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THE GENERATION OF COMMON PURPOSE IN INNOVATION PARTNERSHIPS: A DESIGN PERSPECTIVE

GILLIER T.[1], KAZAKCI A.O.[2], PIAT G.[3]

(1) Grenoble Ecole de Management; (2) CGS - Mines ParisTech ; (3) EDF R&D - ICAME

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Abstract

Purpose - Scholars and practitioners have both emphasized the importance of collaboration in innovation context. They have also largely acknowledged that the definition of common purpose is a major driver of successful collaboration, but surprisingly, researchers have put little effort into investigating the process whereby the partners define the common purpose. This research aims to explore the Generation of Common Purpose (GCP) in innovation partnerships.

Design/methodology/approach - An action-research approach combined with modeling has been followed. Our research is based on an in-depth qualitative case study of a cross-industry exploratory partnership through which four partners, from very different arenas, aim to collectively define innovation projects based on micro-nanotechnologies. Based on a design reasoning framework, the mechanisms of GCP mechanism are depicted.

Findings - Regarding GCP, two main interdependent facets are identified: (1) the determination of existing intersections between the parties' concept and knowledge spaces ('Matching'); (2) an introspective learning process that allows the parties to transforms those spaces ('Building').

Practical implications - The better understanding of the GCP and the specific notion of "C-K profiles", which is an original way to characterize each partner involved in a partnership, should improve the capabilities of organizations to efficiently define collaborative innovation projects.

Originality/value - This article explores one of the cornerstones of successful collaboration in innovation: the process whereby several parties define the common purpose of their partnership.

Paper type - Research paper

Keyword: *generation of common purpose; innovation partnerships; shared objectives; C-K design theory; cross-industry exploratory partnership*

[1] Address correspondance to: Thomas Gillier, Grenoble Ecole de Management, 12 rue Pierre Sémard, BP 127, 38003 GRENOBLE France. Tel : +33 (0)4 76 70 64 55. E-mail : thomas.gillier@grenoble-em.com

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1. INTRODUCTION

The emergence of innovation partnerships is a novel phenomenon that is impacting many industries today. Firms facing environmental contexts characterized by the need to intensify their innovation efforts encounter difficulty in developing new valuable products or services alone, and so often resort to collaboration networks. Collaborating with and learning from partners, customers, users, competitors or suppliers are now well recognized as important factors that can increase firms' performance and innovativeness (Hagedoorn, 2002; Powell et al., 1996; Von Hippel, 1986).

Having a *common purpose* (CP) has been largely acknowledged to be a main driver of successful collaboration (Gray, 1989; Barczak et Wilemon, 2001; Mattessich et al., 2001; Mora-Valentin, 2004; Wildridge et al., 2004; Weck, 2006). Barnard (1938) states that the presence of a common purpose is an axiomatic condition for the formation of a collaborative group. We can also find this requirement in different definitions provided by the literature. For Mattessich and al. (2001), *"collaboration is a mutually beneficial and well-defined relationships entered into by two or more organizations to achieve common goals …"* (p59), while Gray (1989) defines collaboration as *"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"*. Whatever terminologies researchers use - whether it be a purpose, a goal, a problem, a good or an objective - sharing *an object* is obviously a core element of collaboration.

Surprisingly, we can recently observe some particular new forms of organization, inter-organizational collaboration in an "exploration context" (March, 1991), that challenge this crucial requirement and thus, question our common understanding of the word "collaboration". Segrestin (2006) identifies a main feature of the 'pure' exploratory partnerships as a specific class of cooperation where the CP is either unknown or incomplete

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ex ante, so that partners begin to collaborate without precisely knowing the object their work. The emergence of exploratory partnerships has recently called into question the Generation of Common Purpose (GCP) as noted by Elmquist et al. (2009): *"Is it necessary to have a 'Common purpose'? if yes, how to 'design' it? If no, how to organize an open innovation without common purpose? "* (p.335). In the same perspective, Gero (2010), underlining some future directions for research about design creativity, asks how consensus is reached by collective designers.

Today, firms no longer restrict their collaborative activities just to the exploitation of complementary assets to commercialize products, but increasingly cooperate to find ways to break existing dominant design, or to create completely new one, that form the seeds of new business fields (Chesbrough, 2003; Linnarsson and Werr, 2004; Rothaermel and Deeds, 2004; Gupta et al., 2006 ; Möller et Rajala, 2007). Collaboration in exploration refers to a particular process that consists of collectively creating something radically new and unpredictable from the combination of heterogeneous fields of knowledge. In contrast to more classical exploitation partnerships, such exploratory collaborations are not seen as means to exploit external competences or/and technologies to co-develop pre-determined goods, but as opportunities to explore new and desirable futures collectively. Since the CP in exploitation partnerships is often pre-determined between the partners before the collaboration begins, researchers have often conceived innovation partnerships – as Doz (1996) acknowledges - as means to achieve clear-cut objectives. As a consequence, the GCP phenomenon has received only limited interest from the research community, and often in studies conducted after those objectives had already been established and accepted by participants.

In exploration, firms do not exactly know what they could design together, they are not aware that they could be, for instance, be strategically interdependent and benefit

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mutually from working together. In such partnerships, firms do not know exactly what competences or technologies are lacking, or with whom they should best collaborate, or what might turn out to be the central target of their co-exploration: the CP is not fully articulated given at the start but is rather considered as the cooperation develops.

Very recently, scholars have begun describing an interesting exploration partnerships in the early design stage : *Cross-Industry Exploratory Partnerships* (CIEP) (Brunswicker and Hutschek, 2010; Enkel and Gassmann, 2010; Gassmann et al., 2010; Gillier et al., 2010; Meyer and Subramaniam, 2004). Whereas research sometimes argue that the collaboration between partners coming from different sectors, with different cultures, is source of misunderstanding (Li et al, 2002 ; Enkel and Gassmann, 2010 ; Gulati, 1995), the scientific community has begun to recognize the chance of benefitting from heterogeneous knowledge and networks (Enkel and Gassmann, 2010 ; Möller, 2010 ; Lavie and Rosenkopf, 2006 ; Kazakci et al., 2008). Organizations involved in such partnerships expect to be surprised by unforeseen insights and to discover new valuable knowledge. The motivation for companies to look beyond their own industry is based on the core assumption that new ideas emerge from the interaction with actors from distant domain who provide heterogeneous knowledge (Brunswicker and Hutschek, 2010). In such pre-competitive states, partners accept the idea of working collectively on innovative projects and in creative workshops, sharing and developing ideas, studies, rapid-prototyping and so on. Metaphorically speaking, collaborating with partners from another industry may be an opportunity for organizations to ‘think outside the box’ by being in contact with another industry’s ‘box’.

