

When artists and designers inspire collective intelligence practices: Two case studies of collaboration, interdisciplinarity, and innovation projects

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Abstract

Current mainstream collaborative processes and practices are not always fit to deal with the complexity of our society and the problems it generates. The lack of complexity-based practices for empowering collective intelligence conditions makes it difficult to address and solve intertwined multi stakeholders situations. As a disciplinary attitude can rarely succeed to solve complex and wicked problems, there is relevance and a need to question today's mainstream approaches to collaboration and innovation. We explore this issue by asking how design can be of help to lead this reflection and to translate collaboration into pragmatic activities. We propose that by focusing on a constructivist paradigm and an interdisciplinary approach, collective intelligence can be constructed. It will then generate new ways to address complex situations.

To support this, we draw from two interdisciplinary projects done in two organizations where collaborative design has translated into various social practices. In one case the creative process involves artists and managers, in the other, collaborative reflective practice within an HCI project brings stakeholders to focus on a human-centered approach to design and sustainability. We examine how design has in each case been of help, and finally, we conclude by presenting pragmatic ideas easily translatable into guidelines for fostering collective intelligence.

Keywords

Collaboration; Interdisciplinary; Complexity; User-centered approach; Project-grounded approach; Collective intelligence; Innovation.

The issues the world has had to face in the last decade have become increasingly complex, global, and interdependent. When social, political, economical, or organizational problems prove to be intertwined, the communities at stake still largely address these issues with abilities based on XXst century disciplinary methods and tools.

In such a context, counting only on disciplinary problem-solving approaches is thus inadequate to address the complexity of the global and emerging issues in a long term, responsible, and sustainable perspective.

This decade has also seen an increase in social movements claiming for recognition, expecting to take part in the reflection, and in the design of solutions as recognized stakeholders. Groups have become active, exercising ownership and willing to commit. This call for participation from various lobbies and communities has become vocal, putting pressure not only on governance but also on methods and tools to negotiate participation and problem solving. Thus collaboration has now become mandatory and unavoidable. Consequently, the abilities required to engage in this perspective of collective intelligence are becoming central to foster innovative solutions for complex problems.

While short-term, narrow sighted solutions are still often privileged over long-term commitments, the complexity and pervasiveness of today's issues call for questioning XXst century methods, as well as their underlying epistemology, which have shown their limitations.

Encompassing collaboration, shared goals, and processes, the concept of collective intelligence is a helpful paramount construct, useful to translate what we pose as being a desired outcome and a nurturing context to address complex and wicked problems from an interdisciplinary perspective. This being posed, what are the core practices that can be associated with it? What are the conditions that support the emergence of collective intelligence and, more specifically, how is

collaboration embodied? While technology, organizational and interpersonal communication, creativity and facilitation skills come to mind as some key dimensions to consider, for the purpose of this paper, we limit the scope of the exploration to the contribution of design. The central question of this paper then becomes **how design can be of help to lead this reflection and to translate collaboration into pragmatic activities**. To answer this question we will explain how we relate 'collective intelligence' to 'design' and 'innovation', considering collaboration as the key process leading to the construction of collective intelligence, in an innovation context. We will illustrate this by drawing from two interdisciplinary projects done in two organizations where collaborative design has translated into various social practices. Before providing answers to the research question, we will examine how design has in each case been of help, and finally, we will conclude by presenting some pragmatic ideas easy to translate into guidelines to foster collective intelligence.

Is collective intelligence something to design?

For Morin and LeMoigne (1999), complex thinking is essentially dealing with uncertainty by providing clarity to the strategies human beings put forward to address today's world. Complex thinking is able to *design* complex social, human and technical systems like organizations. Complexity is also the ability to bind, bridge, and connect, to put in context, to globalize while recognizing singularity, uniqueness and the concrete aspects of a phenomenon. Based on this definition, design can naturally be considered a relevant approach to address the collective phenomenon of collaborating. With the development of information technology, an interest in the active user and in activity theory also grew. The designers of human computer interfaces (HCI) found themselves confronted with new demands of users, which were created by the evolution in Information Technology (IT), and by the lack of performance of the classic engineering-type interfaces (Linard, 1998; Norman, 1988; Winograd & Flores, 1986).

