Dissolving Disciplinary Boundaries in "Making Together": A Recall of the Boundary-Object Methodological Power

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Abstract

The goal of this article is to contribute to the literature on interdisciplinary collaboration by suggesting that efficient collaboration occurs when boundaries disappear (and not by trying to bridge them). By using Star and Griesemer's notion of boundary-object as a framework and a constitutive approach to organization we can comprehend this "dissolving of boundaries." This conceptual articulation allows me to reveal the "making together" as a means to dissolve disciplinary boundaries. This article shows how an architectural "project" becomes a site for communication enabling collaboration between specialists from various disciplines.

Introduction

The industrialization era of the eighteenth and nineteenth centuries led to a significant segmentation of the working tasks that widely impacted and increased the professionalization phenomenon, which is a characteristic of the working environment of our times. The dominant functionalist thinking of the early twentieth century (Wittorski, 2008) reinforced the professionalization. "It was [functionalists] who came up with the notion that professions should be identified by certain 'traits' that marked them as a particular and special kind of occupation" (Abbott, 1995, p. 547). Although specialization has plenty of benefits – as deepening specific knowledge and professional practices – complementary specialized activities need to intersect at a certain point. Indeed, resolving particular complex problems requires a common

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understanding that can only be created by the grouping of multiple perspectives (Abbott, 1995; Carlile, 2002; Giery, 1983; Star & Griesemer, 1989). This article explores the ways of mediating the work of these heterogeneous groups when considering the collaboration space as a communication site.

Paul Carlile (2002), in a literature review on knowledge in organizations, stresses the challenge triggered by the valorization of expertness and, as a consequence, the emergence of clear-cut territories of expertise. Moreover, since every discipline and professional sector continually refines its specific knowledge, a constant hardening of the contours of fields of expertise is observable (Abbott, 1995; Bechky, 2003; Carlile, 2002; Giery, 1983; Star & Griesemer, 1989). Carlile concludes by acknowledging the difficulty of managing knowledge transfer in situations of collaboration nowadays. He argues that these professional barriers prevent problem-solving, knowledge creation across fields, and innovation in organizations.

The issue of cross-discipline and trans-discipline collaboration has been largely addressed through the notion of "boundary." Scholars from diverse fields of interest have discussed the issue of interdisciplinary collaboration from the boundary perspective and proposed plenty of theories and strategies to bridge the limits of disciplinary and professional territories. The boundary-work (Giery, 1983), the social work of boundaries (Abbott, 1995), the articulation of work (Corbin & Strauss, 1993), the object of control (Rennstam, 2012), boundary crossing, boundary spanning, boundary organization, boundary shifting, territorialization, professional jurisdiction, politicization, relocation, the institutionalization of boundaries (Lamont & Molnár, 2002; Trompette, 2009; Trompette & Vinck, 2010), and the well-known boundary-object (Star & Griesemer, 1989), are all notions that have populated the academic dialogue on this topic. However, this wide literature has mainly focused on understanding how to "cross" disciplinary boundaries without ever seriously calling their very existence into question (Barley, Leonardi, & Bailey, 2012; Bechky, 2003; Carlile, 2002; Nicolini, Mengis, & Swan, 2012).

Take for example Juliet Corbin and Anselm Strauss's (1993) renowned article exposing the notion of the "articulation of work" as a framework for collaboration. These authors note that in a collaborative process, actors, while performing their tasks, inevitably need to renegotiate their positions in relation to one and another. This renegotiation, as Corbin and Strauss (1993) point out, is associated with actors' own disciplinary role and function. In other words, these authors are saying that a group of actors can effectively collaborate, but always in respect to their specific expertness.

The results of this exploratory study diverge from the boundary literature, as it suggests the possible *disappearance of disciplinary roles* in a collaborative context. This article first seeks to contribute to the literature on interdisciplinary collaboration by considering that efficient collaboration can also occur when boundaries disappear. Second, this article challenges way that the boundary-object framework has been used in the last decades: the boundary-object notion is used as an analytical tool (Star & Griesemer, 1989) and not as a mediating device for collaboration. This analysis seeks to identify the factors that facilitate interdisciplinary work when the collaboration space is

seen as a communicational site. Ultimately, this article shows that it is the analytical application of the boundary-object that brought up the experience of "making together" as an interdisciplinary work facilitator, which led to the dissolution of boundaries.

