project. The main goal of this project was to create novel concepts and applications for all literacy levels of youth in growth economies (i.e. Africa). The stakeholder team consisted of a Nokia research unit located in Nairobi, Kenya. Based on their experience and knowledge of the local culture, the stakeholder team defined three topics for the participants to focus their exploration on: 'employment', 'education' and 'entertainment'. Each of these three topics was set in a different physical location of the dialogue-labs environment, so that each team would be exposed to these topics while coming up with new ideas. The participants were given the following task: think about how the images could embody aspects of 'employment' using the PLEX categories of 'thrill', 'expression' and 'submission'.

Regarding the alignment of the three structuring elements in the 'Playful services for growth economies' project (Figure 6, right), one of the three main topics identified by the researchers from the Africa team was 'employment'. A mix of random abstract images was collected from magazines, together with more specific photographic ethnographic material. The material was placed inside a large green box, which was then put on a table. Participants were asked to create a collage using these materials. Participants were told to try to use the images as a source of inspiration instead of trying to assign literal meaning to them. Participants were also presented with three PLEX categories to start their exploration from: thrill, expression and submission.

4.5. Summary of the four dialogue-labs examples in practice

As can be observed from these four cases (Figures 5 and 6), dialogue-labs have been applied in a variety of contexts, using different materials and for different purposes. Each case presented a different challenge in terms of aligning process, space and materials. While in the first and fourth cases the co-design exploration was rooted in

previous fieldwork in relation to a specific user group or use context, for the other two cases the exploration was broader and used a theoretical framework (i.e. PLEX) to guide the co-design work. These four cases aim to illustrate how dialogue-labs can be used for co-design activities that tackle design problems that are very different in nature.

5. Discussion: the interrelations between process, space and materials in dialogue-labs

Taking a meta-perspective on these findings from employing and analysing the dialogue-labs method, the reason the method can be useful in co-design practice is that it both invites and scaffolds different ways of making sense of, exploring and shaping the design problem and situation. The aim of this paper has been to explore the premise that the particular assemblage of process, space and materials is key to understanding the method. In the remainder of the paper, these aspects and their interrelations are discussed.

5.1. Process: supporting different idea development strategies

One of the main benefits of the dialogue-labs method is that it provides a clear structure by means of a step-by-step process. Idea generation workshops have become common practice in companies. Varying numbers of people are invited to these workshops (e.g. four to 20 people), which can last anywhere between one hour and a full working day. During these workshops, many ideas are generated using different brainstorming techniques. The success of these workshops largely depends on the facilitator's skill in keeping people motivated and focused. However, participants often end up being frustrated by spending endless hours locked in a meeting with an unclear focus, with poorly documented outcomes and with no clear way of how to take those ideas further. The dialogue-labs method tries to introduce a clear structure that boosts creativity in a limited time frame of two hours, thus improving both the efficiency and effectiveness of the session.

Dialogue-labs prompt facilitators to think well ahead of the session in order to plan how the different types of content, tasks and materials will work together. As facilitators consider the interplay between these different factors, they may gain a better understanding of the design problem and potentially become more aware of how participants perceive the co-design activities in which they will be involved. Careful planning before the ideation session increases its chances of success. The main idea is to avoid last-minute improvisation before the co-design event.

In practice, the proposed process supports different idea development strategies. Breaking the contents of the sessions into separate locations makes participants think of different aspects of the design problem from new perspectives. For example, during the 45 minutes of co-designing in pairs, participants are forced to move to three different locations in the room. Three different strategies used by the participants have been observed. First, some pairs begin the exploration with the tasks and materials that are available to them in the first location. Then they move to a second location that has different tasks and materials and continue to evolve and shape the original idea further. These pairs then use the third and final location to finalise the idea and bring it closer to a concept using yet different tasks and materials. Second, other pairs have started a new idea in the first location; they have put this idea to rest for a while and in the third location they have naturally picked

the first idea to work further on it. Third, some participants are more at ease with exploring three different ideas in the three locations. Although the materials' ability to support converging or diverging ideas also plays a role in these different strategies, the proposed process does not force a single way of generating ideas on the participants.