While multidisciplinary addresses the study of a same disciplinary object by different disciplines or domains, interdisciplinarity aims at transferring methods from one domain to another. Nicolescu (2002) shows how interdisciplinarity triggers innovation inside and across domains by making possible new applications, epistemological reflections, and even the emergence of new domains. By considering design as the method shared between domains we are able to see how collaborative practices are enacted in different domains, as the two cases presented hereafter will illustrate.

For the purpose of this paper, innovation is seen as the key motivation and context, and we refer to Lawson (1984) who compared students from architecture (design discipline) and science (non-design discipline) and concluded that designers are 'solution-focused' whereas scientists are 'problem-focused'. In other words, innovation is seen as new and creative solutions found by design teams when attempting to solve complex problems.

Practice-based knowledge differs largely from academic theory-based knowledge in its production process. Where academic knowledge is mainly mono disciplinary, practice-based knowledge is multi and inter disciplinary, and co-created by the communities to whom it is relevant. Focused on finding complex solutions for complex problems, practice-based knowledge assumes a close collaboration between all actors. Many (Carroll 2000, Löwgren & Stolterman 2004, Findeli 2008) suggest that design focused on human beings could constitute an ideal collaborative research mode to create innovative systems.

Considering complexity, humanism, and action based learning as the grounding epistemology for the research presented here, the concept of design translates itself into methodology, problematic, products, and impact (LeMoigne, 1994; Findeli, 2001, 2008). Accordingly, collaboration embodied as practices -which are enacted through an inner posture, attitude, and processes- is the conjunction and meshwork of talents from different fields and disciplines. These practices are anchored in an asserted humanistic perspective, valuing collective and personal responsibility and ecosystemic sustainability. Thus, collaboration is a process where individuals and groups engage in collective thinking and action for the common good.

In a variety of fields, such as building design, human computer interface, artistic-creative processes, it is recognized that to solve complex problems an efficient form of collaboration among

all actors involved is needed; the knowledge for problem solving lies in the interaction between actors rather than in a collection of many individual expertise. Thus, collaboration depends largely on social skills, the ability and the will to share knowledge, leadership skills, and the aptness to act collectively in an intelligent manner, as birds in a flock do, in synergy, contributing to the knowledge flow. This flow (Csikszentmihalyi, 1996) is neither planned nor conducted, it emerges from a collective body sensing situations and reacting to them organically. This collective learning process depends on the perceptual acuteness possessed by each member of the flock, its ability to feel, anticipate, and adjust. Encompassing all the skills and abilities described here, the concept of collective intelligence provides a useful understanding of the phenomenon of purposeful collective interaction. We will refer to this as "*the capacity of human communities to evolve towards higher order complexity and harmony, through such innovation mechanisms as differentiation and integration, competition and collaboration*" (Por, 2008).

Considering human collective intelligence, in the area of HCI for example, interfaces are traditionally designed through a technology centered approach using problem solving methods (Carroll 2000, Dourish 2004). But for almost a decade now, user centered approaches have been thoroughly researched (Dourish 2004, Löwgren & Stolterman 2004) and it is accepted that to develop HCI, collaboration within a multidisciplinary team is crucial. However, in practice, we continue to recognize that HCI specialists, mostly computer scientists and designers, have a different understanding about users' interests and needs. So design practitioners encounter conflicting situations, meaning, it is difficult for team members to create a shared understanding about the needs and motivations of the end-user.

Needless to say these situations are complex ones. Current mainstream collaborative processes and practices are not always fit to deal with the complexity of our society and the problems it generates because the solutions invoked to solve such problems have themselves been designed *within and from* a much simpler and more controlling view of the world, as Boulding's nine levels of complexity model suggests (Pondy & Mitroff, 1979)¹. This absence of complexity-based practice as mainstream collective intelligence empowering conditions draws our attention to the need for change.

Alone, today's practices, fruit of a modernistic Cartesian reading of reality, are no longer relevant to address the difficult task of finding solutions to problems that no one discipline or expertise can understand on its own (Senge, 1991). Thus, there is a discrepancy between the situations we are facing, and the tools we use to address them. In other words, we can act collectively but it is difficult to be effectively intelligent together.