To achieve this goal, this article explores the constitutive role of communication in organizations (CCO) articulated with the notion of boundary-object (Star, 2010; Star & Griesemer, 1989). This approach characterizes communication as a symbolic activity between subjects, but also as being achieved through the participation of objects, bodies, and sites (Ashcraft, Kuhn, & Cooren, 2009). The constitutive role of communication in organizations enables a communicational analysis of an interdisciplinary collaboration in a context where the use of objects, material contexts, abstract notions, and action are at the core of interdisciplinary work. This conceptual framework reveals how an architectural "project" becomes a site to analyze communication. Ultimately, this article discusses how this tool of analysis revealed the prominence of "making together" as a cohesive factor in an interdisciplinary team.

Boundary management and communication: Elements of a conceptual framework

A WORD ON COLLABORATION

Generally speaking, when aiming for problem-solving, the complexity of today's realities brings forward a need for the jointed work of professionals from various expertise and disciplines (Barley, Leonardi, & Bailey, 2012; Bechky, 2003; Carlile, 2002; Dossick & Neff, 2011; Fujimura, 1992; Gray, 1998, 2008; Jeantet, Tiger, Vinck, & Tichkiewitch, 1996; Nicolini, Mengis, & Swan, 2012; Olsen & Heaton, 2010; Trompette, 2009). A great example of this need, linked to a major current matter of concern, is the scientific collaboration around the issue of climate change; hundreds of scientists are operating together from multiple locations around the world to produce a report every four year (IPCC, 2007). Another illustration can be found in health systems. In order to achieve a complete diagnosis or to perform surgery, the joint participation of multiple medical specialities is required. Despite these collaborative requirements in many spheres of our daily contexts, efficient methods to better carry out a cross-disciplinary marriage are still lacking (Gray, 2008). This article addresses this particular concern: strictly speaking, the management of boundaries required by an interdisciplinary collaboration.

Barbara Gray (1989) says collaboration "[is] a process through which parties who see different aspects of a problem can constructively explore their differences and search for solutions that go beyond their own limited vision of what is possible" (p. 5). In an article advocating for an interdisciplinary approach to innovation, Carlile (2002) follows this definition of collaboration. He stresses the necessity for today's industries to favour the joint work of different types of knowledge to innovate and thus face contemporary issues. As underlined by Carlile, transferring a professional knowledge is difficult because its growth is too well-rooted in a single specialization, or its uses dictated to a single kind of problem-solving. As knowledge matures through practices in a specific domain, professionals develop strong tacit knowledge. Unfortunately, this is difficult to transfer. This practical conjuncture actively contributes to the creation and persistence of professional boundaries.

If the goal is to make organizations progress, a diversity of knowledge and expertise among actors in a joint work process is inescapable. This need for plurality in collaboration situations is not only attributable to human actors. Gray (2008) identified collaboration as being operated through interactional processes such as "decision-making, problem solving, conflict resolution, information exchange, coordination, and boundary management" (p. S125). Agendas, mails, contracts, timetables, schemas, and so on are all material actors playing a role in coordination activities within a group. Holding on to the *plurality of actors'* requirement, practices (Nicolini, 2009), routines, and habits (Lorino, 2013) are all additional communicational activities participating in the sense-making of these interactional processes. This "material" perspective of collaboration is especially interesting in architectural contexts: a domain commonly recognized for employing materiality (drawings and models, but also quotations, timetables, agendas, etc.) for its communicational needs. We have to expand our exploration of the activities and practices arising from the use of material devices for the benefit of collaboration.

In sum, this quick review demonstrates that learning processes in today's working environments lead to the acquisition of knowledge limited to a specific disciplinary field. Paradoxically, a plenum of knowledge is required to ensure innovation and to solve problems efficiently (Carlile, 2002). For example, an architectural project – architecture, landscape architecture, urban planning, engineering, carpentry, mechanics, accounting – requires all types of critical knowledge to address the complexity of a building construction. What are the possible ways of transcending these boundaries during a collaborative work to ensure innovation?