As noted, at the initial stage of the collaboration, the CP is ill- defined and ‘fuzzy’. Basically, in the upstream phase of cross-industry exploratory partnership, partners joint their efforts in order to build innovation projects but, at the beginning, may not even know what they could include. The involvement of stakeholders from various industrial domains also

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leads to difficulties in determining their respective interests and preferences: systematically reaching a consensus cannot be guaranteed. For instance, Jørgensen et al. (2007) insist on the difficulties to observe when a CP is generated. The authors describe GCP as an unstructured process where ideas become the sources of industrial projects or simply disappear.

2. RESEARCH QUESTION AND PLAN OF THE PAPER

This article aims to contribute to a better understanding of how innovation partnerships are formed. While we know much about why organizations collaborate (cost and risk sharing, exchanging information, reducing time to market, increasing skills and knowledge, etc. (Hagedoorn, 1993 ; Miotti and Sachwald, 2003)), how such organizations define the CP of their collaborations has been under investigated. Defining a CP in radical innovation collaborations is not straightforward: when partners put joint efforts into investigating new objects that are not necessary linked to their past products: how do they share common definitions of an object that does not yet exist, but can only be imagined? How does such unknown object emerge? We use design theory framework (Gero, 1990; Reich, 1995; Simon, 1969; Suh 1990) to describe and understand how both objects and partners' reasoning evolve as the cooperation develops: according to us, the emergence of CP in exploratory partnerships can be assimilated and modeled as a design process.

This article is organized as follows: Section 3 highlights the limits of existing approaches to GCP for addressing the case of exploratory partnerships, while section 4 presents our theoretical framework. To understand how CP emerges between parties, we base our research on C-K Theory, a recent design reasoning theory (Hatchuel and Weil, 2003, 2008), which permits us to model the generation of new objects at a high level of generality. We then extend C-K theory to capture the collaborative dimension of innovation, and offer a detailed presentation of our theoretical model, Matching/Building. In Section 5, we detail our

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methodology based on an in-depth case study of a Cross-Industry Exploratory Partnership in the micro-nanotechnology field, and we present the emergence of a CP, "*Through Your Eyes"*, and we simultaneously use Matching/Building to interpret our empirical data. Finally, section 6 discusses our main finding, notes some limitations and suggests theoretical and practical implications for collaboration in innovation.

3. THE GENERATION OF COMMON PURPOSE

Today, the GCP often appears as a random process in which partners accidentally realize they have common interests. For instance, Kreiner and Schultz (1993) describe collaboration as the fruit of accidental encounters (p195); Perocheau (2009) reports the case of an innovative project created by a fortuitous meeting where partners found they had complementary competences and overlapping interests; and Ring et al. (2005) qualify as "emergent", the collaborations "*characterized by a strong sense of converging interests, sometimes revealed by specific incidents"* (p146). Although we do not exclude the dimension of serendipity in collaboration, how can we theoretically explain that these events become so 'special' for the actors concerned? How can we explain that few ideas spontaneously 'find echo' among partners? And among them all, how do actors detect the 'good' opportunities? Can actions control the generation of cooperation possible or does it only come about serendipitously?

Some researchers argue that partners collaborate despite limited, multiple or even contradictory interests, and that the objects of their collaboration are not fully agreed at the beginning but emerge through a social construction process between the participants. Various models consider GCP from this angle, and indicate the negotiation steps via acceptable compromises are surfaced (Brouthers and Brouthers, 1997; Das and Bing-Sheng, 1997; Luo, 1999; Ring and Van de Ven, 1994; Marshall, 2004). Unfortunately, whereas consensus building is often described in terms of a wide range of activities (e.g. ideas and knowledge

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exchange, contractual negotiation, formalization of potential risks and return on invest…) and by several good practices (e.g. selection of the 'good' negotiators, necessity of a win/win strategy), *"no clear model exists for building consensus"* (McKinney, 1997:36). Although good communication between actors plays a central role in GCP, it is not sufficient to fully explain the GCP. Taking a similar perspective, Ring and Van de Ven (1994) emphasize the role of formal and informal sensemaking processes (Weick, 1979). In a macroscopic view, Möller (2010) propose a cognitive model that highlights the role of sense-making and development agenda construction in emerging markets. In such new business fields, the "dominant design" do not exist ex-ante, organizations need to constructively collaborate in order to create a common future. Partners could share common purpose if the objectives made sense in the same way to each partner, if they could align their different interpretations of their aims. But how can we model the influence of the sensemaking process in terms of defining a CP? And how can we model the implications of negotiations from a cognitive point of view?

4. ANALYSING GCP WITH A DESIGN REASONING FRAMEWORK: MATCHING/BUILDING

When parties decide to join forces in an exploratory partnership to set up innovation projects, they face two main challenges: they must design objects (products, services, ecosystems…) that do not yet exist, and they have to agree to design the same objects. We therefore suggest using the design theory literature to interpret GCP. We first section introduce a recent theory - C-K Design Theory – which allows for describing the design process of innovative objects with a great level of generality. We then take a new perspective in proposing the use of this theory to model the design process of several actors, which involves new theoretical elements that constitute Matching and Building.