There is also a discrepancy between the ways actors see the situations: designers deal with 'wicked' problems and 'messy, problematic situations'. This is as noted by Rittel and Webber (1973), for whom design and planning problems were characterized as wicked problems, contrarily to techniques of science and engineering, which dealt with 'tame' problems. Alexander, Simon, and other thinkers also pointed out the distinction between design methodology and science as we can see in the following quotes. Alexander (1964) explained that "*Scientists try to identify the components of existing structures, designers try to shape the components of new structures.*" Later Simon (1969) described: "*The natural sciences are concerned with how things are... design on the other hand is concerned with how things ought to be.*" The discrepancy in understanding situations as designers versus other disciplines is highlighted by the concept of the 'designerly' way of thinking and communicating, which differs from scientific ways of thinking and communicating (Archer 1979).

Collaborating in complex situations to solve problems in an innovative way often assumes that all the information required for understanding the problems is available and understandable. Schön (1983) challenges this positivist idea which assumes that problems are well-formed and thus possible to solve. He brought about the idea that design has to deal with 'messy, problematic situations' and offered a constructivist paradigm instead. He proposed the concept of 'reflective practice' which is to search for "*an epistemology of practice implicit in the artistic, intuitive*

¹ Boulding proposed to read complexity as a 9 levels hierarchy where « all human organizations are level 8 phenomena, but our conceptual models of them (with minor exceptions) are fixated at level 4, and our formal models and data collection efforts are rooted at level 1 and 2 ». (Pondy and Mitroff, 1979, p.7)

processes which some practitioners do bring to situations of uncertainty, instability, uniqueness, and value conflict."

To address the central question of this paper, we therefore propose that by focusing on a constructivist paradigm and interdisciplinary approach, collective intelligence can be generated and complex situations can be addressed. According to Morin (1994), the interdisciplinary approach supports a dialogue and exchange of knowledge, analysis, and methods between two or more disciplines. It also implies interaction and a mutual enrichment between specialists.

Situated in this constructivist paradigm, the task for the research is then to find embodied practices that are collective and lead to intelligence; they should be collaborative, complex, and interdisciplinary. They must also nurture innovation and be innovative in their being, or, that is to say, in the way the process is sketched out in the making and how it unfolds throughout the project. Considering this, there is a need to find inspiration from design approaches focused on contexts rather than steps and procedures.

From design to collaborative design

We have defined several concepts that all contribute to creating collective intelligence situations, where wicked problems are discussed and solved by people from different disciplines who act-learn-innovate together in a creative dynamic. This collaborative design is defined by Kleinsmann et al. (2008) as "the process in which actors from different disciplines share their knowledge about both the design process and the design content. Doing that, they will create a shared understanding of both aspects." This shared understanding leads to collective intelligence, which is needed for dealing with complex situations.

Methodology

To explore the various collaborative design practices with the cases, we will refer to artistic creative processes involving artists and managers as inspiration for developing practices useful for facilitating organizational innovation in the context of sustainable development and corporate social responsibility. We present two parallel cases, the first on organizational innovation with the example of a Cirque du Soleil architectural project held in 2001-2002 (Mahy, 2008), and the second, on collaborative reflective practice within HCI projects (Zahedi et al., 2008) held in 2005-2006 at Princeton University. Two realities of collaboration will be presented: collaboration in a project where the priority was given to innovation and artistic aspects, (Mahy, 2008) and collaboration in a website design project where human-centeredness and development of the project in a timely manner were particularly critical. A comparison between the two projects follows the presentation of their respective practices focused on how collaboration emerges through design.

The Cirque du Soleil Case

The organization and project studied

At the crossroads of arts and management, this Cirque du Soleil architectural project was studied through ethnography (Mahy, 2005, 2008). A group of 25 persons, both artists and managers, worked together for more than a year to design the architecture of a cultural centre, called the 'Complexe Cirque', in Montreal. At the time of the study, while pursuing its principal activity of creating circus shows, the company was seeking to develop new products and services to respond to pressing demands from clients. From these expectations sprang the idea of a laboratory that would serve to imagine and test concepts of a new lifestyle in a place set up in Montreal before being launched elsewhere. The spirit animating the Montreal project was one of an 'innovation lab', where an exploratory prototype of a 'creative life' targeting the creative class would be created.