WHAT ABOUT COMMUNICATION IN COLLABORATIVE CONTEXTS?

Every act of communication in collaborative situations is a heterogeneous process of "working things out" (Corbin & Strauss, 1993, p. 71). People *work things out* through the use of interactional mechanisms (Gray, 2008) as a means to manage, maintain, and challenge the limits of professional boundaries.

> Working things out is the interactional process through which arrangements are established, kept going, and revised. This process consists in a series of actions taken by participants, in response to what is said or done by others during the process of making arrangements. … Strategies include negotiating, making compromises, discussing, educating, convincing, lobbying, domination, threatening, and coercing. (Corbin & Strauss, 1993, pp. 73, 82)

Through their encounters in shared spaces, a multiplicity of actors will interact, exchange, and share the historical and cultural baggage they are carrying to readjust themselves (Corbin & Strauss, 1993). It is also through the mobilization of material objects or symbols that we constitute our collaborative realities. Words, songs, artefacts, images, speeches, objects, built spaces, etc., can transport subjective knowledge. These non-human actors are performing too in those meeting spaces. In these regards, it is accurate to claim that an act of communication embraces the intersection of multiple agents. Moreover, Poul B. Olsen and Lorna Heaton (2010) argue that effective collaborative approaches are based on relationships of trust. They observed that this

feeling of trust is built through the shared routines and hardships a group encounters, but also by maintaining interpersonal relationships (Barley et al., 2012). Communication is a key element in developing interpersonal relationships, which are the foundation of relationships of trust and respect in an organizational environment.

This article further explores the boundary management issue from a constitutive approach. Endorsing a constitutive approach means, for an observer, being conscious of studying an object – here interdisciplinary collaboration – continuously in transformation *by* and *through* the communicational activities. As collaboration implies organizations and organizing (Weick, 1995), this article is concerned with communication processes within or in between organizations. Before going any further, it may be useful to clarify the meaning of "organization" and "organizing" from a constitutive perspective.

An organization emerges when people have the opportunity to interact with each other in order to achieve a common goal (Ashcraft, Kuhn, & Cooren, 2009). The organization is not only the result of institutional will; its constitution goes far beyond common meaning (company, family, sports teams, etc.; Weick, 1995). An organization is realized through the encounter of actors aiming to make sense of a situation together, which is essentially achieved through communication processes. An organization is a space of constant negotiation about its activities toward a common goal, and communication is what permits, creates, and maintains the organizing process to reach this goal (Ashcraft et al., 2009; Weick, 1995). Such a communicational posture asks: how is communication constitutive of an organization? In other words, how do communication activities interplay with professional boundaries to create an "organization"? Or, even more precisely, how do communication activities transform the boundaries while professionals are collaborating?

A CCO approach considers communicational acts as a symbolic activity between subjects, but also as being achieved through the participation of objects (Ashcraft et al., 2009). The interdisciplinary collaboration literature defends this statement (e.g., Barley, Leonardi, & Bailey, 2012; Bechky, 2003; Carlile, 2002; Dossick & Neff, 2011; Fujimura, 1992; Ingold, 2013; Jeantet et al., 1996; Lamont & Molnár, 2002; Nicolini et al., 2012; Star, 2010; Star & Griesemer, 1989; Vinck, 2009). All these authors see material support as an infrastructure facilitating work across boundaries, because "when individuals with different types of knowledge communicate with each other, they often employ objects—such as sketches, photographs, or tables of data-to help them convey ideas" (Barley et al., 2012, p. 280). However, CCO researchers are going beyond the mere material as a support, proposing that the constitutive activities of our daily social reality are leaving recognizable marks. By doing so, CCO makes visible the pervasiveness of "action" in *working things out* and creating interpersonal relations. They go on by affirming that these intangible but recognizable marks also enable us to outline *spaces* (Ashcraft et al., 2009).

This article proposes that materiality contributes to the management of boundaries by generating "lived spaces" (Boutinet, 2005). In other words, as actors activate a multiplicity of agents to communicate, and thus organize themselves, they are

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5

performing identifiable communicational sites: spaces dedicated to managing professional boundaries. Before more deeply explaining the nature of this organizing space with the help of the field data, let us first revisit the boundary-object concept.

