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Abstract: How do ideas evolve in the context of collaborative design? This research explores the framing strategies and tools involved in the co-construction of a shared understanding in the early stages of a design project. We observed a team of four industrial design students working to design a popup shop. We found that, while the key design elements of the solution were present from the early stages of discussion, they were continually framed and reframed through intense verbal discussion supported by sketching reflection-in-action (individual or collective) that help each team member make sense about the popup shop branding, user experience, visibility, structure, etc. The design ideas were crystallized at the end of the fourth working session. The research presents the cycle of framing and reframing of ideas that emerged from different symbolic elements associated with a brand, allowing students to design customized, non-standard, impressive and complex forms.

Keywords: framing; knowledge co-construction; collaborative design; object-world

1. Introduction

For many years, we have been involved in teaching design to undergraduate students. We noticed that when students work collaboratively on a project, their learning experience is enriched: they better understand the complexity of the design project, they challenge each other, they learn to explain their ideas and refine their arguments to defend them, and they co-construct new understanding of the project. Nevertheless, collaborative design is rarely fully understood by students. Rather than co-constructing understanding and codesigning, students' activity is more akin to cooperation. Kvan (2000) explains that collaboration is "achieved when we have accomplished something in a group which could not be accomplished by an individual". To collaborate, the group understands the interdependencies of the members, whereas cooperation is "characterized by informal

relationships that exist without a commonly defined mission, structure or effort" (Kvan, 2000). Team members divide tasks and information is shared as needed. Also when people cooperate, the intent and degrees of participation in activities varies.

Students don't distinguish between these two types of dynamic easily. The creative aspect of collaboration that is achieved by co-construction of ideas is not well understood. In many situations students divide the project into tasks at the beginning and they assemble their work at the end. This gap of understanding encouraged us to set up design projects where 'collaboration' is central.

Understanding what design students need in order to develop and refine their abilities to collaborate with others is all the more important, given the increasing complexity of design projects as a result of economical, social, environmental and technological challenges of today's world. To meet this reality, practitioners need to work in teams of various experts. To prepare industrial design students to work within this collaborative context, workshops based on scenarios very similar to real design situations are now part of educational programs.

This paper is based on observations of a team of four students in their second year of an industrial design program. The theme of the project was the design of a temporary insulation (a popup shop) for a particular brand during a special event (more details are presented in section 3). The students worked together for seven weeks to design the popup shop and they communicated their final concept through different means including drawings, photography, technical plans and mock-ups. This paper focuses on the first two weeks of their work: the discussions about the characteristics of the project and generation of early ideas.

Our focus was on the following research question: "How do ideas evolve in the context of collaborative design among students in the context of a complex design project?" In other words, the research objective was to better understand the framing strategies and tools employed by a team in the early stages of the design process. We analyse our observations using multiple frame theories (Goffman, 1974; Dewulf et al., 2009, 2012; Putnam & Holmer, 1992; Spielvogel, 2005) and mobilize the idea of *designerly actions* (Heaton et al., 2015). In particular, object-worlds (Bucciarelli, 2002) appear as powerful elements for sharing and negotiating meaning.

This research project is part of our team's larger research program that focuses on the framing stage (framing, de-framing and re-framing) of complex and interdisciplinary design projects. The research activity studies in situ professionals as well as students co-design. Our ambition is to understand HOW framing, and particularly reframing takes place collaboratively.

2. Literature and conceptual background

Design projects are characterized as wicked, multifaceted and complex (Rittel & Webber, 1984; Schön, 1985). Even in the initial stages, they are typically characterized by a continual

back and forth between the project's initial needs and goals, clarification of intentions, and crystallization of main ideas. Design education insists on teaching student the process of 'problem-setting' and consideration of the context of the project. However, very often students are uncomfortable with fuzziness and ambiguity of problem-setting phase and prefer to get a 'given' definition of the problem to solve (problem-solving).