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4.1. C-K Design Theory

4.1.1. C-K Theory Formalism

To address our research questions, we propose to structure our theoretical framework from design theory literature- more precisely, by using the recently developed C-K Design Theory (Hatchuel and Weil, 2003, 2008). By generalizing from classic engineering design theory (Pahl and Beitz, 2007) and search theory (Simon, 1969), this theory offers a rigorous formalism that unifies the logic of rule-based and innovative design. C-K theory models design by making a formal distinction between two interdependent spaces: of concept (the C-space) and of knowledge (the K-space), which its authors argue are structured on different axiomatics. Thus the K-space integrates all the designers' knowledge, whatever its nature (scientific and economic knowledge, norm, patents, databases, artifacts...) into propositions which have logical status (true or false). In contrast, C-space holds concepts that cannot be decided in K-space terms, concepts are unknown objects which a designer cannot say will or will not be feasible (e.g., a 'dry shower' or 'emotional radiators'). Hatchuel and Weil argue that the design process starts when a concept is formulated, after which the design process consists of partitioning (or de-partitioning) the initial C-set elements according to their attributes (also called 'properties'), which could be either qualified as 'restrictive' partitions if the properties are already known in K-space (e.g. a dry shower with water) or alternatively as, 'expansive' partitions (e.g. having a dry shower without water). The properties are added to the concept until it can be transformed into knowledge (i.e. propositions in K-space). The design process is consequently explained as a co-expansion of C and K-space in terms of four types of operators: C→C, C→K, K→C, K→K (see Figure 1).

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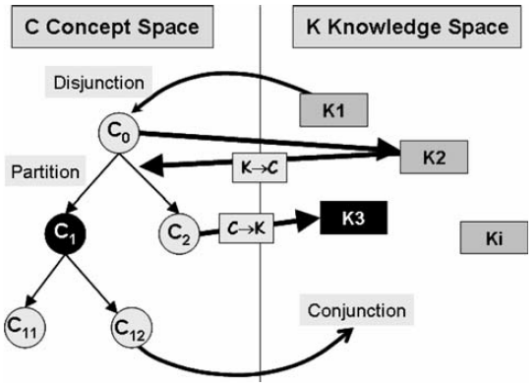


Figure 1 C-K design formalism (Hatchuel and Weil, 2008)

4.1.2. Actual limits and advantages of C-K Theory for GCP

In terms of how it relates to GCP phenomena, we suggest C-K theory is fruitful for two main reasons. First, as explained previously, exploratory partnerships are established while the CP is still unknown by partners, so a full understanding of GCP requires theory that permits the generation of new objects to be modeled. In contrast to search theory (Simon, 1969), for instance, the fact that the properties of the CP are not 'given' at the beginning does not raise questions about the deciding between multiple alternatives but rather focuses attention on the creation of those alternatives. C-K Theory enables to the generation of new knowledge and partners' learning process during their collaboration to be taken into account. Secondly, a partnership's CP can take multiple and contrasting shapes depending on situations. Partners may agree on a CP that is only weakly elaborated, for instance, just as vague ideas, first drawings with no physical reality, or they start by considering how their CP would resemble or differ from material products that already exist on the market. By using the generic term of 'properties' (or 'attributes'), C-K theory offers a high degree of generality that allows a variety of collaborative contexts to be modeled. Taking this perspective makes, for instance, the Function-Behavior-Structure Theory (Gero, 1990) seem inappropriate for modeling GCP: since our research demands a description of collaboration even during the upstream stage when functions or materiality do not yet exist. In addition to this, considering the CP as an

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'object with properties' retains the ambiguity of terms like 'common goals', 'convergent objectives', 'shared problems' etc.

Since its first development, C-K Theory research has been used in various studies (Elmquist and Le Masson, 2009; Elmquist and Segrestin, 2009; Gillier et al., 2010; Gobbo Jr and Olsson, 2010; Le Masson and Magnusson, 2003). In most examples of it use, the research is centered on the object to be designed, and the role of actors is not explicit: surprisingly, the collaborative dimension of design has been poorly integrated, except by Kazakçi and Tsoukias (2005) and Szpirglas (2006). As far as we know, C-K theory has not yet been used to model collaborations between two or more designers. The following section adapts C-K theory to the case where several actors are designing together, using Matching/Building model.

4.2. C-K Theory and the social dimension: the principles of Matching/Building

4.2.1.: C-K profile: the collaborative organization's identity card

In order to collaborate in innovation, we assume that each partner needs to explore other partners' concepts and knowledge spaces to discover fruitful complementarities, synergies or creative insights.

In our model, an organization O_i is defined according to its *C-K profile* - noted as (C-K profile)$_{Oi}$. In respect with the C-K theory formalism, O_i's K-space represents the propositions which have a logical status for O_i, it represents what it 'knows' and what knowledge it can identify as 'missing' when it sets out to collaborate. Thus, the usual elements of K-space include the firm's documentary studies (technical, commercial, etc.), portfolio of technologies and patents, process methodologies, internal competencies and existing strategies. Similarly, O_i's C- space contains partially unknown objects, it means propositions undecidable in its K-space (i.e., neither true nor false). Basically, C-space

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elements included in O_i's C-K profile correspond to the new products or services it intends to design, as well as any unsolved problems. Thus, in formal terms, collaboration between O_i, O_j, O_k, …O_n can be represented as the interaction between $(\text{C-K profile})_{Oi}$ - $(\text{C-K profile})_{Oj}$ - $(\text{C-K profile})_{Ok}$ - … - $(\text{C-K profile})_{On}$. For clarity reasons, we present our model with the case of collaboration between two organizations (O_i and O_j) but the logic remains unchanged for more organizations.

4.2.2. Matching and Building: the two core process of GCP

The GCP process of consists in finding or creating intersections or complementarities between the partners' respective concepts and knowledge, which can be characterized as two significant cognitive processes: Matching and Building.

Matching can be viewed as a search process during which collaborative organizations aim to identify potential overlaps in their respective interests by detecting any intersections that exist between their C- or K-spaces. In the sense that it designates what they are interested in doing together, matching helps formulate the collaboration's CP.

Thus, typically, partners can share three peculiar types of CP. First, partners could agree to collaborate around a same concept – perhaps participating in creative sessions on a wide topic – here, the CP is created by matching between their two C-spaces. Second, partners could explore not the same concepts but the some knowledge they both lack – working together at a scientific conference, exchanging knowledge and know-how to learn as much as they can about a specific technology so as to integrate it into their own innovation products. The CP is the result of a matching between their two K-spaces. Third, a collaborative project can give one partner the chance to design its own concept based on the other partner's knowledge. In this last case, the CP is the matching between O_i's C-space and O_j's K-space.

