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Managing Inter-Organizational Knowledge Sharing: Integrating Macro, Meso and Micro Level Analysis

Chiraz Guedda

Abstract

Numerous studies focus on the increasing role that cooperation plays on knowledge creation and the importance of knowledge diversity. However, in dealing with different background, culture, process, and knowledge throughout collaborative project, organizations must improve their practices to access, share and create knowledge. This paper aims at highlighting the complexity of interfirm collaborative projects while analyzing how different factors bolster knowledge sharing between partners depend on project phases. This work supports literature on interactionist approaches and project management to analyze these concepts of collaboration and knowledge sharing. Based on case study of an aerospace cluster, the findings highlight the factors that may enhances the effectiveness of knowledge sharing depend on project phases. We conclude by identifying further conceptual research and implication for research and practice.

Keywords: collaboration, ecosystem, knowledge sharing, project

1. Introduction

In today economy's, knowledge becomes more and more critical for organizational survival and competitiveness. Both researchers and practitioners have emphasized the need to develop, refine and access to knowledge to ensure the innovative capacity of organizations [1, 2] and hence their competitiveness. In this context, mainstream literature on knowledge management considers that process which leads to knowledge creation and innovation requires to cooperate with actors inside and across the boundaries of organizations. The success of certain innovative regions such as Silicon Valley and Route 128 of Boston, which argue that these industrial location models or clusters are a source of economic progress for the local communities' regions and consequently the nations, sheds light on the localized nature of innovation. In fact, the clusters are seen as the driver to the development of knowledge economies based around innovation [3–5]. In this way, innovation is seen more and more as a social, collective and localized process.

The literature on clusters provides useful insights that explain the factors that enhance knowledge creation and innovation within the cluster. Most of these research analyses the role of proximities in facilitating the collaboration and

knowledge sharing. However, despite the widespread expansion of research on concepts of cluster, recent studies emphasize the current analytical shortcomings and the failure of conceptualizing innovation in contemporary societies [6], the lack of understanding the dynamics of collaboration within the cluster [7–9], and the little known in the explanation of the link between knowledge ties and proximity within the cluster [10]. As cluster enhances innovation by facilitating knowledge creation, the aim of this research is to shed light in the factors that bolster knowledge sharing between partners. To do so, we draw from research on cluster and knowledge management to analysis the factors that enhance and impeded the interorganizational knowledge sharing. In the sections that follow, we first review research on collaboration, cluster and knowledge sharing highlighting the factors that foster or impede the interorganizational knowledge sharing within a cluster. Section 2 explains the methodological framework used for this research and in the final section we summarize the findings as well as future research directions.

2. Literature review

2.1 Inter-organizational collaboration and ecosystem

Business today is based on networks and collaboration within and between organizations. As, knowledge is dispersed among different actors and organizations [11, 12] a most relevant motivation of organizations is the access to new ideas and complementary knowledge resources [13, 14]. In fact, knowledge diversity resulting of these collaborations enhance innovation as it is seen to expand the range of ideas that individual can use. Increasingly, literature on innovation considers industrial clusters [15, 16], national system of innovation [5], business ecosystem [17] and ecosystem of innovation [18–20] as territorial systems that facilitates and drive collaboration. Whatever name they are given, these concepts are widely analyzed to better understand the nature of relation between space industry and innovation [6]. For both researchers and practitioners, much of this intense interest is driven by the recognition that co-location allows the generation of a learning process, following the externalities of knowledge generated by geographical proximity, thus leading to innovation [15, 21, 22]. Mostly based on the success of certain highly innovative regions such as Silicon Valley and Route 128 of Boston, the unanimity about the virtues of these forms of territorial agglomeration has been reinforced. Local production system is here referred to under the generic term of «ecosystem» which is defined as «*an economic community supported by a foundation of interacting organizations and individuals-the organisms of the business world. This economic community produces goods and services of value to customers, who are themselves members of the ecosystem*» ([17]:26). As Moore [17] states, the ecosystem refers primarily to notions of interdependence, leadership, and coevolution around innovative ideas.