For Schön design knowledge is knowledge-in-action, that is mainly tacit and is revealed during the designing (1983, 1992). He approaches designing as a 'reflective conversation with the situation' which refers to construction and reconstruction of objects and relations by the designer who is dealing with the situation and wants to determine 'what is there for purposes of design'. For him, designers are in transaction with a design situation and set the problem. "In real-world practice, problems do not present themselves to the practitioner as givens. They must be constructed from the materials of problematic situations which are puzzling, troubling, and uncertain" (Schön, 1983 pp. 39-40). Designers make choices and take decisions to solve the problem through the selection of their available means, of the one best suited to the goal. The cyclic process of problem-setting is defined as a "process in which, interactively, we name the things to which we will attend and frame the context in which we will attend to them." (Schön, 1983 p. 40). The model of the process is naming, framing, moving, and evaluating.

For Schön (1994), framing is an activity that enables sensemaking based on previous experience. He proposes that reframing is the result of a process of reflection in action when designers realize that their repertory of responses is insufficient to deal with a given situation, which impels them to reconfigure their understanding of the situation. Initially defined by Goffman (1974), frames are basic schemas that help place a situation with respect to past experience, and so to build interpretations and determine what is important for actors in a given context. Frames allows individuals to selectively foreground certain elements of experience among the continuous flow of events and activities going on around them, and to relegate others to the background, at least temporarily (Putnam & Holmer, 1992; Weick, 1995; Valkenburg, 1998). A frame repertory is thus a structured set of aspects of experience, continually formed and reformed in interaction (Czarniawska, 2006).

Increasingly, design is a group activity. Collaborative design refers to activities that lead to framing and reframing criteria of a project, and lead the team to develop innovative solutions using an interdisciplinary and iterative approach (Valkenburg & Dorst, 1998; Kleinsmann & Valkenburg, 2008). For Kvan (2000, p. 410):

> "Design collaboration requires a higher sense of working together in order to achieve a holistic creative result. It is a far more demanding activity, more difficult to establish and sustain, than simply completing a project as a team".

Like a number of other researchers (Bucciarelli, 1988, 2002; Cross, 1984; Schön, 1992; Valkenburg, 1998), we view design situations as collaborative social processes. Developing shared framing is recognized as an important factor in collaborative design (Dorst & Cross, 2001; Paton & Dorst, 2010; Schön, 1994; Hey et al., 2007; Hey et al., 2008; Kleinsmann &

Valkenburg, 2008; Whelton, 2004; Dorst, 2011), but strategies leading to frame co-construction in collaborative design are underexplored (Badke-Schaub et al., 2007). Valkenburg & Dorst (1998) identify problems of synchronising understandings and activities as limiting collaborative design. They use Schön's —naming, framing, moving, evaluating— (reflective conversation with the situation theory) to study design teams and their relations that they called 'mechanism of reflective practice'. They propose a model (Figure 1) where Schön's 'evaluating' is replaced by 'reflecting'.
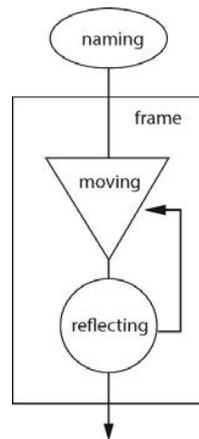

*Figure 1   The mechanism of reflective practice: the four design activities and their interplay.
(Valkenburg & Dorst, 1998, p. 254)*

The model suggests that boundaries (framing) are created after naming, and reframing happens through cycles of 'moving' and 'reflecting'. "Reflection is a conscious and rational action that can lead to reframing the problem (when the frame is not satisfactory), the making of new moves, or attending to new issues (naming, when the reflection leads to satisfaction)." (Valkenburg & Dorst, 1998 p. 254).

In the context of collaborative design, Zahedi (2011) develops the idea of co-reflective practice, based on Schön's reflective practice theory (1983), to describe how an interdisciplinary team creates a common language, exchanges knowledge and co-constructs new knowledge.

Bucciarelli (1988) argues that different team members, with different competencies, skills, responsibilities and interests, inhabit different worlds; although they are working on the same object of design, they see it differently. In order to explain how they harmonize their claims and proposals during the design process, he focuses specifically on design discourse, which he divides into three stages: constraining, moving, deciding.