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Building It is possible in some cases that the partners find no such intersections - they may not exist or may be very hard to identify if partners are very different. If their scanning yields no result, it is still possible for partners to create the new intersections – but they will need to transform their own C-K profile - changing their C-space or/and their K-space - in a learning process we label *Building*. During their collaboration, they may rearrange the structure of their C-K profile: they can reactivate 'sleeping' knowledge or concepts, or refresh their knowledge base by adding newer knowledge, etc... Collaboration may involve several such C-K profile expansions: for instance, new knowledge is learned when a one partner gives another a new concept to consider.

5. METHODOLOGY

This section presents our methodological approach and uses the Matching/Building framework to interpret the GCP in a cross-innovation exploratory partnership.

5.1. Research setting

That research takes place in a multi-partners innovation platform called MINATEC IDEAs Laboratory® (MIL). Created in 2001, MIL is localized at Grenoble near of a French National Research Centre, which is specialized in micro-nanotechnology. The laboratory is a partnership between different firms which have contracted mutual R&D agreements. They have agreed to pool human and financial resources (>100K€), and to allocate at least two people with specific and varied backgrounds (engineers, managers, industrial designers, sociologists, etc.). The R&D contract covers the conditions by which they will share their: results; for instance, the Intellectual Property agreement stipulates that each partner wanting to patent a discovery must gain the agreement of other partners - if more than one is interested in patenting, they must negotiate or co-patent.

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MIL is an upstream partnership that gathers partners from diverse separate market sectors. Partners do not join to commercialize products together, but rather they collaborate to develop proofs of new concepts quickly. The concepts imagined in MIL may be then co-developed by partners in external exploitation partnerships: such as the shared lab set up to develop a new generation of innovative and digital lenses by the French Atomic Energy Commission (CEA) and Essilor in 2006.

At the time of this research, the MIL was made up of four industrial partners from different sectors - EDF R&D (Energy), Rossignol (Sport and Leisure), Essilor (Ophthalmology), CEA (Micro-Nanotechnology) and an anonymous industrial partner [1] - to launch joint innovative projects to discover business opportunities to take advantage of emerging micro-nanotechnology advances. Due to the wide range of the partners' businesses, reaching a satisfactory CP was not obvious, so the MIL represents an interesting case setting to address questions regarding GCP. The collaborators face the unusual situation of having to define projects that do not address just their own strategic targets, but attend to all the partners' interests. Management of the collaborative organization is handled by quarterly meeting of a steering committee that involves representatives of all the partners. Its most significant function is to manage the MIL project portfolio, in which an absolute rule is respected: projects can only be sponsored and officially launched within the partnership if they are supported by the majority of the entire membership.

5.2. Methods

5.2.1. A case study in a collaborative setting

In our research methodology, we combined traditional action research (Coughlan and Coghlan, 2002; Lewin, 1946) with modeling (Hatchuel and Molet, 1986; Moisdon, 1997; Wierzbicki, 2007). Our findings are based on a case study set up in a broad collaborative

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context, involving both academics and practitioners coming from different spheres and holding divergent perspectives (Adler et al., 2003). As frequently occurs in collaborative research works about social systems, the authors were involved as observer-participants: this type of involvement induces multiple interplays between theory and practices in action, which are thus sources of both relevant and actionable scientific knowledge production (Argyris, 1993; Glaser and Strauss, 1967). These strong ties between scholars and managers enable actors to assimilate more easily the knowledge created via its dissemination into concrete actions, and this methodology also provides an inside understanding of ongoing organizational processes and problems (Jönsson and Lukka, 2006).

Researchers have used the case study research method for many years across a variety of disciplines to gain a qualitative and in-depth comprehension of complex phenomena (Einsenhardt, 1989; Yin, 1990). The method allows us to investigate GCP within a real-life longitudinal context by analyzing various variables and their interacting relationships. A case-study methodology is also claimed to be appropriate in situations where the investigators have limited or no control over events (Yin, 1990), a criterion that covers the GCP field: as the specific circumstances in partners interests would convergence cannot be not known in advance, GCP would be hard to plan or to replicate in laboratory experiments.

A main methodological element of our work is the proposal of a *model* in order to materialize and illustrate our findings. The significance of modeling as a scientific approach has been much debated in management literature (see e.g. David, 2001, Hatchuel and Molet, 1986; Liberatore et al., 2000 ; Moisdon, 1997).

Wierzbicki (2007) stresses the importance of modeling *as a way of organizing knowledge*. He argues that, human civilization, throughout its evolution, has used some kind of model (starting by speech and text, followed by contemporary multimedia and finally, formal and computerized models) to capture, analyze and make sense of reality and future

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possibilities. As such, modeling can be seen as an integral part of knowledge production (Wierzbicki, 2007). Le Moigne (2004) discusses modeling within the context of a constructivist approach to scientific knowledge production. Modeling is constructing intentionally an entity in order to comprehend our experiences and relationship to the phenomena. Modeling *as a way of understanding* is thus a process of epistemological legitimization of the knowledge produced by the investigation (Le Moigne, 2004).

Intensive use of modeling as a part of a participative action research has been labeled intervention research (David, 2001). Modeling becomes especially powerful within an iterative, participative intervention research context, as the model is refined through researcher's interaction with the field and the confrontation of the model to the reality. As numerous reported intervention research cases demonstrate (Moisdon, 1997), modeling is a non-linear process involving multiple iterations between the formulation of the model and the confrontation of the model to the processes observed by the researcher. In our case, we followed such an iterative process to develop the principles of Matching/Building, which were progressively defined by the investigation of the empirical data we collected. Early attempts (Kazakci et al, 2008) have been progressively refined (Gillier 2010) to take the present form.