More and more, innovation is seen as a collective action, which involves many different actors operating in a cluster context [23]. Furthermore, cluster enhances interorganizational relationship among the actors by facilitating networking and socialization through the geographic proximity [24, 25]. This socialization, facilitated by the possibility of frequent face-to-face contacts, helps foster knowledge exchange by building trust [26, 27]. As Cohendet et al. [28] argued, what are matters in the socio-economic approach of networks is the quality of the relationship between firms rather than the quality of the transaction. This social dimension's interest in the relationship between the partners has led to more and more in-depth research on the notion of social proximity. As it is increasingly recognized that the knowledge economy is a relational economy [29], much of research on networks

and collaboration [30, 31] knowledge management [26] has stressed the benefit of social proximity to facilitate collaboration and knowledge sharing. As suggested by the literature of sociology [32], social proximity fosters trust and builds a mutual commitment and consequently facilitates collaboration and interactive learning. In other words, it is often highlighted that the network partners may generate new solutions by joint-problem solving arrangements facilitated by ties embedded in the network [31]. As Boschma et al. [33] and Boschma [34] explain, an innovative performance at the firm follows an inverted «U» relationship between embeddedness and firm's innovative performance. Boschma [34] uses the embeddedness literature [32, 35] to define social proximity as a micro level' socially embedded relationships that includes trust based on friendship, kinship, and experience. This social proximity fosters the interactive learning by reducing the risk of opportunistic behavior and facilitating the sharing of tacit knowledge [26], which requires frequent interactions. However, Boschma [34] argue that as well as too much social distance, too much social proximity may be harmful for learning and innovation as it could lead to a closed community and consequently impedes innovation by limiting the access to the innovative ideas and diversity.

2.2 Ecosystem and knowledge sharing

Knowledge creation and innovation processes have become increasingly complex due to a wide variety of sources of knowledge and the growing need for collaboration [7, 36]. The main purpose of theses collaboration is to maintain a sustainable advantage [37] by creating and sharing knowledge. Corno et al. [38] present three levels of knowledge transfer. The level of «initiation» that allows the sharing of explicit knowledge, the «encounter» level in which the actors seek to understand the tacit knowledge of their partners, to convert them into explicit knowledge, to integrate and to use them, and the level of «intimacy», in which the interaction between partners becomes deeper and characterizes a more developed level of cooperation between them. In this phase, the partners exchange their tacit knowledge by sharing their experiences, exchanging their culture and adopting a common language.

Different factors can influence the success of knowledge sharing. The overview of the literature highlights these main factors in [18] the characteristics of the units involved in the sense of their motivation and their cognitive and absorption capacity [19, 39–42] the attributes of knowledge [11, 39, 40, 42, 43] the relationships between partners [7, 38, 39, 42] the organizational context [41, 44] and [39] the network properties [45]. However, most of these researches examine the factors facilitating the knowledge transfer and sharing by using one level of analysis such individual or team or organization.

The present qualitative interpretative research seek to better understand inter-organizational knowledge sharing process. It adopts an interactionist approach as stipulated by Strauss [46] is divided into three main elements: [18] the society as a collective production resulting from the interaction between different actors [19] the competences the knowledge and the rules are essentially elaborated in inter-subjective relations that evolve over time and [11] the human being must be seen as an active, reflective and creative being. The review of literature shows that the knowledge sharing between ecosystem partners needs a deeper understanding of the factors and determinants that enhance the knowledge sharing and how that affect it. Little is known about the determinants of successful knowledge sharing [47]. The present qualitative research seeks to better understand interorganizational knowledge sharing process between interorganizational projects partners by answering those two main questions: what are the factors that bolster knowledge sharing between partners? How these factors emerge during the collaborative project?

3. Research methodology

3.1 Case study

This research studies knowledge sharing between collaborative project partners within an innovative ecosystem. As the Quebecer aerospace ecosystem is an innovative ecosystem, it provides an interesting case for understanding collaborative projects and knowledge sharing processes. Our case of study is the projects of the Consortium for Research and Innovation in Aerospace in Quebec (CRIAQ). The Consortium for Research and Innovation in Aerospace in Quebec (CRIAQ) is a non-profit organization (NPO) created in 2002 with the financial support of the Quebec government. Including companies of all size, academics and research centres as actors, CRIAQ aims to improve the collective knowledge base in the aerospace industry and to increase its competitiveness. CRIAQ operates in a network based on logic of open innovation and promotes collaboration between specialists from industry and researchers to identify and implement projects that meet industry requirements. His mission is to stimulate the ecosystem innovation by increasing collaborative projects and to enhance the skills and knowledge of aerospace actors. For CRIAQ projects, the funding structure determines the allocation of leadership within the team. Indeed, since the 50% of funding comes from NSERC (Natural Sciences and Engineering Research Council), it was agreed that leadership should be attributed to the university partner. As conceived by Etzkowitz and Leydesdroff [48], the CRIAQ model is strongly built on the interrelationship and interdependence between three spheres: state, industry and university and provides three analysis level: macro, meso and micro.