WHAT *IS* A BOUNDARY-OBJECT?

The notion of boundary-object has extended with the renowned article "Institutional Ecology, 'Translations,' and Boundary Objects," by Susan Leigh Star and James R. Griesemer (1989). The boundary-object concept rapidly became a victim of its popularity: for the past thirty years, numerous scholars reused the notion and applied it to many objects (e.g., social sciences, medicine, organization theory, history, feminist theory, information sciences, and so on). This is why, even though this theoretical notion is well-established, this article explores boundary-object using Star's (2010) article, "This Is Not a Boundary Object: Reflections on the Origin of a Concept."

As presented in Star and Griesemer's 1989 article, the boundary-object notion called for an ecological perspective on collective action and innovation, as both are characterized by the need for the heterogeneity of actors (Trompette & Vinck, 2010). Star and Griesemer (1989) define the boundary-object as "something people [from diverse attachments] act toward and with." (Star, 2010, p. 603) Its materiality, the fact that it becomes "matter," derives uniquely from its introduction to a situation: it gains "matter" directly from the action it is embedded in. The boundary-object is not a facilitator but an object of cooperative work. In that sense, the boundary-object is not something meant to facilitate reaching consensus but a frame to "analyze the nature of cooperative work in absence of consensus" (Star, 2010, p. 604). Pursuing this description, unlike the other concepts derived from the boundary-object enumerated in the introduction,[1] the boundary-object concept is mobilized as an analysis lens on the field data presented here.

Star (2010) goes on about the boundary-object by explaining it "allow[s] different groups to work together without [prior] consensus" (p. 602) and without the need for a shared language. She redefines the concept as follows:

1. *Interpretive flexibility*: the object's significance will depend on its use and the interpretation of a specific group. This feature is the most renowned one, as it has been largely mobilized by constructivist approaches (Lamont & Molár, 2002).
2. *Organic structure:* the material and/or organizational structure of the object is constructed in an organic manner as information needs arise. In other words, "groups that are cooperating without consensus tack back-and-forth between [the] forms of the object" (Star, 2010, p. 605), the moment the object becomes a standardized tool, it mutates into a stabilized infrastructure.
3. *Scale* is the most important aspect because, as Star specifies (2010): what is not a boundary-object is entirely a question of scale. She "think[s] the concept of boundary objects is most useful at the organizational level" (p. 612), for questions of social interest.
4. Finally, Star (2010) adds a fourth feature: *"information and work requirements,"* which means "work" can be seen as any cooperation activity.

Star (2010) concludes: "the object (remember, to read this as a set of work arrangements that are at one material and processual) resides between social worlds (or communities of practice) where it is ill structured" (p. 606). She adds the object is located "in" the boundary:

> [A boundary] is not a clear-cut line but a shared space, where the objects are common to the groups in collaboration situations. In other words, the object significances are confounded and continuously in transformation in the boundary space [it serves] as the basis for conversation, for sharing data, for pointing to things–without actually demarcating any real territory. (p. 608)

Following this definition – an object getting matter through cooperative action at the intersection of disciplinary territories – it is accurate to affirm the link between the boundary-object and the CCO perspective. In other words, a boundary-object can be seen as a communicational tool (and site) always in transformation throughout organizing activities. This article will now demonstrate how a "project" (more specifically an architectural project) can be seen as an organized communicational site, or how the project can be seen as a boundary-object.

The "project" as a boundary-object? A conceptual framework

Generally speaking, the notion of project has multiple definitions and is used in as many contexts. Commonly the project is "a specific plan or design" (Merriam-Webster, n.d.a, n.p.) for a group as a means to reach a given goal. Nevertheless, Jean-Pierre Boutinet (2005), a French anthropologist, deepened this tenet in a manner that suits the conceptual framework proposed here.