It should be noted that, by its very nature, modeling involves arbitrary decisions by the modeler and the model represents necessarily only some partial aspects of reality. This status of the models has been termed "*rational myth*" (Hatchuel and Molet, 1986). A model needs to be rational, that is, it should be internally consistent and the inferences that can be drawn should logically follow and they can be supported with available evidence. Nevertheless, a model is also a myth since modeling any human situation and conceiving its transformation is akin to utopia building, even if the model contains technical matters (Hatchuel and Molet, 1986). Le Moigne speaks of an "*imaginative rigour*" of modeling that

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fits well within a constructivist approach of science. Consistent with these aspects, during the construction of the model, our aim was not to elaborate a normative or prescriptive model of GCP - we do not attempt to suggest a unique possible interpretation, nor to use Matching/Building to guide partners' actions - but rather to examine how CP was generated in the previously described specific real-life situation and provide structured insights into the process. It should be realized that, our model contains our own arbitrariness in that, following C-K theory's essence, we focus on design dynamics of the process using as ontological elements knowledge and concepts. Our consistent involvement with the field has led us to believe that those elements are indeed important explanatory factors of GCP.

5.2.2. Data Collection

As is widely recommended for increasing internal validity in case study methodology, we adopted a triangulated research strategy combining three main sources of evidence: direct observation of the 2008 'Visual Interfaces' innovation program, written documents and exploratory meetings. Our observer/participant status enabled us to collect 'live' data as it happened, which was very necessary to understand cooperative activities, the relationships between partners, and their respective behaviors, motivations and interests. We officially assisted the project manager in charge of the 'Visual Interfaces' project which included seven sub-projects aiming to explore potential applications of the 'Visual Interfaces' project. This gave us a privileged position that increased our access to a broad range of data, allowing us to collect several innovation reports, and specifically to know the ideas selected by partners, their technical development (feasibility studies, physical demonstrators) and each partner's inputs into the whole collaboration. In the seven sub-projects, we observed at least ten creative sessions, three focus group sessions and several expert meetings.

The main source of written documents was the partnership's intranet database, into

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which all organizational and strategic information (executive committee reports, annual reports, intellectual property management, etc.) and projects (intermediary and final innovation reports, etc.) were systematically stocked. We gained further strategic information about each partner via the partnership agreements, and complemented our data collection with recorded interviews of 8 practitioners (2 from each partner) which lasted about an hour and focused on the objective of each project and the relationships between partners.

In general, two main types of data were collected: 'partner-centered' and 'project-centered'. For the former, we obtained information about partners and inter-relationships from their formal and informal exchanges (meetings, e-mails, etc.), about their individual strategy and motivations, and about their skills and competences. In terms of 'project-centered data', our official participation allowed us free and full access to project details from their beginning to their end (project objectives, participants' involvement and their respective roles, ideas generation, intermediate and final results, etc.). We followed our data collection by systematically analyzing and recording any patterns relevant to GCP. Two main groups of patterns were revealed: the objective of each project and the circumstances through which convergence of interest was reached between partners in each case; and levels of cohesion and coordination among partners. As each pattern was formulated, we attempted to explain it with our theoretical model so as to propose any relevant new complementary notions. Managers were continuously involved in discussing the emerging results, and we organized two special seminars for this purpose.

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6. USING MATCHING/BUILDING TO INTERPRET AN APPARENTLY 'ODD' COLLABORATION: THE CASE OF MINATEC IDEAS LABORATORY®

What common topics could there be between a winter sports product company, an energy market player, a French government-funded technological research organization and an ophthalmic optics company? At first sight, MIL is a surprising and unnatural R&D partnership, since the partners' C-K profiles (see Table1) are so very different [2]. How could common purpose be generated in such a situation, allowing such heterogeneous stakeholders to build innovative projects together?

This section discusses the MIL case to show how Matching/Building can be used to better understand GCP , and describes how CP was generated around an innovative concept called "*Through Your Eyes*" which had not been initially considered by any of the partners. The section is divided into three main stages. The data was collected from the four companies (EDF R&D, CEA, Rossignol, Essilor), but, for clarity reasons, we illustrate the use of Matching/Building between only two organizations. The logic is the same for the simultaneous collaboration among the four partners.

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Partners	*C-space (unknown objects, new products or services to design, unsolved problems, etc.)*	*K-space (skills, technology, internal projects, etc.)*
EDF R&D	• New applications for employees in commercial agencies or nuclear power plant (Occupational safety and health, etc.) • New ways of payment • Energy saving • Ambient intelligence: Home-automation and well-being	• Production and monitoring of electricity • Energy trading • Electricity distribution • Customer Relationship Management
CEA	• New technology-based applications (energy, data, materials, sensors, etc.) • Arts/Performance with sensors technology	• Fundamental research in Micro-electronics, nanotechnology, energy, IT, biotechnology
Rossignol	• Integration of microelectronic into sport products • Providing valuable information for skiers • Improvement of raw-material performance	• Clothing and textile • Materials Science and Engineering • Alpine ski, snowboards practices
Essilor	• New immersive glasses • Augmented reality for customers • New materials and surface finishing	• Design, material and coating for lenses • Vision screening instrument • Edging instruments

Table 1 The high diversity of MIL partners' C-K profiles

(source: R&D contracts)

6.1. Stage 1. Focusing on familiar and pre-existing concepts in cross-industry collaboration: a failed strategy

In January 2008, while the MIL partners hoped that micro-nanotechnologies would revolutionize their future business, they did not know how to start exploring such a broad field of knowledge, nor what clear cut objectives their collaboration might achieve. They saw entering MIL as a fruitful means to exchange points of view, to benchmark good practices and to share costs. But they did not know how to work together: while they hoped their collaboration might generate very original ideas and unusual projects, they thought a CP would be extremely hard to find. During the early, agenda-setting meetings, we observed that partners' intentions were to reach agreements on projects that each had in mind before joining MIL for developing micro-nanotechnology-based products. Thus, during the first steering committees, Rossignol proposed working on the integration of miniature speed sensors in

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skis, EDF R&D wanted to design new energy-harvesting devices for air-quality measurement, Essilor was thinking about new glasses exploiting the optical features of carbon nanotubes. In the face of such diverse agendas, the steering committee's first plan to reach a CP involved selecting one of CEA's many technologies – but, unfortunately, it could propose one behind which all the partners could unite, as they could see no links between CEA's technologies and the concepts in which they were interested.