3.2 Level of analysis

Our objective is to understand the dynamics of knowledge sharing between the partners of the aeronautical sector. Thus, the unit of analysis focuses on individual involved in collaborative projects. However, we adopt a systemic analysis that includes the micro (individual), meso (organization) and macro (ecosystem) level.

3.3 Data collection

To collect data, we used semi-structured in-depth interview and documentation nevertheless, our main source of data collection is the semi-structured in-depth interview. The documentation as second source of data collection were collected through forum and steering committee records allows us to provide as much information as possible on the subject and field of our study, but also to triangulate our data sources. Regular follow-up interviews, secondary data analysis (internal documents), and corroboration activities were conducted to ensure that our findings match interviewees' view of reality. The triangulation of different data sources (interviews and documentation) makes it possible to identify converging lines, to corroborate information from other data sources [49]. As Eisenhardt [50] suggested, the data collection process was stopped when the interviews brought little or no more new information.

3.4 Sampling

As suggested by Eisenhardt [50] and Eisenhardt and Graebner [51], we conducted a theoretical sample by choosing cases that present a theoretical contribution for our study. As our sample is composed of 5 sub-samples: [18] main

contractors [19] integrators and Tier One suppliers [11] governmental and consortia organizations [7] universities and research centers and [39] SMEs, for the semi-structured interviews we sought theoretical saturation [50] in each category of respondents. This implies that we did not seek an equal number of interviews between the 5 subsamples. **Table 1** presents the respondent's profiles and the numbers of interviews conducted.

In addition to academics, respondents hold the positions of: President, Vice President (Technology and Innovation), Vice President (R&D), General Manager, Project Director, Technical Director, R&D Director, Head of Department. These respondents are directly involved in CRIAQ projects at the decision-making and/or operational level. These different positions of informants involved in collaborative CRIAQ projects allows us to better understand the motivations of the partners, the context of the projects (decision making process to collaborate) which allows us a deeper analysis of the determinants that bolster the knowledge sharing between partners.

However, two main criteria were important for the constitution of the sampling:

1. The sampling must include respondents belonging to each aeronautic ecosystem actors: major contractors, equipment manufacturers and SMEs, universities and research centers, public actors (ministries), and research consortia and another public-private organization involved in the aeronautical ecosystem and in connection with research consortia.
2. The informant must be involved inclusively in (i) at least one completed CRIAQ project and (ii) another collaborative internal projects to their respective organizations. By the first element, which is at least one CRIAQ project, we sought to guarantee more richness of data through the experience of the respondent throughout all the CRIAQ projects phases. Thus, we excluded from our data analysis two cases of respondents who participated only in a CRIAQ project which is in progress, because we judged that the interviews were not sufficiently rich since the respondents did not necessarily have a complete vision of the project. Our objective is to understand the dynamic of knowledge sharing between partners in the aeronautical sector, it is therefore implicit that the respondents must have experienced all the phases of the collaborative project. However, without carrying out a formal comparative analysis between the two types of projects (internal and CRIAQ projects) in our analysis, for the second element, which is being involved in other collaborative projects internal to the organization, this will also allow us a deeper understanding of the dynamic of collaboration of the organization. This will essentially allow us to understand the impact of the two levels: meso and macro.