Boutinet (2005) argues the project first arises from an actor's ideational intention – it is a space/time projection – that proceeds in the here and now and disappears when the goal (the object) is materialized. In that sense, the architectural practice (given that architectural practice is always referred to as a "project" in the professional field) is the passage from a project space to an object space (Boutinet, 2005). Individuals, thoughts, techniques, practices, knowledge, et cetera pre-exist a project, and as many actors appear along the way. However, from a time dimension, the project itself stays an ephemeral space. Boutinet (2005) proposes the concreteness of the project (the final object) as the expression and witness of the "lived space" (p. 391) of the project. This is why he qualifies the project as a "mode of existence" (p. 7) or, to refer to the communication stance used here, as an organizing space/time that is made sense of through communication activities. Even though a project initiates with guidelines, it is not a linear operation (Boutinet, 2005), this mode of existence requires Karl E. Weick's (1995) ongoing organizing scheme. The active sense-making process, in an architectural context, is ultimately materialized in the architectural object itself. The finalized object symbolizes the death of the project as a *lived space*. From this perspective, and following CCO tenets, the "project" can be defined as a communicational site. Moreover, the project space supported the actors becoming connected, until the organizing process crystallized in a final tangible object. When the object is concretized, the project dies and the object stays in recognition of this *lived space*.

Previously, quoting Star (2010), the boundary-object was qualified as a space able to host heterogeneous objects. As it "allow[s] different groups to work together without [prior] consensus" (Star, 2010, p. 602), and without the need for a shared language, the boundary-object concept is an adequate synonym for the "project" concept as a *lived space*. The four features identified by Star (2010; Star & Griesemer, 1989) strengthen this stance.

Interpretive flexibility

A project can assemble multiple kinds of groups and experts to "exist" and evolve. Even though a project runs to a specific goal, this goal has specific interpretations to each of the groups of actors implicated. Take the example of a house:

- for an architect, a house can represent the achievement of a creative activity,
- for a bank, it can represent an investment,
- for an engineer, it can be the realization of a regular calculation exercise,
- for the user, it can be envisioned as a better living space,
- and so on.

Organic structure

As Boutinet (2005) argues, a project is not a linear process – although it is often planned, and although investors would really like it "perfectly planned" to avoid any delay – along the way, unforeseen events will arise (a lack of material resources, a windstorm, an electricity breakdown, etc.). These events will require new resources, new expertise, et cetera. Thus, a project is incontestably an organic structure.

Scale

A project has an adequate scale in regards of Star (2010) recommendations; although a project can be complex, it still allows human interactions and the creation of social ties. For example, projects are commonly used in management at an organizational scale (Katz, 1982).

Information and work requirements

Concerning this feature, Star (2010) says it means that work can be seen as any cooperation activity. A project is all about interactions: every activity of a project is a collaborative act between groups of actors, but also between actors and objects.

In sum, a project has all the requirements to be deemed as a boundary-object providing a communication space for the actors. Now the article will present the methodology employed in this study, followed by an analysis of the architectural fieldwork. It will explore how this *boundary-object-project* framework allowed "making together" to emerge as an effective feature to enhance the collaboration between object worlds.

Methodology

To challenge the boundary literature, this article explores an architectural context. The author's background is the first justification to this choice. As a graduate of architecture and environmental management and being employed in an engineering firm in wood construction, I initiated this communicational research project to combine my fields of interest. Moreover, as a professional from the architectural discipline in an engineering

world, I personally encountered the interdisciplinary collaboration deficiency as presented above.

My research on the issue of interdisciplinary collaboration is based on the case study of a ten-day architectural competition that groups fifty international students from the architectural and engineering fields. The purpose of the Wood Construction Challenge (a competition held every year since 2005)[2] is to sensitize students (future practitioners in the construction field) to methods for using wood in modern building. The organizers promote wood as an ecological material. Most importantly, the Wood Construction Challenge also aims to support a joint learning process between architects and engineers. During the competition, to accomplish that mission, ten teams of five students from different disciplines take on the "project" of building a small-scale architectural object.

This data was collected during the competition's 2014 edition using participatory observation – I was a member of one of the teams – followed by semi-structured interviews with nine of the participants. Four of the interviewees were participants of my own team, two were from a team I observed at a distance, two others were participants from a past edition (2011) and, the last interviewee was participating in the competition for a second time, having previously competed in 2013. Throughout the fieldwork, I took pictures and took notes in my researcher journal. I personally transcribed the interviews as a way to delve deeper into the data. I did three-page resumes of each transcribed interview and sent them to the nine interviewees as a way to validate my interpretations.