> "The first is about the setting of performance specification early on in the design of the system. The second is about naming which is a design phenomenon that crystallizes images of parts and functions of the design in the minds of participants… The third is about decision making which is best seen as an overlay of interests rather than their synthesis" (Bucciarelli, 1988, pp. 165-167).

"All of these attributes of the object are understood within different frames of reference and they all might contend in a design process" (p. 163). In a later paper, Bucciarelli (2002) expands on his notion of 'object worlds' as agents for structuring design. An 'object world' is defined as "patterns of belief grounded in the object and how these guide (rule) [design] participants thought and action throughout all design activity, not just when they engage the object alone" (p. 161). The concept includes linguistic elements, such as specialized technical 'dialects' and symbol systems, but also logic, ways of thinking, sketches, metaphors and models (Bucciarelli, 1988, 2002).

For Schön, "doing and thinking are complementary. Doing extends thinking in the tests, moves, and probes of experimental action, and reflection feeds on doing and its results. Each feeds the other, and each sets boundaries for the other. It is the surprising result of action that triggers reflection, and it is the production of a satisfactory move that brings reflection temporarily to close." (1983, p. 280) This is called 'reflection-in-action'. Design knowing-in-action consists of seeing-drawing (moving)-seeing, involving doing and thinking. Not only do designers register information, they also construct its meaning through actions. This understanding led us to identify a series of 'designerly actions' (Heaton et al., 2015), used in the analysis that follows.

In his recent book, *Frame innovation*, Dorst (2015) characterizes problems of contemporary life as open, complex and networked. He mentions that frame creation that allows radical innovation is developed originally in the practices of practitioners. For him, expert designers are known for 'solving the unsolvable', which means that they create solutions and find new opportunities where less expert designers see only problems. He calls this approach to problematic situations 'frame creation'. This view of Dorst captures the motivation of this study and its focus on understanding 'framing'. Can 'frame creation' be developed as design students working collaboratively?

3. Methodology

In the context of a Design workshop —project based learning— on Events and communication, second-year Design students were asked to design a popup shop for a particular brand during a special event related to thirst. The objective was to understand diverse aspects related to the design of a temporary installation: functional, visual, structural, installation and take-down conditions, etc.; particularities of a brand; use of the brand particularities for reinforcing the design; and the interaction of public with the popup shop (user experience). Students received a 'client brief', which included some information about the brand (eska, a natural spring water). The client brief also included the marketing objectives of the popup shop and services offered, as well as specifications, such as the location and duration of the event and the footprint of the installation.

Students worked through four phases: 1) research: to better understand temporary constructions, branding, event related issues; 2) ideation: to explore collaboratively without yet considering design criteria. Students started by sharing their individual understanding of

the project brief. They were asked to sketch 40 ideas to explore possibilities. Tutors gave feedback and highlighted the sketches that held interesting ideas for the next phase; 3) three preliminary concepts based on identified design criteria such as the size and the shape of the space, the brand and the user experience; and 4) development of a final concept.

3.1 Data collection

Since we consider design to be a situated activity, it must be seen in context. This requires a qualitative methodology (Anadon, 2006; Denzin & Lincoln, 2000). Specifically, we wanted to focus on the actual practice of collaborative working (Nicolini, 2009). We relied principally on focused observation, taking a particular situation delimited in time and space as the object of inquiry. Frequently used in the field of education for assessment and evaluation, focused observation limits "snap judgments" that may subsequently affect appreciations (Duke & Prickett, 1987) by requiring that observers attend to specific elements rather than the whole picture. Distributed among a number of observers, it also allows for a variety of perspectives and better capturing the multiplicity of what is naturally occurring in a given situation. A descriptive method, observation does not provide insight into actors' interpretations of their actions, as interviews might (Denzin & Lincoln, 2000; Savoie-Zajc, 2010). Since students were working in groups, their conversations provided evidence of their process and thinking. We analysed their conversations since "through talk, the creativity and constrains of design are continually being managed and performed by participants in practice" (Oak, 2010, p. 214).