3.5 Semi structured interviews

We conducted 52 semi-structured one-on-one interviews with various aerospace industry stakeholders involved in CRIAQ's projects including academics (professors), industrials and government institutions. The interview lasted approximately between 30 to 80 minutes and were conducted over an 11 months period. The interview process was based on an interview guide. Taking into account the flexible attitude adopted during interviews, this interview guide is more of an interview support and not a static interview guide and sets out the topics that should be covered during the interview. It is important to note that the terminology used in the interview guide is not the same as that used in the conceptual

Types of organizations	Number of interviews
Main contractors	15
SME	10
OEMs, Integrators and MROs- Tier One Suppliers	8
Governmental organizations and consortia	7
Universities and research centers	12
Total	52

Table 1.
The study respondent's profiles.

framework. This difference is explained by the concern of clarity which requires the use of terms understandable by the respondents and which are part of their reference scheme [52]. A first version of the guide has been served as a pre-test for our interview guide and aims to validate final interview guide. Two main versions of the interview guide were developed: a version (A) addressed to academics and industry and a version (B) addressed to government actors and consortia. These two versions take into account the particularities of the partner actors in collaborative projects and differ slightly and mainly in terms of the theme dealing with the progress of the project and knowledge management. Indeed, government actors and those belonging to the sub-sample of consortia do not actively participate in all project phases (especially in the execution phase) but are more involved in the initiation and set up phases some questions then differ from those asked of industrial and university partners. The interview guide consists of two parts. The first part involved general questions about the informants' background, their experience in collaborative projects. The second section focused on the main purpose of the study which is the determinants of knowledge sharing. The purpose of this section is to collect the information, experiences thoughts and interpretations of respondents regarding the progress of the collaborative's projects and its outcomes in terms of knowledge sharing. In addition, in this interview section, we often encouraged and asked respondents to provide us with concrete examples in order to enrich our data with real-life experiences.

3.6 Data analysis

The data analysis strategy adopted in our study follows the assumptions of the grounded theory. This strategy involves “the systematic comparison of small units of data (incidents) and the gradual construction of a system of” categories “that describe the phenomena being observed” [53]. The data has been condensed, structured and analysed. The data analysis followed the three types of coding of the grounded theory described by Corbin and Strauss [54], Corley and Gioia [55] and Charmaz [56]: open coding, axial coding and selective coding (or theoretical coding). To do so, we conducted line-by-line analysis of every quote to identify common ideas [57]. Through an iterative process, we defined a sub-category, and we established the link between the various categories by questioning causes, how, where and when [58]. Linking these categories allows us to assemble into higher order themes ([55]: 183). Thus, by establishing the relationships between categories and subcategories and integrating the concepts around the central themes, we can provide better explanations of the dynamic of knowledge sharing between collaborative project partners. The analysis is summarized in Appendix 1.

4. Results

The purpose of this research was to better understand the factors driving the knowledge sharing in the context of inter-organizational collaboration. This work aims at analyzing how different determinants bolster the knowledge sharing process between partners. Based on the results of our primary data, these determinants depend on projects' phases as well as analysis level (macro, meso and micro). The research finding shows that the role of social proximity played an important role in the initiation project' phases, especially by fostering collaboration, but throughout the project its apport is controverted. As well, during this phase, the macro level, via the quasi- governmental institutions, helped fostering collaboration and knowledge sharing between aerospace partners. The team dynamic and the organization culture are more determinants in the set-up and execution project' phases while the role of macro level actors is less important.

4.1 Knowledge sharing and project' phases

We deemed it appropriate to present the determinants and issues that influence collaboration between partners according to the phases in which they emerge. This choice is strongly influenced by the primary data which led us to classify the categories of determinants according to the project phases. These different phases are project initiation phase, project setup phase and the project execution phase. The determinants that influence knowledge sharing are related to three levels: micro, meso and macro. The purpose of this research was to better understand the underlying factors driving the knowledge sharing in the context of inter-organizational collaboration. The research finding shows that the role of social proximity in fostering collaboration is controverted. Despite the importance of the social proximity in collaboration, our results highlight that the outcomes of this collaboration, in term of success of collaboration and knowledge sharing, are questionable. In fact, our results reveal how the critical is the role that institutions play in facilitating collaboration among actors and creating an enabling environment for co-innovation. However, our results have also shown that despite the willingness and efforts of public actors to stimulate the process of co-innovation between actors, this objective does not seem to be easily achievable. The success of collaborative activity now depends on other determinants of individual and organizational nature, depending on the progress of the project.