Afterward, I did a manual content analysis (Wanlin, 2007) of the interviews to extract their significant comments. I juxtaposed the dominant themes from the interviews with my observations and research notes. Ultimately, the analysis revealed the prominence of "making together" as a cohesive factor in an interdisciplinary team.

Discussion: Collaboration as effective "making together"

> It's funny you know … the Wood Construction Challenge is actually a way to enhance the fact that we have to work all together, engineer and architect. And it works because at the end we forget that we are architect or engineer. We discuss together and we share ideas. At some point we get so focused on the project that the surrounding world is completely put aside. That was a first great achievement you know, it has totally erased the boundaries! (Monique,[3] architect and participant in the Wood Construction Challenge 2014; author's translation)

As illustrated by this field-interview excerpt, it is primarily through ongoing action that members of the interdisciplinary team engaged themselves in "making together" – to the point they forgot their respective disciplinary backgrounds. This spontaneous remark from Monique, who was participating in this competition for the second time, clearly expresses the prevailing mood during the duration of the competition. The Wood Construction Challenge ended up as a collective working together, where the task distributions operated without any discrimination of any kind.

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9

As the competition started, the sequential division of professional tasks, as undertaken by actual practitioners (Jeantet et al., 1996), was first reflected in the team organizing process. The first two days, I observed a withdrawal from the engineers. They recreated discipline boundaries as they felt the conceptual phase was dedicated to the architects, suggesting they would be more implicated when structural calculations would be needed. An interviewee supported this observation:

> At the beginning, Frank and Pierrot were saying, "well, you are the architects, we'll wait for your ideas and them we'll go on with calculations." I responded, "No, we are going through this project all together. Everyone should give ideas because every view point is interesting." (Angélique, architect and participant in the Wood Construction Challenge 2014; author's translation)

Indeed, everyone was rapidly taken in by the surrounding enthusiasm evoked by Monique and actively took part in the conceptual brainstorming. This conceptual phase was strongly characterized by the production of sketches and miniatures – the competition organizers outlawed the use of computers for this conceptual phase. It is obvious that these objects took on a major significance as a way for participants to develop a cross-disciplinary language. In an article reflecting on the articulation between thought and object, Louis L. Bucciarelli (2002) shows that objects can become linguistic devices to mediate foreign professional languages. He concludes:

> … in the process of design, in the hectic, energetic give and take, decision-making and iteration, negotiation and trade off, [artefacts] are active linguistic elements of a living language shaped, specialized, reformed, extended, provoking new thought, confirming conjecture. (p. 231)

In other words, through the "making together" of conceptual objects (convened by the project space) toward a consensus for the actual architectural object to be constructed, teams experienced the first stages of the disappearance of disciplinary boundaries. Figure 1 depicts this "blurring." It is an example of an engineer using architectural "language" to express his idea.
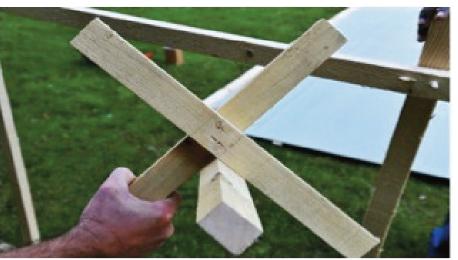
Figure 1: Through modelling, an engineer adopts an architectural language

Note: This picture represents the prototype of the structural articulation built by Frank.

At one point in the designing process of my team's architectural sculpture, I raised the idea of using a twofold and self-supported wall. This concept of an exposed structure immediately captured the attention of Frank (an engineer and carpenter participant in the Wood Construction Challenge 2014). He immediately foresaw how to carry out this idea. Regretfully, despite his flow of explanations, the team was not able to visualize his idea. Confronted by our skeptical facial expressions and criticisms, he went to the workshop to produce a prototype of the structural articulation he had in mind that could, he thought, enable us to construct the self-supported wall.