Any player in the creative industry faces the challenge to innovate in each project, as creativity is the DNA that flows through all business initiatives. Any creative breakthrough will eventually translate into greater business capabilities to fuel future projects, while repeating oneself means diminished power of attraction. How does an organization such as this one deal with the complex

task of innovating the outcomes – shows, music, films, television series, private VIP parties or large architectural projects to host theatres, lounges, bars, etc. – as well its work processes – artistic creative content design, business planning, reporting, etc.? What inter-group practices are enacted to foster innovation between artists and managers? The study (Mahy, 2008) revealed that both groups had their own specific creative and managerial practices while some were shared between the two groups.

More specifically, the study led to understanding how the Cirque culture permeated the creative and management practices of two teams working together, the artists and managers. The practices showed how both teams interacted, and what tools they created in order to deal with their innovative challenge by way of collaboration, in an artistic and business environment where both needed to find common ground. Collaboration emerged through the different practices presented below. For the purpose of this paper, following a short overview of the spectrum of practices, one specific practice is underlined: the storytelling process the artists used as a language to sketch out, test, update and communicate their vision. This ongoing prototyping of discourse on -and about- the project acted as a catalyst of their goal and, as such, became a design tool.

The practices

Shedding light on all the practices the artists and the managers adopted, the metaphor of the tribe acts as an anchor point and it reveals fundamental qualities of the culture. For the artists, their team is their family, with all its potential dysfunctions. Falsely egalitarian, this emotional community is propelled by trust and tragedy. Co-optation is the rule and the privileges are numerous. For managers, the tribe translates a peculiar community – they deal with artists in a world where the organization's primary leader is an artist himself. Thus, the artists' culture, rituals, and rules eventually permeate through to the managers, who leverage it and give it the strategic or operational spin they believe it requires to achieve their business goals.

While interdisciplinarity is a shared practice, artists and managers organize their respective work differently. The jam session analogy, with frequent cacophonous sounds, illustrates well the organic organization of artists, while the mountain expedition and a roped party give a good idea of the relatively hierarchic organization of managers.

The rapport between actors reveals itself through an ongoing dynamic, crossbred between the two cultural groups. It translates into openness, as well as silos. Biculturalism becomes an advantage when seeking to cross barriers between groups.

While the tribe of artists and managers try to establish dialogue between the two teams to communicate about their respective work, the artists use storytelling to talk about their goal and the vision they created to convey it. Dialogue about the expectations, requirements and management of the project is made up of encounters and misunderstandings. Through formal and informal meetings artists and managers share their views and misunderstandings are common. Neither do the teams share the same mental models, nor do they speak the same language but artists design their vision by creating evocative narratives. They speak about their creation through storytelling made up of imaginary narratives that give life to various dimensions of their vision. Then, in their work, managers use the artists' stories to sell the vision, along with their economic rationale made of facts and figures. By doing so, they add to the narratives and create their own. A polyphony of stories soon springs out of these ongoing conversations and become available to the different participants to speak about the project.

Storytelling and Narratives

Among the practices presented above, the practice of storytelling and the different narratives are central to illustrating collaboration, interdisciplinarity, and innovation. They act as strong communication tools, vehicles of expression, mobilization, and desire, used by the organizational members in their work for the purpose of creating necessary and affective binds that underlie learning, buy-in, and commitment. Flowing into or disappearing from the organizational collective memory (Halbwachs, 1951), narratives offer concurrent perspectives on the project by tapping into distinct facts, perceptions, and aesthetics, all depending on the storyteller's profile.

As presented above, the study revealed two types of narratives which acted as useful catalysts. The first type was created and used by the artists in the process of organizing the project to give the managers and external partners 'a feeling' of what was being designed by the artists. In this case, stories were told about the architectural project, the Complexe Cirque, which was about to be built. Characters, events, origins, culture, everything was imagined and dramatized to offer an aesthetic, artful, and meaningful story. For their part, once convinced by the artists' narratives, the managers would develop the business side of the same story in order to support it with the rationale of a business plan focused on return on investment, pride of being part of such an innovative, prestigious, and audacious project, etc.