4.1.1 *The initiation project phase: the role of micro and macro level*

The initiation project' phases highlight the importance of the micro and macro level in the knowledge sharing process. It was particularly noticeable that informants argued that the macro level provides a great condition fostering knowledge sharing and collaboration. For example, the CRIAQ' forum, organized every two years, present the opportunity for the aerospace actors to openly display their issues and their research needs. The objective of those forum is to help organisations and academics to enhance their skills and develop their knowledge by sharing, exploring a new problematic. At this level, it is important to specify that the principal mission of CRIAQ is to bolster collaboration which is leads to knowledge sharing. However, some informants felt that, despite the role of CRIAQ fostering collaboration, the social capital is the most determinant element at this phase.

4.1.1.1 Social proximity: the challenge

Participants' statements such as «it's because I have good relation», «he's a nice guy», «we look at affinities», «the research is between friends» and «if the chemistry is not there it does not work!» have been widely given as an answer to explain their choice of projects partners. Facilitated by the geographic proximity, the social proximity is shown as a foster for the emergence of collaborative project and an important determinant for the knowledge sharing process. According to our results, social capital is dependent on past experiences, friendship and affinities between actors. Those relationships are consolidated by the trust that people develop among themselves through their previous experiences and their evolution over time. Specifically, partners develop their trust in each other based on knowledge, trustworthiness and friendship. This is reflected in the comments of one of our respondents: «we create a certain trust between the players through the relationship» and «the social aspect is an important element that I had underestimated! That's where trust comes in! ». However, curiously, despite the importance of social proximity during the initiation phase of the project, our results throughout the progress of project, the social proximity does not play an important role. Social proximity facilitates the emergence of collaborative project, but it does not always mean it that lead to collaboration none achieve knowledge sharing.

4.1.2 The set-up' project phase: the role of meso level

The set-up project' phases highlight the importance of meso level in the knowledge sharing process. According to most of informants, the team project partners and the organisation' implication played an important role to facilitate the knowledge sharing process during the set-up projects phases.

4.1.2.1 Institutional orientation

The research results highlight the crucial role of institutional orientation of the firm and how it affects the goal of collaborative project and consequently the knowledge sharing process. Indeed, for most of our informants the involvement of the industrial firm in the CRIAQ project is seen rather as a response to a social mission, political pressure and a need for visibility. It is therefore not surprising that the organization' interest in the CRIAQ project is sometimes low and questionable. Consequently, it is obvious that the availability of team members on these projects is compromised. One of informants explained: *«So it limits the frequency of meetings, the availability of industrial very much limits the frequency of meetings ... Then if people are not available, also sometimes it puts frustrations when we want to settle things and then there is no availability»*. The lack of availability affects deeply the purpose of collaboration and knowledge sharing process between partners. As the team partners do not have the availability needed to the project progress, they do not necessarily absorb and integrate in time the information and new knowledge generated by the project. In these cases, the challenge is to take advantage of this information before it becomes obsolete. This informant summarized this issue: *«So often, we will absorb the information in detail a few years later. Because when the project starts, we do not have the resources, we do not have the right resources. We follow the project, but how can I say.. with a certain distance, we are not equipped, and we do not do it from day to day»*. However, the lack of project interest showed two different explanations from informant. In one hand, informants stated that the “bottom up” approach of these collaborative project does not lead necessarily to knowledge sharing process and in other hand, others informant explained that this lack in

the interest in the project is a consequence of the absence of some individual's determinants such as communication, leaderships, insufficient skills in project management.

4.1.3 The execution' project phase: the role of micro level

According to informants, the most important determinant to foster knowledge sharing process is leadership. As stated earlier, social proximity and affinities are just not enough to bolster knowledge sharing process. Sometimes, with disappointment some of informants explained that most of CRIAQ projects are based on social proximity to choose team projects partners. However, despite this social proximity, informants argued that tension and disappointment are experienced during most of CRIAQ project especially during the execution phases the project when the role of leader is much needed. It is worth noting that based on the rules of CRIAQ project, the academic partner should take the lead of project. Most of informants explained that the lack of «strong leader» described as problematic and lead to frustration and loss of project interest. Some respondents explain: «there are several universities and research center and they do not necessarily communicate, it's the job of academic lead normally, it's hard to promote these communications!», «Yes it slows down our involvement in CRIAQ projects definitely. Yes definitely! It's a matter of credibility...We say it starts today, but we will start in a year!». However, our results show that the leadership issues is related to misunderstanding of the reality of each other's partners. For the academic's partners, it is not lack of "strong leader" that impact the execution of project but the misunderstanding of industrial partners of the academic' challenge to build the research team. One of academic informants explained: "Sometimes that's why we can't deliver or start on time because of student recruitment, for some projects we cannot recruit international student, and because of the ability of manufacturers to bring out data internally and communicate it to us... They ask us the impossible". On the whole, the research results show the challenge that face the partners of interorganizational collaborative project especially between academics and industrial partners. For the academic' partners the feeling of misunderstanding of their realities and the challenges they faced is widely raised. In fact, despite the collaborative aspect of these project, this divide on the way how to perceive partners' reality and challenge makes the knowledge sharing process not easy to achieve.