Although the dialogue-labs provide a clear and structured process (i.e. eight rounds of 15 minutes), the method is not a one-size-fits-all solution. The method provides a flexible frame within which a design researcher's personal interpretations and creativity play an important role. Based on their experience and competence, design researchers can try out different things by adapting parts of the structure or incorporating specific ways of using design tools with which they are familiar. No matter how often the method is applied, dialogue-labs should feel fresh every time they are applied, both for the design researchers and for the participants.

Setting up and running dialogue-labs sessions can at times be extremely challenging owing to available resources and time constraints. First, a dedicated room is needed so that all sessions can be run in the same location. Some organisations have usability labs or meeting rooms that can be adapted to host co-design events. However, on some occasions the authors have had to use spaces outside their premises. Second, the available space needs to be booked over a long period so that the room environment can remain unchanged between sessions. To tackle this problem, the authors have tried to organise dialogue-labs events on consecutive days or as close as possible to each other. Running two sessions in one day can be heavy on the facilitator(s) and so usually only one session is run per day. However, sometimes it has not been possible to reserve a space for a longer period and therefore they have had to successively set up and dismantle the environment.

5.2. *Space: arranging and making use of the design environment*

Revisiting the perspectives of embodied, interactive and distributed cognition from Section 2.2, prompts consideration of the interplay between mind, action and world. In these perspectives, a key idea is that cognition is always dependent on the given context, and the world becomes part of cognition because we draw upon the resources of the environment and offload cognitive activities into the environment by delegating cognitive work to artefacts that help us to think and act. In line with Gedenryd (1998), design may be considered a pre-eminent example of interactive cognition in that it is concerned with the resourceful reflection upon and transformation of a challenging situation. Gedenryd shows how designers rely upon the resources at hand and make use of inquiring materials and instruments in order to bring the world into the lab, to make sense of the design situation and to experiment with ways of reshaping it. The way dialogue-labs are set up specifically aims to provide an environment and a pool of resources that scaffold these activities in order to effectively support designerly inquiry. In Schön's (1983) terminology, the dialogue-labs space is thus set up in a specific way to scaffold alternating types of reflective conversation with the design situation.

This set-up consists of a proposed process that prompts different ways of construing and addressing the design challenge, a physicospatial environment in which co-design activities can unfold and a selection of materials to help think, explore and shape, and a context to employ these three structuring elements through the design brief and orchestration of the event. Although an analytical and

presentational effort has been made to address the aspects individually in this paper, separating process, space and materials is not feasible in practice, because the materials make sense because of the context they are in, referring to both the physical space and the situation at hand. As illustrated in Figure 3, the tasks and materials are tied to specific sections of the dialogue-labs space. In addition to the advantages for shared activities and communication among participants, this set-up invites specific design moves such as shifting perspectives, transitioning between focusing on the parts and the whole, and combining understandings of the different levels of abstraction. The tasks and materials also invite and support sense-making and exploration.

Although the arrangement of both tasks and materials in the space of dialogue-labs thus invites and supports a series of design moves and offers a shared space for co-design, there are also inherent pitfalls that dialogue-labs facilitators should be watchful of. Changing physical space is beneficial in continuously triggering the participants in providing versatile ideas; however, introducing new perspectives every 15 minutes may have limited value in later design phases and may not be suitable for all participants. Furthermore, since the method offers alternating perspectives there is a risk that it can be considered exhaustive and lead participants to consider only the points of view inherent in the tasks and structure of the method. In other words, the method may bring about less out-of-the-box thinking than is required in some design situations. In addition to being attentive towards this potential issue, facilitators can take steps towards countering this issue by communicating it to the participants, by formulating open-ended tasks, and by improvising and bypassing the planned sequence of tasks if necessary. As is the case with most or all co-design methods, it takes experience to become a competent facilitator.