It is common practice in architectural academic programs worldwide to make miniatures to develop architectural ideas. But, as Frank recounted in his interview, this practice is not so common in an engineering curriculum:

> *Frank:* I, engineers, never do models to show conceptual things, ever. But I found out that these models are super helpful. Then Sketch-up, it is also useful if it's just for the 3D visualization.
>
> *Interviewer:* But you have good instinct. You're the one who did the first structure assembly, a detailed model, to really show how things could be done to construct our architectural sculpture. You agree? You've never done this before?
>
> *Frank:* This kind of little model?
>
> *Interviewer:* Yes, miniatures that can help you express your ideas
>
> *Frank:* Sometimes for me, when I craft [at] home, I say to myself "oh I could maybe try to do that, it could be fun." But only for myself alone, with no other motive. But then, to convince people that this structural assembly could work and could be done quickly, in series and all, this was the first time…
>
> *Interviewer:* Good. It convinced everyone. (author's translation)

By adopting an architectural language (materiality in the form of a miniature), Frank blurred the traditional role sequence in an architectural designing process. This sequence can be summarized as: first, an architect designs a conceptual form using drawings and models, then the engineer calculates the structure of that architectural form. Here, this prototype of a structural assembly, directed by Frank, an engineer, generated the overall architectural concept endorsed by the team that led to the final construction.

Although these initial changes in the work process operated through the making of miniatures, the main transformations happened in the following phases of the competition: the construction of the one-to-one scale architectural object. In his interview, Christian verbalized the strength of "acting together":

> Day one, we get to know each other, we are simply playing around with ideas and drawing. Then, the second day, when trust is established, we confront and discuss these ideas. The third day, we receive the building materials, we actively engage in the production process: we are building together. This is the moment we find consensus on the architectural concept, we knit together; it is the moment we really become a team. Fourth, and ultimately, we give our heart,

body, and soul to make this project real. (Christian, architect and participant in the Wood Construction Challenge 2011; author's translation)

These phases Christian describes highlight the breaking point of collaborative processes as we know them. The third and fourth moments he points out, where the team is all physically working together, are unquestionably the moments participants seem to forget who they are and where they are coming from: the disciplinary bindings seem to disappear.

As we collaborate to achieve a goal, as our knowledge intersects for this collective achievement, we are building a common situated knowledge. In a construction context, it is moreover a collective learning through the physical ongoing action, also referred to by Olsen and Heaton (2010) as a feeling of trust developed through physical hardships. The Wood Construction Challenge allowed participants, using their bodies, to learn as individuals through the same social and material context; they were continuously in transformation by and through the communicational activities supported by the project space. The project as a heterogeneous encounter space happens to be a unique symbolic site for the identity construction of participants. In other words, the project became an identity marker regardless of the disciplinary attachment of the participants.

The *lived space* of the project emerged from the ongoing action and the creation of symbolic markers arising from the communicational processes. The *lived space* is thus a communicational site mobilizing objects to allow the group members to readjust themselves continuously against unforeseen circumstances: as a team, participants were *working things out*. As Karen L. Ashcraft, Timothy Kuhn and François Cooren (2009) put it, these communicative practices in between actors and agents from different disciplines create communicational sites. Considering communication sites are:

> site-specific combination of presences and absences, a particular combination of physical resources, a specific conjunction of human artifacts and/or elements of the natural world, that serves to enable and focus the interaction or activities in question. (Pred, 1990, p. 123)

A second example from the fieldwork expresses the action-based group learning (see Figure 2). Once again, the centrality of material actors in the communicational processes and the physical engagement in the lived space of the project is shown.

Figure 2: The unifying wood pin

The wood pin – such a small object – became the very soul of the architectural concept of the team. Figure 2 shows the intersections of wood studs fasten by wood pins: pins are defined as "piece of solid material (as wood or metal) used especially for fastening things together or as a support by which one thing may be suspended from another" (Merriam-Webster, n.d.b, n.p.).

Indeed, on the one hand, the entire structure of the architectural object was based on the wood pins, as they were the pieces that would hold the stud connections. On the other hand, we had not only to hammer the wood pins but also to design and make ourselves the pins, a lot of pins! "But you know… I did 328 knots using 1,400 wood pins!" (Angelica, an architect and participant in the Wood Construction Challenge 2014; author's translation). The success of our project depended on our ability to "make" the whole architectural object from this element.