5. Discussion

The purpose of this paper was to gain an in depth understanding the factors that impede and foster the inter-organizational knowledge sharing within a collaborative project. The results highlight how social proximity, which is considerate as a facilitator to collaboration and interactive learning, is needed to initiate the collaborative project but neither fosters collaboration nor facilitates the knowledge sharing process in a lack of other factors. Our finding suggests that throughout the project' progress, the lack of leadership and interest in the project tracked a failure to achieve a knowledge sharing between partners. Indeed, open innovation requires leadership [59]. Overall, more specifically, our results highlighted the existence of deep tensions and frustrations between the collaborative project' partners especially between academia and industry. As explained by open innovation and ecosystem research, the need of complementary knowledge is more and more needed through a cross-boundary collaborations. These interorganizational collaboration implies partners with different background and culture working interdependently across

disciplines arises challenges and makes knowledge sharing between partners more complex.

5.1 Interorganizational knowledge sharing challenge

Despite the complementarities between the aeronautic ecosystem partners and the need of a new knowledge, this study shows a challenging relation between two important actors: the industrials and the academics. In fact, universities have become a major knowledge creator in many countries [60]. Our finding shows a challenging collaboration between the academics and industries.

5.2 Academics-industrial: complementarities with two languages

Innovation is needed in today's challenging environment which dynamism and managing uncertainty is required [61]. Open innovation which is "a paradigm that assumes that firms can and should use external ideas as well as internal ideas to advance their technology" [13] embedded in the notion that the sources of knowledge for innovation is dispersed in the economy and involves a deliberately managed knowledge flows across organizational boundaries [62]. Through collaborative project partners develop, create and share knowledge. In dealing with different background, culture, process, and knowledge throughout collaborative project, organizations must improve their practices to access, share and create knowledge. Ecosystem of innovation [19, 20, 63] is more and more considered as territorial systems that facilitates and drive collaboration which facilitate knowledge sharing and innovation. Our results show that interprofessional collaboration- expressed by academia and industry partners- presents more challenge and obstacle in sharing knowledge. On the one hand lack of communication and leadership is often expressed as a missing skills of academia partners. On the other hand, a misunderstanding of the reality of partners is showed to be the reasons of those missing skills. This tensions between academia and industrials partners leads to a poor projects' output in terms of knowledge sharing whether is strong the contribution of governmental actors to bolster collaboration and open innovation.