Such an inter-group communication strategy assumes that both understand the others' language and intent. The study showed each group had difficulty thinking outside of their own 'disciplinary' culture, and that they might have experienced more fluid interactions if they had relied more on members who were 'bi-cultural', with interdisciplinary competences, and who were at ease within both cultures. Had there been a reflection on how to improve on these communication flaws corresponding to a collaborative approach to design, the project organization could have helped participants integrate those who were fluent in business, arts culture, and process.

Unable to understand and support each others narratives, members of both groups had to spend time trying to 'translate' the other group's narrative into their own rationality. To do so, both groups held regular meetings and long summits during which they would present to each other the artistic and the business version. The summits would last 1 to 3 days and the executive management team along with the company's founding-president would attend and intervene. The president ultimately refocused, adjusted, commanded, or dismissed ideas and people. This external regulation helped in decision making, but it also ignited rivalries and confrontation. This disconnect between the two rationalities made the project difficult to present to external partners when trying to convince them that it was a coherent, robust, and attractive initiative, both aesthetically and business wise.

The harmonic polyphony of narratives often became a cacophony for many participants in the project and it did create some dissonance among the tribe. Resulting from an artistic creative process, the stories created by the artists carried a dream. The managers ones conveyed the economical interest of becoming a partner. Between the two, stories on how to translate the dream into concrete were missing and the reflexive knowledge on the process did not lead to concluding that another type of narrative was missing and greatly needed. A story on how to work together between the two teams would have helped but it was not observed or heard of in the study.

Nevertheless, a collective narrative evoking the vision was created and had a positive reception. While it was appealing to all participants and partners, the political and economical context of the time played against the project and it was finally stopped before the building phase.

The case of HCI design

The early stages of the design process of a website was studied in order to understand what really happens during collaboration within the assigned team. Project-grounded research (Findeli 2004, 2008) was privileged for this study. This approach allows the designer-researcher to conciliate theory and practice (Findeli 2008, Jonas, 2007). In other words, conducting research and constructing knowledge become part of the design project.

The project was about the redesign of a complex website for Princeton University. The existing website was designed a short time before this intervention, however it had technical flaws which seemed to be the single reason for the client's request to redesign. A careful analysis of the website made it clear that it was designed following the administrative structure of the institution and very elaborated visual elements were used to make the website attractive to users. Although most content was valid for reuse, the site had several shortcomings from a user point of view, including deficiencies for those who had to feed the site and keep it updated. These people were office staff members who had the responsibility of updating the site daily. They were also in direct contact with users of the site and received regular feedback. A functional site was urgently needed to serve both groups but very limited time was available for redesign and development of the website. However, the time constraint in this case was of help; the client accepted to make everyone involved in the project available for the redesign and the development of the site. The

availability of these people for a set period of time was the needed condition for applying a new design model, one geared to translate disciplinary collaboration into new knowledge construction, useful for the purpose of the project.

This professional design project became our field of study. Through this research and project, we aimed to find out what conditions were needed for a variety of experts to think outside of their disciplinary boundaries, to enrich the collective knowledge regarding the end-users of the project. The idea was that the enriched knowledge would contribute to a more successful design, and to the development of the project in a timely and more economically efficient manner.

Collaboration within an environment of reflective practice

We introduced a new design model for this project (Zahedi et al., 2008). The model is based on 'interdisciplinary attitude' and 'joint reflective practice'. Its purpose is to facilitate collaboration and knowledge sharing among team members of a complex project, early in the design process, while positioning the user at the centre. The model, 'environment for reflective collaboration', allows for the construction of collective knowledge, which can be achieved by collaborative learning opportunities that combine theoretical and practical aspects.

The concept of interdisciplinary attitude means shared commitment, acceptance of approaches from other disciplines, and looking at the problem from various perspectives (Boyarski, 1998). It allows openness to other perspectives and a willingness to share information. This is to say, the interdisciplinary attitude is the mind-set that encourages an informal teaching and learning dynamic. With shared information in the context of the project, all team members understand diverse perspectives and see the relevance of diverging viewpoints. Schön (1983) emphasizes on "complexity, uncertainty, instability, uniqueness, and the value conflicts" of situations of professional practice and explains that these situations are not problems to be solved. They are problematic situations to be understood. Through 'joint reflective practice', we bring together diverse knowledge and skills, allowing the team to notice interconnected problems, construct new knowledge, and to formulate the situation differently. As reflective practice is associated with learning from experience, it allows the team to change its perspective, gain new knowledge, and challenge the concepts and theories by which they make sense of knowledge. By joint reflective practice the team can bridge different understandings and produce new knowledge to deal with uncertainty.