The research team observed one group of four students working together. Although the entire workshop was seven weeks in length, observations focused on the first two weeks of the activity – phases 2 and 3. Direct observations were made at four different moments during the creative process, each time for about two hours. Five members of the research team were present at each session and noted their observations in the way ethnographers might look at a phenomenon. One observer focused specifically on the way students used different tools, and another on emotional (nonverbal) interactions between students. Other observers took notes of general sense-making discussions and gestures that seemed significant. In addition, four segments, each about 45 minutes in length, were recorded on audio and video. The final observation was followed by a discussion between the research team and the students. The traces produced during the design activity (drawings, presentations, mock-ups) were also collected and were used to inform our analysis.

3.2 Analysis of data

The research team conducted collaborative analysis sessions, in the tradition of grounded theory (Glaser & Strauss, 1967). Our analytic method consisted of continually going back and forth between our research question and our corpus, questioning our data to check whether our emerging claims were supported and, conversely, whether the theory helped us understand our empirical material (Yanow & Schwartz-Shea, 2006). Morse (1994) describes

this oscillation between the conceptual and the concrete in terms of four decisive cognitive moments: understanding, reducing, abstracting and recontextualising.

Combining our multiple sources of information in order to analyze them was a challenge. First, the observers' notes were compiled into a single document, organized chronologically for each observation. This produced a synthesis of the activity. Figure 2 is an example of the layout of such pages. Two researchers then segmented this chronology, signaling a break each time there was a change (such as a change of subject, modification of concept, addition of an element, questioning a concept, etc.) The episodes identified in this way were then examined one by one, and their transcriptions coded using a categorization of 'designerly actions.' We noticed that one of the sessions we observed was not significant for the problem-setting phase and didn't contribute to the concept. That session was eliminated.

The list of designerly actions was developed in our previous work (Heaton et al., 2015) as a composite of activities found in both theoretical (Archer, Zeisel, Cross, Buchanan, Lawson) and more applied (Sun Sigma Framework, Garrett) models of the design process. We added one new action to the 13 previously identified (see Table 1). This last action (private thinking while collaborating) was identified during our observations. We also associated the actions with the type of tool (cognitive, interactional, graphic, gestural or technological) that generated or supported the action. Conversations were coded line by line, although the segment in which the line appears was also considered in order to best determine "what was going on." Table 2 is an example of conversation transcript, coded with designerly actions.

Table 1 List of designerly actions developed by authors (Heaton et al., 2015).

Designerly Actions	Codes No.
Informing (giving information)	1
Facilitating understanding	2
Questioning / requesting for justification	3
Referring to past experience or known elements	4
Identifying needs / desires	5
Presenting a synthetize view	6
Fixing a goal	7
Fixing priorities	8
Proposing ideas	9
Proposing a process	10
Determining role / task	11
Taking a position	12
Making decision	13
Private thinking (Private reflection)	14

Figure 2 *Example showing columns and rows of the observation document organized chronologically. The black row shows the segmentation, which was added by researchers. The layout of the observation grid includes two sets of coding according to designerly actions. The column 'Outil(s)' identifies tools used during the action (C for cognitive, Ge for gesture, V for visual, Gr for graphic, I for interactional). The grid was enriched with color-coding related to design elements that researchers identified during data interpretation.*

4. Results and discussion

Five visual/structural elements emerged from students collaborative design sessions: glacier, snowflake, mist, image projection and national identity of the brand. We view them as 'object-worlds' that structured talk during phase 2 and phase 3 of the design process. Identification and construction of object-worlds started early in the process. They were modified and enriched, and were carried through the end of the final version of the project. The alteration and improvement of these visual/structural elements (object-worlds) happened through discussion, sketches, cardboard mock-ups and gestures: "Broken lines, like ice breaking …"; "I see an ice cube … that's how I imagined it to start with. It could be more like an iceberg, but I saw a giant ice cube – I think we need to think conceptually, not too literally…" These elements also helped students negotiate priorities and make decisions about "what is important and significant, what is less so." (Bucciarelli, 2002, p. 230). As mentioned by Bucciarelli (2002, p. 230), "In this way, through the construction and use of these varied things, participants in design [design students] extend their language competencies. Their building and manipulation of these artifacts brings insight and robust meaning to their analyses and trials within an object-world".