Angelica raised this aspect of the project often during her interview. Jokingly, Maxime (an architect on the team) established the wood planer (the essential tool used to create the pins) as the federative object of the team. The whole team was very proud of completing the wood structure using only the wood pins as fasteners. This is because none of the teachers on site believed it would be feasible to complete the architectural project in time using this method, and also because the wood pin was at the core of the team's common effort. The wood pin represented the greatest part of "making together."

This material object was at the centre of a knowledge-sharing process: at first it was a knowledge transmission from Frank to the other members of the team. Then, all team members were able to explain the construction process using the wood pins to those who came to lend a hand, or to curious people who asked for explanations. Moreover, during the construction process, the team had to make adjustments on the stages of production linked to nailing the wood pins. For example, at one point, so many people were helping nailing the pins that the team was forced to rethink the organization of work. From these examples, we can extrapolate that this object held an interactive role; the wood pin initiated the gathering, dialogues, and knowledge sharing.

Using a CCO lens, these illustrations and explanations show that during the Wood Construction Challenge, collaboration was embodied in the material objects of the project – such as miniature or numeric models, sketches, pins, or the wood matter itself – thus creating a flexible communicational space for the participants. The findings revealed that in an interdisciplinary learning context, the members of a team can become "one" through the objects they create and mobilize, the embodied practices of "making" an architectural prototype, and the communicational site these activities generate. In other words, in situations where heterogeneous elements meet – objects, bodies, sites (Ashcraft et al., 2009) – a unique symbolic site appears and disciplinary boundaries seem to fade away.

As previously demonstrated, a project can be seen as a boundary-object, which Star (2010) defined as a space where different social worlds intersect. From a CCO perspective, a project is a communicational site where the members are engaged in an ongoing sense-making activity until the object of the project materializes.

In other words, the project-boundary-object communicational framework is what permitted this analysis and revealed "making together" as a means for the disappearance of disciplinary boundaries. It is the CCO views on the body's implication in a phenomenon that helped reveal the strength of the physical experience in the creation of a symbolic communicational site. In the "making together" of the communicational objects and sites, participants created a common symbolic space they could strongly identify with – to the point that everyone forgot their disciplinary attachment. Once the project goal was concretized, new boundaries were drawn.

Conclusion

As stressed in the introduction, the literature on interdisciplinary collaboration has mainly focused on understanding how to "cross" disciplinary boundaries without necessarily questioning their existence. The results of this exploratory study diverge from the literature as they suggest that the disappearance of disciplinary roles is also a possible way to facilitate collaboration among professionals. Through an intense physical immersion in a project space (a *lived space*) where objects are at play, participants can create a powerful common communicational site they are all attached to.

These results are also quite fruitful to further develop CCO fields of interest. This recent approach has mainly grown relying on notions such as: discourses, dialogues, language, objects, technologies, media, and information technology, et cetera. It has only been a few years now that elements such as emotions or the embodied experience (e.g., Linda L. Putnam, 1993; Katherine Miller, 2002) – and these are still largely based on gender studies – have gained importance for CCO academics. Thus, this study suggests that CCOs can certainly benefit from scrutinizing the communicational strength of bodies and, more specifically, the emotional act of "making" things. In other words, looking more carefully at the implications of "getting ones' hands dirty," and how it would positively enrich the notion of the communication site as a lived space.

Lastly, and most importantly, I was able to analyze my participative observation during the Wood Construction Challenge using the boundary-object concept. In conclusion, it is important to stress that I used this concept in the initial mindset of Star and Griesemer (1989). That is to say, I did not propose the boundary-object as a facilitator for cross-discipline collaboration but as a framework to analyze collaboration. Even though these observations from an exploratory study are quite original and interesting, they do need more fieldwork experimentations. Thus, academics are invited to deepen the notion of "making together" as a path to efficient collaboration.

Note

1. The concepts derived from the boundary-object concept are mostly seeking to better equip collaborative teams and/or seeking to categorize collaborative phenomena.

2. At the time of writing, the organizers are planning a 2019 edition.

3. The name has been modified for confidentiality purposes. The participant is, however, identified by the correct discipline.

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15

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