The model is composed of three elements: an intensive workshop to encourage both the interdisciplinary attitude and the joint reflective practice; tools to support knowledge sharing and team performance; and design as a method to facilitate collaboration and understanding between people. The workshop, the tools, and the designer in the role of facilitator, are strongly related. By applying the model, the multidisciplinary team works closely together, focused on user needs and motivations in order to redefine the objectives, the priorities, and the information architecture. Reaching consensus on these factors, coupled with the knowledge produced, was essential for specifying the parameters of the project and realizing it efficiently within our time constraint.

The team was composed of 11 persons, including office staff members, web programmers, content experts, higher management, and a designer. Although, in most activities the workshop functioned with 6 or 7 team members. Based on the previous analysis of the project, its estimated complexity, and the knowledge about the team, the workshop was planned for 6 days. We designed a set of activities to support the workshop and planned to facilitate its progress. Visual representations of design and development process were shared with the team. Also the team developed a web-based system for gathering information about the project which could be accessed when needed. As the main goal of the intensive design workshop was to redefine the information architecture of the site with a user-centered approach, it was clear that a common understanding of users' interests and needs was essential. The team participated in a set of activities such as creating persona and use scenarios. Their discussions and exchange of knowledge contributed to redefining the objectives and priorities of the site, the methods to achieve them, and to retaining a constant focus on the users.

It was clear that we were dealing with a 'messy' situation. In HCI, these situations are complex: they are unique in their context; there is a continuous change of users' needs; development of

information technology is fast; and there is a necessity to work within a multidisciplinary team. In working with multidisciplinary teams we had already noticed that team members were mainly concerned with their own expertise, making it very difficult to consider the end-user, and that they had different understandings of users' interests and needs. Being engaged in the activities of the workshop modified the focus and understanding of team members.

The activities of the workshop led to the exchange of knowledge and new ideas. By using the project-grounded research approach, the theory was situated in the project and its implication on practice was directly observable for us, but also for other team members. During the workshop activities, as the team became more familiar with the user-centered approach to design, new questions emerged and modified the viewpoints of all contributors. Their interest in theory and its implications in practice grew. Discussions regarding the concerns of each discipline helped the team to share information and develop a common understanding; it also helped them to realize the complexity of the project. Their attitude toward collaboration and exchange of knowledge was modified. Design as a method for understanding people and knowledge sharing contributed to increased innovative solutions for the project.

Discussion and conclusion

The cases presented here aim to answer the 'how' question introduced at the beginning of this paper: how can design be of help to lead the reflection on collective intelligence and to translate collaboration into pragmatic activities? The two cases showed how complexity and interdisciplinarity are connected. It also showed that design can be used as a means to encourage and motivate construction of new knowledge at a personal and collective level. In both cases, collaborative design brought the team together for social practices. The outcome was that design was very useful as an overall framework for guiding practice. The following is what we have learned.

Design the conditions for meaningful conversations

We saw different social practices and creative ones, both based on one shared assumption: that there is a need to nurture meaningful conversations among the groups and teams who work together on challenging projects. When design helps to bring collective intelligence to a team, it acts as a method to encompass complexity.

A planned-change approach, made of steps and procedures, can be useful in complicated situations where the problems are well defined, not 'wicked', where all the information is available, and when the future can be anticipated. But when a situation is complex, events and situations that could not be anticipated do happen. This characteristic of emergence intrinsic to the concept of complexity (Morin and LeMoigne, 1999) contribute to inviting new approaches, those that do not focus on control but on nurturing and sustaining the process in the making. Consequently, the shared assumption for both cases is the fact that conditions for nurturing meaningful conversations becomes mandatory.

