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Presented by:

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Driving factors for symbiotic collaborations between startups and large firms in open innovation ecosystems

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Déterminants de la collaboration symbiotique entre startups et grandes entreprises au sein des écosystèmes d'innovation ouverte

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To my children, Eloane & Ethan

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In Nancy, August 27, 2020

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“C’est toujours ce qui éclaire qui demeure dans l’ombre”

Edgar Morin,

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GENERAL INTRODUCTION

GENERAL INTRODUCTION

Context of the research program

Faced with the complexity of the macro-environment, but also their meso-environment, large firms must explore new spaces of external knowledge in order to innovate faster and better than their competitors do. There are many failures of large groups, which have not manage to gain a competitive advantage in their market:

> "*In July 2016, Yahoo! is acquired for less than $5 billion by Verizon, a mobile phone operator. Twelve years ago, this Web pioneer was worth $43 billion. Why such a slump? "Yahoo! has been a news portal, a search engine, an email service and a stock exchange company, but it has never become the best in any of these markets," says Frédéric Fréry, professor of strategy at ESCP Europe."*[1]

Faced with this context, large firms are increasingly moving towards open innovation, to integrate various external actors into their innovation process in order to achieve or maintain a competitive advantage. Startups, as a valuable resource for the development of innovations, but also for their strong client-centric orientation as part of their business model (Sarrazin, 2017), are among these external players. Their agility allows them to react quickly and to propose innovative solutions sought by large firms to meet the market demand and enable them to maintain their competitive advantage or simply survive (Chesbrough, 2003; Spender, Corvello, Grimaldi, & Rippa, 2017). Startups, for their part, will seek collaboration with large firms for a variety of reasons, including a need for financial or material resources, complementary external knowledge (technical resources), recognition and legitimacy in the eyes of target customers with a perspective of rapid commercialization and,

[1] https://www.capital.fr/votre-carriere/6-echecs-historiques-que-tout-manager-doit-avoir-en-tete-1231141, source consulted 21/07/20, freely translated.

above all, scaling up. This points to a first fundamental difference between startups and large firms: their business model, that of startups, is based on its scalability, as mentioned by Blank & Dorf (2012), which is not the case for large firms.

Collaboration between startups and large firms seems a priori natural: each searching for what the other has, collaboration integrating this complementarity might seem obvious. If it can be so from a rational and external point of view, it is however not yet natural in practice, as Jean-Pierre Bouchez shows in his excellent book recently published (Bouchez, 2020, p. 234, freely translated) :

> *"A review of practices shows that while there are some encouraging factors regarding the collaboration between these two worlds, a number of improvements still need to be driven."*

The balance of collaboration is therefore not so easy to find. Reconciling the interests of these "two worlds" whose realities are very different in order to bring them closer together and collaborate to innovate jointly around a common goal is a challenge. Beyond these very different realities, other dimensions can intervene and slow down, or even make fail, the collaboration between these actors. For example, the fear of the large firms to see in the startup a potential future serious competitor. Although this fear should be nuanced because it has been less present in recent years, according to the collegial opinion of the startups and innovation intermediaries questioned on the subject, it remains latent nevertheless. On the startup side, the fear that appears to be the most important is that of a "*hold-up of intellectual property rights*"[2]. A materialization of these fears on both sides can be seen through the different perception that the two actors have of the notion of exclusivity (see Figure below): in fact, 50% of the large firms surveyed consider it "fairly or totally relevant", against 24% of the startups who prefer to work with large firms on a more independent basis.

[2] https://lehub.bpifrance.fr/startups-grands-groupes-2-regles-jeu/, source consulted 31/07/20.

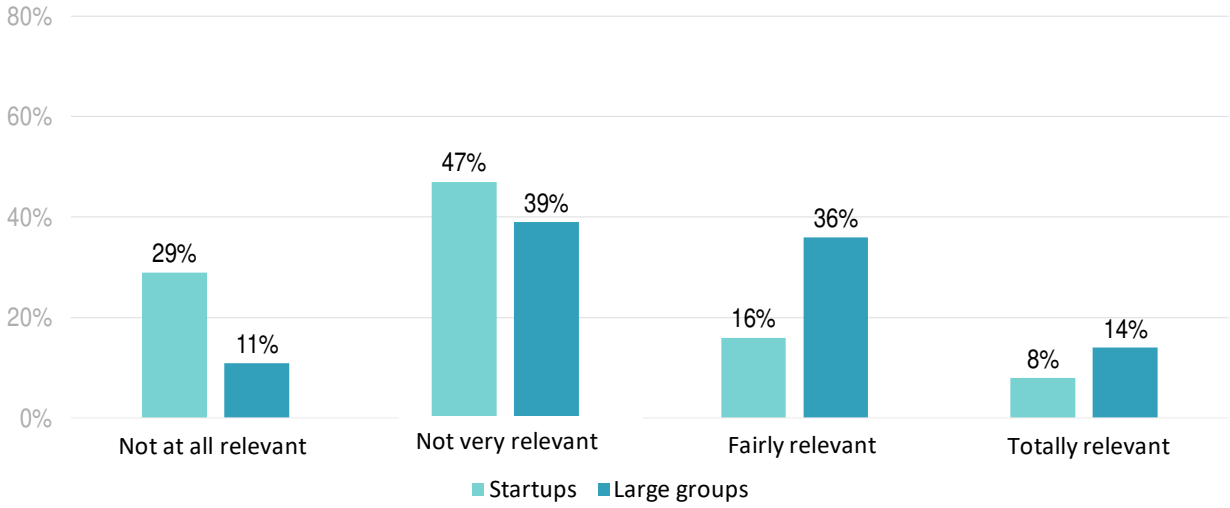

Figure 1 - Perception of the notion of exclusivity in the startups - large groups relationship (Source: Cap Gemini)[3]