5.3 A balanced bottom-up and top-down collaboration approach

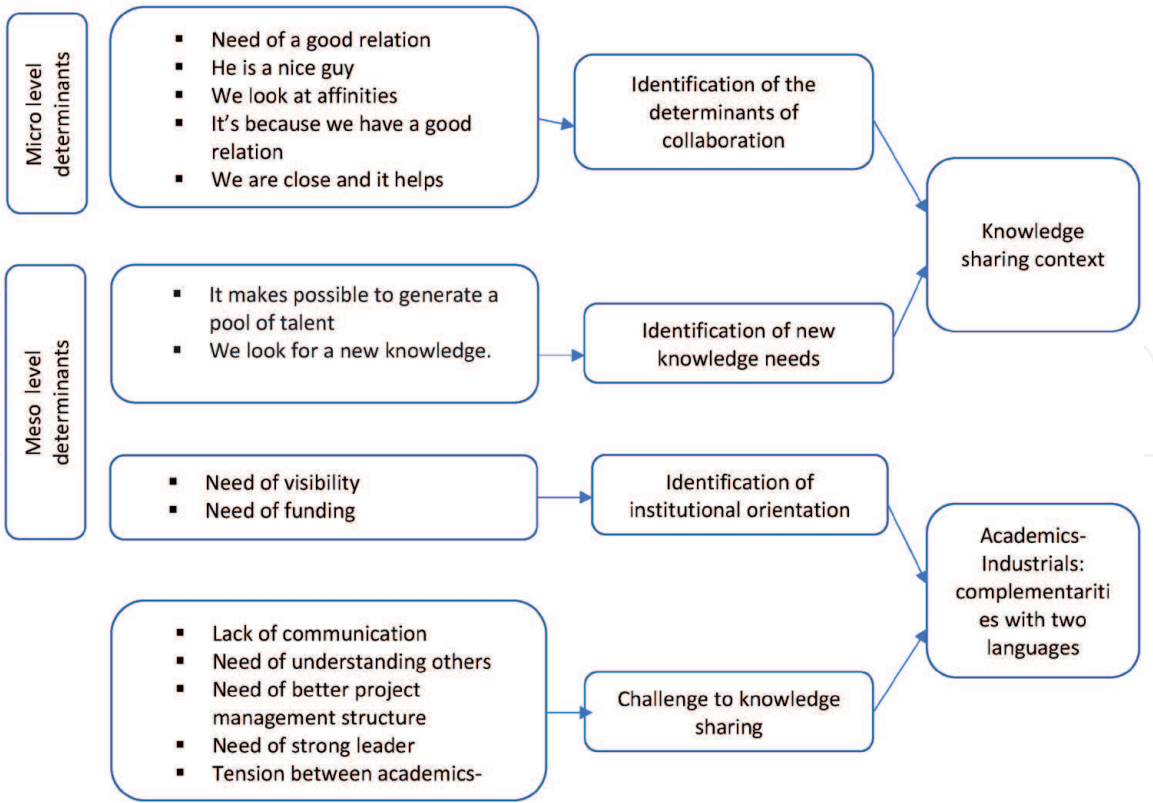
Our results show the balance between a "top down" and a "bottom up" approach is required in order to promote collaboration between ecosystem actors. Despite the existence of social proximity and geographic proximity that should lead to facilitate knowledge sharing process, our informants expressed a weak knowledge sharing through those collaborative projects.

6. Conclusion

The purpose of this paper was to gain a better understanding of factors that impede and foster the inter-organizational knowledge sharing within a collaborative project. The results generated in this analysis highlight how social proximity, which is considerate as a facilitator to collaboration and interactive learning, is needed to initiate the collaborative project but neither fosters collaboration nor facilitates the knowledge sharing process in a lack of other factors. Contrary to research showing the relevant role of social proximity to foster collaboration, our finding suggests that within the project progress, the lack of leadership and interest in the project the collaborative project fail to achieve their goal which is

the knowledge sharing. Furthermore, this paper contributes to existing literature on collaboration and knowledge management by analysing the role of proximity, especially social proximity, depending on project stage and progression. This paper points out the need of multilevel analysis to better understand the dynamic of interorganizational knowledge sharing. As stated earlier, three level of analysis used for this research. The three levels are continually interacting. Indeed, we believe that the relationships between organizations within the cluster impact the dynamics of individuals and groups that collaborate, but also these organizations evolve within an environment that shapes them. This impact is by no means a unilateral one, since the structures of social systems are both «conditions and results of the activities performed by agents who are part of these systems» ([64]: 15). There is therefore a duality between action and structure according to Giddens [64]. Similarly, as the knowledge sharing is a social phenomenon, we believe that the understanding of the interorganizational knowledge sharing dynamic within the cluster should shed light on the interaction between different actors and social systems at three level of the ecosystem: micro, meso and macro. The choice of CRIAQ projects as a single case of the study limits the generalization of the results. Moreover, even if the choice of this typical case seems adequate to our study and our research concerns, it would be interesting to study other cases of collaborative projects within the ecosystem. In addition, a comparison between national and international projects would make it possible to deepen certain results, in particular on the concepts of proximity, leadership and the philosophy of the organization.

Appendix 1: data structure



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Author details

Chiraz Guedda
University of Montreal at Quebec, Montreal, Canada

*Address all correspondence to: guedda.chiraz@gmail.com

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