4.1 In search of patterns

The process of framing is central in our research. As explained above, transcripts were coded according to the designerly actions being undertaken. Table 2 is an example of discussions between the team members, along with their designerly action codes. The detailed coding of

talk as it was performed shows that design practice required team members to "clarify, explain, interpret, assess, argue, and engage in interactive levels of reflection and critique," as mentioned by Oak (2010, p. 229). We noticed that certain actions seemed to go hand in hand with others, so for many lines more than one code is attributed to capture the meaning of the actions.

Table 2 A segment of conversation coded with designerly actions (the original conversation was in French and has been translated by the authors).

Init.	Talk	Code
M:	*Finally, what are our design criteria?*	5
MJ:	*Shall we take criteria one by one and generate ideas for each?*	10, 3
E:	*Or, do we just select three objectives?*	10, 3
S:	*Yes! it is true, he [the tutor] suggested that. […] I just want to say that when we presented, we offered three interesting options: closed space, half closed, and open. We should decide what we want to do with these options.*	4, 1, 10
M:	*Within our 40 sketches, do we want to explore the three options?*	2
MJ:	*Yeah, our three options are interesting. But when we talked, it really seemed that we wanted to create something impressive.*	12
M:	*Wait, let me write down what we are saying.*	6, 1
M:	*Related to the three options, are we focusing on 'space'?*	1, 5
MJ:	*We can start by deciding on all the dimensions.*	5, 9, 10
[…]		
M:	*I think that – we only have 6 square meters… when it's open, so that's the thing – you lose a lot of space when you do something that's on an angle…*	2
S:	*If we want to do something a lot more immersive, it gets a bit strange – we thought of something like a cave concept [...] you enter, it creates an atmosphere. But with a length of 2,40 m the potential is limited. We need to rethink that a bit.*	2, 3, 12
E:	*I like the idea of roundness …*	12
M:	*For sure, with the product [takes the eska bottle] and with all our research, we're moving more towards curves rather than walls in square shapes.*	4, 9
MJ:	*But it depends, because since the idea of…*	3, 4
S:	*It has been squarer and it could resemble an iceberg.*	2
MJ:	*Yeah, yeah, there was, like, a transparent space...*	1
M:	*I think we can achieve what we want with straight lines.*	12, 10
M:	*OK, so shall we check the design criteria just to be sure that we have everything we need to present today?*	10, 8
[…]		
MJ:	*We keep coming back to roundness … It could be a drop of water, a*	9, 4

	snowflake.	
S:	*We could design three small kiosks – drop, snowflake, rock … It's a bit like the eska logo*	9, 4
M:	*We could design a tall kiosk that is visible from far away… Give the illusion that it's ice that's producing the water.*	9
[...]		
M:	*You can integrate the aspect air conditioning I was talking about earlier. It gives a feeling of freshness to attract people.*	8, 9
E:	*You can put mist inside [mimes]*	9
M:	*We could almost do that, [to MJ]: «your mist»*	4, 9
E:	*Ohh, that's good! [satisfaction on faces]*	7
M:	*What would be really interesting I think is the cold aspect. Like an air-conditioned mist in a partly closed circle, and that's where you make your sale.*	12, 9
S:	*Like in the passageway?*	2
M:	*It would be like an aisle but you would still have quite a lot of space [points to the drawing on blackboard] Yeah, where people are walking. You would use the outside to do I don't know what yet.*	2, 9

Following this, we looked for patterns of framing, deframing and reframing in the design sessions, and used the following definitions (see Table 3) to eventually demystify the groups.

Table 3   Definitions of Constraining, Naming, Negotiating, Framing, Moving, and Evaluating.