In terms of the Matching/Building framework, such events can be interpreted as a failure of Matching: partners could find no pre-existing intersections between their established C-K profiles (see Table 1, Figure 2). Indeed, the projects each partner submitted were too specific to them – and not appropriate for all: they noted the projects proposed did not align with their different businesses and interests, and thus failed to serve collective interests. The number and diversity of the partners meant they faced a 'cognitive crisis' - finding already existing intersections among their current concepts and knowledge seemed impossible, so the partnership made little progress.

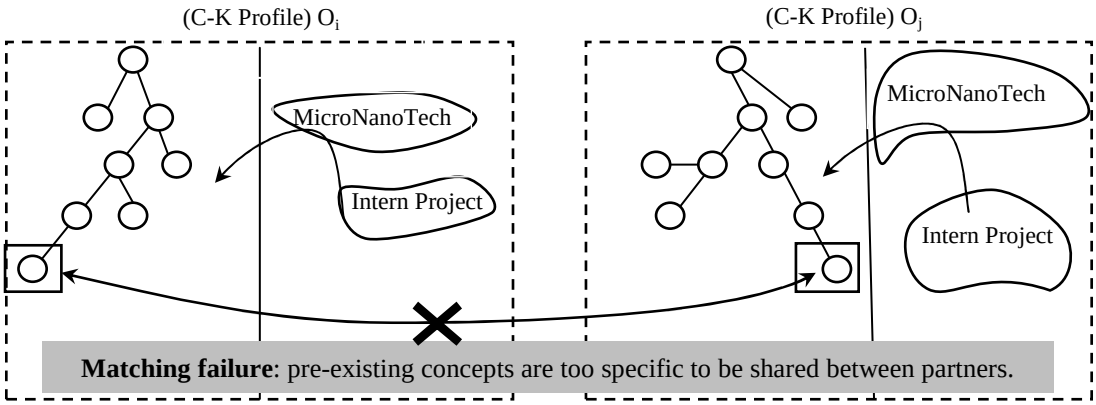


Figure 2 An unsuccessful Matching in C-spaces

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6.2. Stage 2. Sharing and assimilating C-K profiles: setting in motion the collaboration

Faced with the difficulty of reaching a fair agreement by starting from their projects they already had in mind, partners then made a radical change in their strategy: they stopped looking directly for a CP. As each partner considered the concepts initially submitted by the others were too 'business-specific' and would not yield them results (and therefore declined to be involved in them), each now had to justify and to explain their own area of interests. A 'task force' (of one representative from each organization) was formed to visit each partner and to collect information about their industrial contexts, skills, competences and resources, innovation strategies, their main concerns and knowledge gaps, their expectations from the collaboration, etc.. In other words, partners worked on each other's C-K profiles, to get to know each other's concerns and aims better and gain a fuller cognitive representation of each other's C and K spaces.

This process was an opportunity for partners not only to expand their concept and knowledge spaces but, more interestingly, to revisit them, Sharing their C-K profiles stimulated partners' innovation processes, giving them an opportunity to reactivate past knowledge or to reassess latent or overlooked concepts, and to prioritize the concepts they wanted to explore within the partnership and their reactions to other partners proposals. This was a deeply introspective step for the partners – and an important building phase.

The results of these interviews were presented to all partners. During this C-K profile-sharing step, partners came to understand that a common need was the ability to design new solutions for helping customers/users (see the different elements related to communication topics in Table 1: EDF R&D – new applications for employees; CEA – sensors; Rossignol – information for skiers; Essilor – new immersive glasses). EDF R&D expressed this common need in the following idea: *"we could imagine a new device for helping customers when an electrical failure occurs. From that device, the customer could be guided by a professional*

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adviser at distance". While this concept clearly related to their 'version' of the common need for helping customers/users, it was not adapted to other partners businesses – but they then undertook a cognitive exercise to find how such device (or a version of it) might be useful for their own business. For Rossignol, the initial EDF R&D idea was transformed in an *"information device that enables skiers to know the queue state at ski lifts at any time";* Essilor considered how to give visual street directions to users; CEA envisaged a new testing regime for transparent electronics. Although each partner developed an idea of what type of device might be valuable for them, they knew it would not be possible to ask others to work on their specific application, so their progressively tried to imagine a more abstract concept that could interest all of them. A specific objective eventually emerged and gained consensus in the partnership – "Through Your Eyes" – a concept that could give for one person the ability to see - virtually - what another observes in reality (see Figure 3). Formulated at an abstract level, this general concept was sufficiently broad and ambiguous to cover all partners' agendas, and from it, the 2008 'Visual Interfaces' innovation program was officially launched.

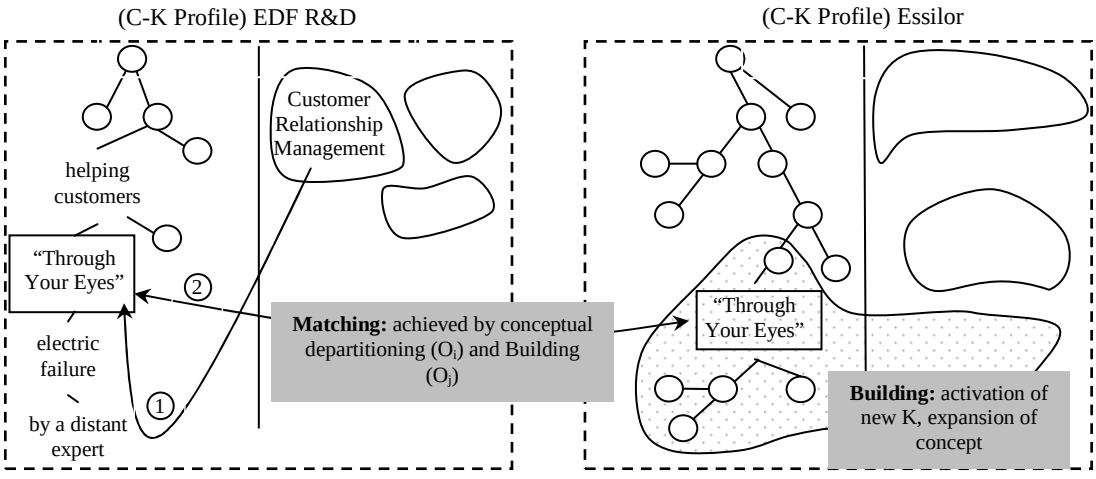


Figure 3 Discussing C-K profiles: expanding and revisiting mutual concepts and knowledge

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6.3. Stage 3. Refining the CP and strengthening collaboration via the design of generic concepts

The previous step led the partners to a paradoxical situation: they had found a CP, but did not know how to take their general concept further. What projects could the partnership launch? How could such a concept best sustain their collaboration?