Design attractors to foster culture

Design was also put to work in situations where keeping memory appeared to help projects. In one case, an aesthetic and memory dynamic process was created in order to nurture the creative activities of Cirque du Soleil artists. It was done by offering them a mirror to their work, an alternative perspective on their culture from which they could learn and draw ideas. In the second case, a web-based system was created around which team members could gather and contribute to sharing ideas, understanding, and meaning. This fostering tool nurtured the project culture and its evolution.

Design shared stories

Characters, personas, and scenarios were created in both cases as pieces of a grand narrative about each project. The use of images, metaphors, and stories is a powerful and artistic creative technique able to reach out and touch human senses while acting as an emotional lever. This approach added a rich texture of humanity to daily work and helped team members feel they are part of an inspiring initiative. By contrast, we have seen that the interweaving of different stories can also be delicate when interdisciplinarity is not present. It is an intangible process that implies competencies, and reflexivity from all team members.

Design collaboration

Collaboration is a complex phenomenon, one which fluctuates when context changes and pressures from project environments increase. Because relying only on planning, procedures, and control is irrelevant in a complex situation, collaboration gains from being supported to emerge and maintain itself, thus considering design as a framework for sustaining collaboration is a useful perspective.

Design collective intelligence

As we have seen, different practices in an interdisciplinary setting contribute to leveraging collaboration in innovative projects. Because it is fully social, shared knowledge and the collective learning process reside largely between the team members (Hutchins, 1995), and is enacted through all communication, in all activities. Acting as a favorable condition for collaboration, in an intelligent and positive way, reflexivity presents itself to be a keystone of collective intelligence. The idea of fostering -holding the space for² the project to bloom, or in other words, for good ideas to emerge, is a key aspect of this collective intelligence.

Design bridged the gaps

We benefit from the research approaches in design, which helps the team to connect with the complexity of the situation, and integrate the theory and practice within the project. Design, as a vehicle for changing the way team members interact, makes integration of all viewpoints possible.

Conclusion

The previous considerations invite us to propose that collective intelligence is not the sum of all the discourses created in a project and that complex collaboration requires reflexive experience-based rules to shape action. It also implies interpersonal and collective trust, a will to explore, creativity and playfulness, as a recent study on collaborative challenges has shown³. In the two cases presented, we saw an ongoing design strategy of sketching out the project vision and its activities through discourse. The successes and flaws lead to proposing that strong reflexive and interpersonal skills are required for this nature of collaboration but because of the very nature of such projects, which implies complexity thus chaos, collaboration needs to be the centre of attention and to achieve this, it needs to be designed. This design does not aim at sketching out complex social interactions through planned procedures but to create the conditions, or in other words the context, for interactions to emerge and to be experienced as positive and nurturing. To support this humanistic view on design, Scharmer (2007) proposes that deep listening skills, reflexive skills, and more than a superficial openness to co-creation are mandatory to create such conditions. Scharmer suggests that these social design skills focusing on how to embody co-sensing, co-presencing and co-creating states of being could be of help to revisit the expected competencies needed to create collective intelligence.

To conclude, we have found that design actually acts as a catalyst when collaboration becomes mandatory for complex projects success. This finding opens further research questions on the appropriate guidelines we could provide project members to help them with organizing their initiatives. Anchored in a complexity paradigm, this question would lead to developing adaptable social change supporting tools and techniques.

² As the concept of "Ba" or context, container or place, proposed by the Japanese philosopher Kitaro Nishida. This concept was the leading idea of many innovation projects studied by Nonaka, Toyama and Scharmer through the lens of knowledge management, in Nonaka I., R. Toyama, O. Scharmer. (2001). *Building Ba to Enhance Knowledge Creation and Innovation at Large Firms*, http://www.dialogonleadership.org/Nonaka_et_al.html

³ This study based on an exercise called 'the marshmallow challenge', presented by Tom Wujec, reveals how teams deal with collective abilities to collaborate <http://www.marshmallowchallenge.com/Welcome.html>

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Prior to becoming faculty in the department of social and public communication at the Université du Québec à Montréal, Isabelle Mahy worked in various organizations for 25 years, in organizational design, collective learning, knowledge creation and sharing. Her research focuses on transformational change, collective intelligence, organizational communication, participatory action-research and art-based methods. In 2008, her book "*Les coulisses de l'innovation, création et gestion au Cirque du Soleil*" was published at les Presses de l'Université Laval.

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