- **Constraining** is setting the performance specifications of the project. It depends on the culture, traditions, values, etc. of participants, including External constraints (what is imposed through the brief) and Internal constraints (criteria defined by the designer or the design team).
- **Naming** is identifying relevant issues in design situations. It is created through conversation 'alone' with the situation and with others, mediated with tools: drawing, pointing, body language, etc. Naming is also when a team member draws or points to elements or parts relevant to the design problem.
- **Negotiating** is deliberating with others [to verify] if their individual proposals and claims are to be taken into account and have meaning (Bucciarelli, 2002, p. 220).
- **Framing** is setting boundaries and determining the features and priorities that the design will attempt to impose on the situation. Designers perform by 'doing and reflecting' alone or through conversations with others, mediated with tools. Designers select particular elements and relations [criteria] for attention in relation to the situation, features and order. Looking for a coherence that can guide next moves. Explained by Visser (2010), designers, through reflective conversations with design situations, 'frame' and 'reframe'

problems. With such conversations "the practitioner's effort to solve the reframed problem yields new discoveries which call for new reflection-in-action. The process spirals through stages of appreciation, action, and reappreciation. The unique and uncertain situation comes to be understood through the attempt to change it" (Schön, 1983, pp. 131-132).

- With framing, an ambiguous situation comes to be understood through the attempt to change it. "Furthermore, the practitioners' moves also produce unintended changes which give the situation new meanings. The situation talks back, the practitioner listens, and as he appreciates what he hears, he reframes the situation once again" (Schön, 1983, pp. 131-132).

- **Moving** is designer's actions (doing and thinking) inside the problem space that he/she has constructed to attempt to find solutions. It is a change in configuration. It is testing a hypothesis within a frame (Schön, 1983). It refers to development of a possible solution that fits with the context. Seeing-moving-seeing are constituents of the design stage of 'moving'. 'Seeing' has two meanings: the first is 'what is there', whereas the second 'seeing' conveys a judgment about what was seen (the first meaning). Through seeing-moving-seeing episodes, one creates design experiments (Schön, 1983; Visser, 2010). During the 'moving' activity, the designer/team tries to solve the problem but "at the same time also explores the suitability of the frame" (Valkenburg & Dorst, 1998).

- **Evaluating** (in terms of Schön, 1983) or reflecting (in terms of Valkenburg & Dorst, 1998) is the mechanism that brings the designer or the team of designers back to moving and reframing. Since design problems are complex situations/systems, moving related to an element produces changes in other connected elements of the system. This is when designers evaluate the move decision. Because a designer or a team of designers have limited information, it is not possible to know in advance the consequences of the move. But the multiple, sequential episodes of seeing-moving-seeing, and the evaluation of these episodes enable designer(s) to deal with this complexity.

4.2 Framing model

Based on analyses of our data and the theories explained earlier —Schön's naming, framing, moving, evaluating (1983), Bucciarelli's constraining, moving, deciding (1988), and Dorst & Valkenburg model (1998 - see Figure 1)—, we proposed a model (Figure 3) that formalizes our findings. The model is accompanied with a coding system for the designerly actions (Table 4), presented below.

The model shows the cycle of framing as a stage constructed by moving, reflecting and evaluating. We find these stages more global, whereas naming (and negotiating within design teams) are closely linked to constraining.
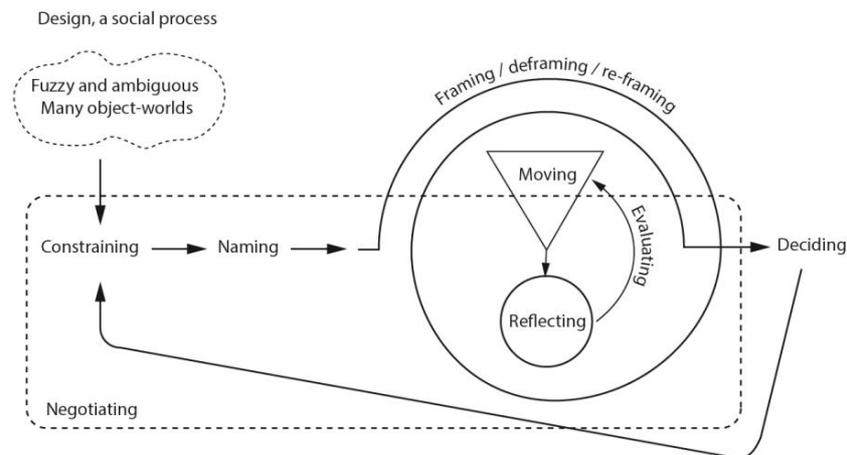
Figure 3   Model depicting the mechanism of 'co-reflective practice' of designers. The concept of co-reflective practice was introduced in an earlier work (Zahedi, 2011).