5.3. *Materials: supporting design inquiries and dialogue*

Creating and maintaining a relaxed atmosphere and finding a common design language between two strangers during 45 minutes can be challenging. On the basis of their experiences from orchestrating dialogue-labs, the authors found that prompting participants to find and build a common design language is one of the keys to success in applying the method. Some of the best results came when participants were not told which material they were supposed to work with next but were instead provided with a diversity of media to choose from. Consequently, designing took divergent forms in the 18 dialogue-labs sessions despite similar settings and overall structure. Expressing ideas varied from sketching on paper and experimenting with props, to discussing with almost no visualisations. This notion suggests that providing a wide range of media for expression may help participants to find the appropriate dialogue style for them in that particular situation. In co-design this may help a relaxed atmosphere to be reached, since participants are not forced into activities with which they are not comfortable.

Regarding participants' motivation, the method promotes what can be considered a layered approach to inspire and trigger people's creativity. The strategy typically consists of first reading the instruction cards together (description) and, second, talking within the team (explanation). At this stage, most teams have enough information to begin working on the task. If they feel they still need to build a better understanding of the task, the third step consists of playing around using the objects available on the table (the material). Having things to play with and touch

has helped many participants to enter the fourth step, that is to engage and start performing the task itself (the action). After a few minutes discussing ideas, the teams can sometimes forget the content of the task or feel they are a bit off track. In these situations, the teams naturally go back to the instruction cards or design material and restart the inspiration procedure.

In the terminology of Agger Eriksen (2009), the selection of props in dialogue-labs is a combination of basic, predesigned and field/project specific materials. For example, the Make Tools kit and collage material used in most of the dialogue-labs are predesigned but not case specific since their ambiguity allows the same set to be used from one project to another. Magazines and red-eyeglasses were some of the basic design materials provided in the 'Augmenting mood boards' case, whereas the videos that were shown were project specific in nature. In all dialogue-labs, videos are collected according to a particular project and need; hence, they are very much project specific. The three characteristics of design material have an influence on the resources needed in the preparation phase, and thus should be considered beforehand. Sometimes project-specific material may become general, e.g. if it represents certain practices or user groups that are of interest to some other project as well.

In spite of the available options provided by the materials to inspire people and get them going in their exploration, some participants either find it difficult to start the dialogue or who get stuck. Some participants have begun the work in pairs using abstract materials that are better suited for converging ideas (e.g. Play Acting), which has resulted in long awkward periods of silence. Participants have reported that concrete and approachable materials such as video, collages and sketching are good to begin idea exploration or similarly divergent phases in design. In line with Sleewswijk Visser *et al.* (2005), it is beneficial to allow participants to move from easier tasks to more challenging ones to become familiar with each other, to become accustomed to the lab setting and to achieve a comfortable creative mood. Similarly, on other occasions participants have been overwhelmed by the way the materials were presented to them. In one session participants encountered a set of Make Tools, a vest and glasses laid out on a table and they did not know what to do with them. Participants were overwhelmed by the amount of options that were given to them simultaneously. Placing all materials inside a box prevents overstimulating participants by having them gradually discover and remove the elements from the box.

6. Conclusion

This paper has presented the dialogue-labs method and examined the roles that the structuring elements of process, space and materials play in this co-design method. The process provides a clear step-by-step procedure for a two-hour idea-generation session in which participants work in pairs. The space is carefully crafted to align content to different locations, inspire participants and encourage them to move around the room. Finally, the materials are the means for participants to build a design language of their own and to provide different entry points to the design problem. Dialogue-labs combine these three aspects in a structured but flexible way in order to spark dialogue between the co-design participants and thus support idea generation.

The findings from developing and employing dialogue-labs indicate that process, space and materials are central to orchestrating and carrying out this type of co-

design session. Looking beyond the dialogue-labs method, it may be speculated that the interplay between process, space and materials is prominent in many other co-design methods and techniques. Through this analysis of dialogue-labs, the authors have been prompted to explore these interrelations in their ongoing work, and propose that academic contributions within design research in combination with theoretical positions such as embodied, distributed and interactive cognition present a promising foundation for examining these aspects more thoroughly in future studies. It is hoped that the discussion of the three aspects in the specific dialogue-labs method will inform and inspire the use and understanding of other co-design methods and techniques, for it addresses a paradox in co-design studies: even though many design projects aim at developing or transforming physical and virtual artefacts and spaces, the role of materials and the physicospatial design environment is relatively unexplored in the literature of the field.

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