The initial "Through Your Eyes" concept was then co-design by partners to gain more precise specifications, and the concept was progressively both enlarged and redefined. The initial concept was progressively partitioned by properties ('helping more than one user', 'voice or text transmission', 'environmental data', etc.) which came either directly from collaborative efforts, or from the initiative of a partner for whom such properties had high value. Some were accepted by the other partners - for instance, Rossignol was really interested that the device could be 'energetically autonomous' so it could be carried outdoor by skiers – but some others were not. Thus technical robustness against hard weather conditions (snow, rain, etc.) was very important for Rossignol, but not for the other partners. In order to reach a common project as members of MIL, partners had to change their design reasoning, and reorganize the relevance of the partitions in their own concept spaces. We observed a kind of positive 'cross-partitioning effect': the properties added to "Through Your Eyes" at the initiative of one partner opened up new product possibilities for others: thus, although EDF R&D rejected Rossignol's idea of taking hard weather conditions into account, this process also acted as a stimulus, leading EDF R&D to imagine that the "Through Your Eyes" could be valuable in risky situations (e.g., handling materials in nuclear power stations) (see Fig 4).

After the value of some related properties ('autonomous devices', 'helping more than one user', 'voice or text transmission', 'risky events', etc.) was generally acknowledged by partners, they was added to what was now an overall **'**generic concept'; i.e. several conceptual elements that embedded the partners' collective interests. The generic concept

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design process can be described as a kind of ‘conceptual oscillation’ and ‘regulation process’: the level of abstraction of each property added to the generic concept was negotiated according to the partners’ interests. If the property did not interest all the partners, the proposing organization tried to change the conceptual level by thinking about a more abstract version of the property to make it more generally relevant. Partners were gradually able to predict more and more accurately what might interests each other and thus make the collaborative process more efficient by proposing more acceptable concepts and more widely-useful knowledge. As the collaboration went on, partners revealed parts of their C-K profiles not previously part of their MIL involvement (for instance, partners were jointly interested in nanoluminophore based-materials for new systems of lights), and continued to discover new matching opportunities in both their C and K spaces. In the end, the generic ‘“Through Your Eyes” concept was stretched in different ways, different original concepts were created and prototypes designed. One major success of the investigation was the innovative ‘ICI Info’ application commercialized by Bouygues Telecom (a new partner) in November 2009. This augmented reality based application enables users to locate urban services easily (transport schedules, street visualizations, shops and restaurants, etc.) from their smartphones, allowing them to virtually ‘see’ their environment and thus obtain visual information from a distance.

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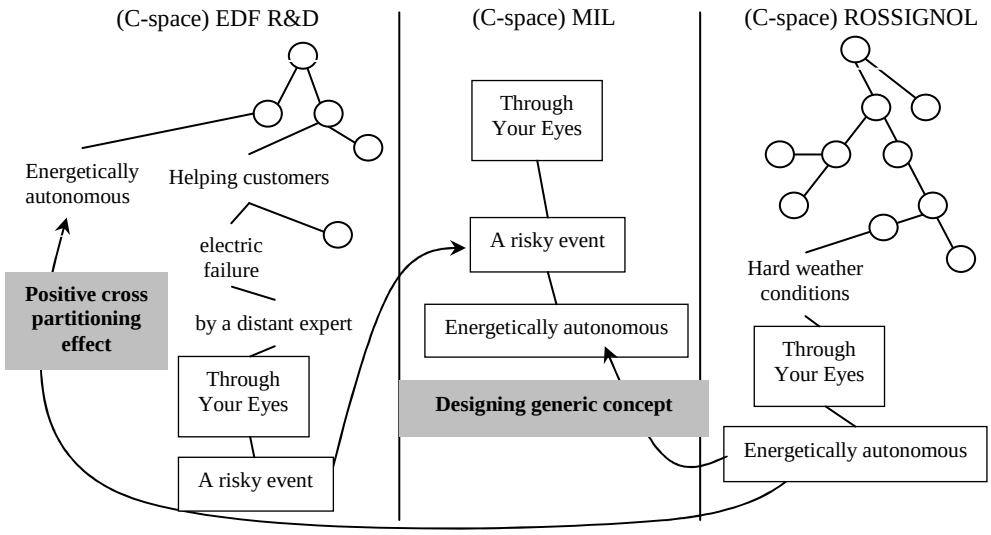


Figure 4 Designing the generic concept

7. DISCUSSION AND CONCLUSION

7.1. Contribution of the framework

This article examines the GCP in inter-organization collaboration. Although past studies claim that clear and realistic definition of CP is a key of success of partnerships (Geisler et al., 1990; Mora-Valentin, 2004; Weck, 2006), the mechanisms by which it is generated remained poorly studied by the existing literature. This article develops an original approach to this issue: based on a recent design theory, C-K theory, we cognitively interpret the emergence of CP as a sequence of design reasoning activities, so extending the existing design theory framework to become a powerful means for modeling design reasoning by multiple actors. By describing each collaborative organization with its own concept and knowledge space (i.e., identifying its 'C-K profile'), we represent their collaboration as the dynamical interaction between their C-K profiles). We also emphasize the role of two main processes: 'Matching' (identifying existing intersections between partners' concept or/and knowledge spaces); and 'Building' (in which partners' C-K profiles are expanded and/or

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reorganized) (see. Fig 5).