We used the model to reinterpret our data. Analyzing the design process in a fine manner (using designerly actions) combined with the regrouping of the actions (using the model) helps us to make our understanding of designing more concrete. We hope that the model can be useful not only in design education but also in professional settings and be operationalized for the development of projects. Table 4 presents how the model can be used in relation with designerly actions.

Table 4   Elements of the model and related designerly actions.

Elements of the 'co-reflective practice' model	Definition	Designerly action codes
Constraining *External and Internal*	*Ex.: project brief*	
	Int.: setting of performance specification	1, 5, 6
Naming	*Identifying relevant issues* *Elements of design phenomenon*	1,2, 4, 5
Negotiating	*Proposing, questioning, explaining, approving*	2, 3, 12, 14
Cycle of framing, deframing, reframing	*Leading to new boundaries*	
Moving	*Propose change, explain a tentative solution*	9, 10, 11
Reflecting	*Consider 'moving' in situation. Listening to situation 'talk back'*	6, 7, 8, 14
Evaluating	*Judge potential / evaluating fitness within situation context*	3, 12, 14
Deciding *External and Internal*	*Int.: overlay of interests within the team*	13
	Ex.: client / tutor instruction	

A synthetized definition (in terms of action) is added for each element of the model to make the model operational for research, in educational settings and professional projects. We consider two types of 'Constraining' and 'Deciding': External constraining refers to imposed restrictions (by client, regulations, etc.) and cannot be changed. Internal constraining refers to criteria and specifications defined by the design team as fundamental performance specifications for the project. Internal deciding refers to decisions made by the design team to crystalize a concept or a direction whereas External deciding is about suggested (or even imposed) direction by tutors or clients (Zahedi & Sharlin, 2013).

4.3 More about the collaborative design

Many issues and conditions influence collaborative design: knowledge, expertise and skills of team members; the nature of different design tasks; available time; influencing external conditions including organizational why of functioning; team's implication and availability; etc. (Badke-Schaub & Frankenberger, 2002; Goldschmidt & Badke-Schaub, 2011; Kleinsmann & Valkenburg, 2008).

In the situation observed, object worlds served an essential function: "they enable negotiations among participants with different responsibilities and technical interests" (Bucciarelli, 2002, p. 230). We also noticed that one of the students took on the role of facilitator. This was agreed upon informally and without discussion within the team. He kept track of what was agreed upon and constantly recentered the team negotiation on the agreed-upon criteria.

5. Conclusion and further studies

Our goal in this exploratory study was to find answers to the question presented earlier: on how ideas evolve in the context of collaborative design among students, and develop tools and guidelines in order to assist students in collaborative design. We explored the framing, de-framing and re-framing process within a team of industrial design students who worked collaboratively on a design project. We used a set of designerly actions to explore our data in depth and interpret our observations. The detailed coding of talk as it was performed over the whole observation period, points to the vital role of discussion among team members in clarifying, explaining, and interpreting as well as in encouraging reflection and critique. The interpretation led us formalize a model that is inspired by Schön's naming, framing, moving, evaluating model (1983), Bucciarelli's constraining, moving, deciding model (1988), and Dorst & Valkenburg's model (1998). The model, combined with designerly actions, is part of the contribution of this paper, a new approach to analyzing design communications in social settings. This case study is the third in a series of case studies that the research team has conducted in both educational and professional situations. The case has its limits: on the one hand, although the research team observed design activities during critical periods, the entire process was not recorded and it is possible that significant developments occurred outside the observation periods. In addition, we do not have a way of knowing how the lecturers' actions, such as providing advice and instructions, influenced the process. Thus

one of the questions that will be considered in future studies is "to what extent would the resulting model remain the same with or without lecturers intervention?"

Further studies are planned to allow us validate the applicability of the model to other design situations involving talk, gestures and the use of artifacts during early phases of design, and to improve it.

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