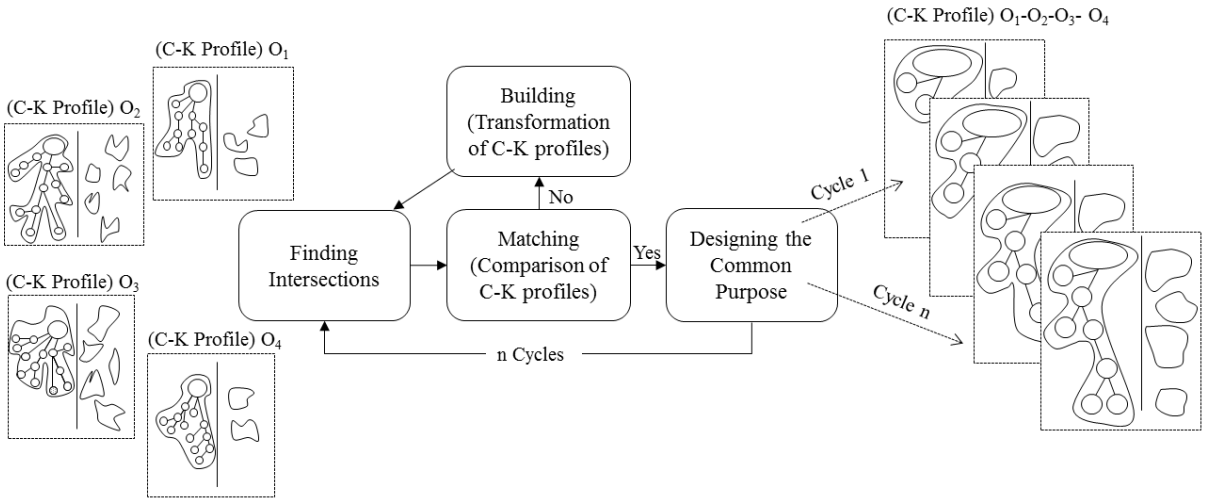


Figure 5 – Designing the CP in innovation partnership with Matching/Building (adapted from (Gillier, 2010))

Regarding our theoretical contributions, we can point three main results. First of all, compared to existing theories that explain the formation of collaboration, the Matching/Building model permits to better understand GCP both in micro and macro- level. Indeed, this model permits to study the common purpose as enunciated by the actors. Furthermore, the definition of CP is linked with more "macro-level factors" involved in the formation and evolution of alliances like the firms' strategies, knowledge, resources and competencies…

Secondly, our theoretical model sheds further light on the seemingly random and chaotic GCP process. Matching/Building explain two different process of GCP, depending if the collaboration is rather exploitative or explorative. In exploitation partnerships, the objectives are well-known by participants who acknowledge the pre-existing overlaps between their C-K profiles: it is a pure matching process. There are no dynamic interactions between the partners' design reasoning, and they need only exchange concepts and knowledge. But new forms of partnerships, like those set up for exploration, require thinking

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differently about the GCP issues. In such partnership, intersections between the initial C-K profiles may not necessarily exist, the Matching process cannot be possible at the beginning of the cooperation but it depends on the partners' capacities to expand and reorganize their design reasoning (Building). This new capacity explains the emergence of unsuspected CP between partners coming initially from disconnected fields.

Finally, our research contributes to linking two streams of innovation management literature that are often divided: the research about of the management of collaboration and the cognitive theories of design thinking. Albeit further research is still needed, we find that the sensemaking process involved in innovation partnerships can be modeled by a design theory perspective. Indeed, according to us, when partners make sense of their environment in a partnership, they simultaneously design the CP by partitioning with their own properties and they modify their mental representation to rearrange and expand their own C-K profiles.

7.2. Managerial contributions: how do cross-sectors collaborations make work for innovation?

Although breakthrough innovation is acknowledged to require a combination of heterogeneous knowledge, organizations are urged to complement their local knowledge search by collaborating with cross-field partners. Nevertheless, collaborating with unfamiliar partners is also reported as being risky, a paradox that is clearly captured in the notion of 'cognitive distance' (Nooteboom et al., 2007; Wuyts et al., 2005). These authors suggest there may be an 'optimal' cognitive distance between partners: they must be different enough to offer each other originality and innovativeness, but not so different they cannot understand each other – they must have something in common. But, how can practitioners measure this optimal cognitive distance to help select the best partners – does it depend on their CP? In contrast to such arguments, the interpretation of our case study via a Matching/Building

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framework addresses these issues from a more dynamic perspective. The difficulties heterogeneous partners find in collaborating can be explained by their problems in finding pre-existing intersections between their respective C-K profiles: so Matching cannot be executed directly, Building is required before Matching is possible.

From this point of view, we can point to two significant managerial contributions for the success of cooperation for innovation. First, partners have to set up collective learning mechanisms that enable them to not only to share their C-K profiles but to investigate opportunities to expand them. Simple communication alone is not sufficient to enable them to find a CP, they must create learning situations where partners can reveal and expand their knowledge and concept spaces (for instance, organizing creative sessions about unfamiliar concepts to all partners). Second, partners in such innovation collaborations must be able to revise their conceptual level in order to find more abstract versions of concepts. This finding fits well with the analogical problem solving method for inventing new solutions in cross-industry partnerships (Enkel and Gassmann, 2010) or with the C-K theory-based tool proposed by Gillier et al. (2010) to make the exploration process visible to practitioners.

7.3. Limitation and proposals for further research

This research is limited to a single case-study, and further empirical research are required to understand these new forms of partnerships better. Researchers have seen the chance of acquiring complementary knowledge, technology or markets quickly as the classic motivations for collaborating. The MIL case shows that partners may collaborate for a totally different reason: they hope to be surprised by the new ideas and events that come from partners from different sectors. But, how do they then absorb such unexpected results? And what are the most favorable ways to manage such partnerships?

We argue that the Matching/Building concept may suggest new frameworks to

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analyze these new forms of partnership. For instance, we can imagine different starting configurations for collaborations according to the diversity between participants' knowledge spaces, or between their concept space. How might the exploration process differ? Which configurations are most successful? In C-K theory terms, Matching/Building is a first proposition to test this theory against the collaborative dimension of design, and more research is required to predict or interpret major issues of collaboration in innovation more fully.

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[1] For confidentiality reasons, this company is not included in this research.

[2] Readers should be aware that, at the start of their collaboration, partners did not have a clear picture of their mutual C-K profiles (see next section). The 'C-K profiles' were generated from data collected from R&D agreements and interviews: they do not represent all these firms' activities, but they only describe the partners' objectives in the MIL context.