Moreover, if we look at the territorial strategy, in 2019 there were only 7 unicorns[4] in France, whereas the United Kingdom (a country of a size close to that of France in terms of population) had 25 and the United States 228 in June 2020, according to the recent CB Insights report. Therefore, it seems legitimate to question these differences, with a view to improving the existing situation. According to the French Secretary of State for the Digital Economy: "*There is a French and European way of doing technology and there is a Chinese and American way of doing technology. In France, there is always a balance between performance and humanity*." [5] Values and meaning would therefore be placed at the heart of action in France, alongside performance, and would partly explain these differences. For others, such as Gilles Babinet[6], a French entrepreneur and vice-president of the National Digital Council, these differences are more related to the culture of risk-taking in France, the very low "polyculturality" of startup founders, structural failures such as a lack of proficiency in English or "*the absence of real clusters bringing together universities, startups and large firms*".

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[3] https://www.capgemini.com/fr-fr/news/le-village-by-ca-et-capgemini-presentent-les-resultats-du-barometre-2020-de-la-relation-start-up-grand-groupe/, 4th Village by CA and Cap Gemini barometer of the relationship between startups and large groups, June 2020. Source consulted 01/08/20, freely translated.

[4] In reference to a startup that grew into a company with a value of over $1 billion

[5] https://www.gouvernement.fr/argumentaire/french-tech-2022-interview-mounir-mahjoubi, source consulted 29/07/20, freely translated.

However, France would count (the number varies from one source to another) more than 10.000 startups in 2019, 51% of which are concentrated in Paris[7]. Many efforts have been made to support the development of startups and the dynamics of the ecosystem as a whole throughout the French territory with the creation of SATT, incubators, accelerators, studio startups, for example. Startups can also count on the support and essential actions of key national stakeholders such as French Tech, created in 2013, and of course BPI France, to name just a few. The public and private actors are very numerous and reflect the collective will to support entrepreneurship in the French ecosystems. In less than ten years, the number of active accelerators and incubators around the world has jumped exponentially, from 560 in 2009 to 2,616 at the end of 2018[8]. France counts 270 incubators and 56 accelerators in 2018, their number having increased in one year by 12.5% and 12% respectively[9].

Finally, during the first 2020 episode of the Covid-19 pandemic, the government decided to support startups for these reasons invoked by Cédric O, Secretary of State for Digital Technology: "*Technology companies play an increasingly important role in our economy in terms of growth and job creation. Thanks to the innovations they develop, they also help to meet many societal challenges. The period we are going through is a striking illustration of this, as teleconsultation, teleworking and e-learning tools are proving to be decisive in enabling everyone to continue to live despite difficult conditions*."[10]

In the light of these contextual elements, the challenge of supporting startups and large firms through a better knowledge of the success factors of their collaborations to innovate appears to be fundamental at several levels:

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[6] http://blog-french-iot.laposte.fr/pourquoi-y-a-t-il-si-peu-de-licornes-en-france/, source dated 09/12/19, and consulted 01/08/20, freely translated

[7] https://www.capterra.fr/blog/470/situation-economique-et-sociale-des-startups-francaises-en-2019, source consulted 26/07/20.

[8] https://www.bpifrance.fr/A-la-une/Actualites/Accelerateurs-et-incubateurs-5-fois-plus-nombreux-en-dix-ans-45467, according to a Roland Berger study. Source consulted 23/07/20.

[9] https://lespepitestech.com/blog/2019/02/12/point-detape-sur-lecosysteme-startups-francais-en-2019, source consulted 26/07/20.

[10] https://www.economie.gouv.fr/coronavirus-startup-mesures-de-soutien-economique, source consulted 01/08/20, freely translated.

- Economic: impact on the growth of startups, large firms and by extension the French economy, combined with a dynamics of employment, the perpetuation of jobs within large firms and the creation of new jobs by startups.

- Societal: startups focus on the needs of customers and users, their offer is in line with the demands of society.

- Ecological: society is beginning its transformation towards sustainable innovation, which is now becoming urgent, and innovative and agile startups have a key role to play in this transition.

Emergence of the research object and problem

A research focusing on asymmetric actors

Startups and large firms being the main stakeholders on which this thesis focuses, it is useful to clarify here the definitions selected in this thesis.

From the entrepreneur to the startupper

The question regarding what a startup or startupper is was the subject of recurring discussions with the startuppers interviewed for this thesis.

At the origin of the term startup: the term "entrepreneur", which can already be found in French short stories written in the 14th century[11]. Later, in the 18th century, the first contribution to the field of entrepreneurship was made by the economist Bernard Cantillon (Stevenson & Jarillo, 1990) who invented the entrepreneur theory. Around 1800, the French economist J.B. Say referred to the entrepreneur as a person who "*shifts economic resources out of an area of lower and into an area of higher productivity and greater yield*" (Drucker, 1985). Moving away from the traditional view

[11] *Nouvelles françoises en prose du XIVe siècle,* published in 1858 from manuscripts. Introduction and comments by Charles d'Héricault and Louis Moland. Text available at the French national library (BNF): http://gallica.bnf.fr/ark:/12148/bpt6k27756m/texteBrut

of the entrepreneur and entrepreneurship, Schumpeter (1934) considers that the essence of entrepreneurs is innovation and that "*it is the carrying out of new combinations that constitutes the entrepreneur*". He defines (p.66) these new combinations as "*the introduction of a new good (…) or of a new quality of a good, the introduction of a new method of production (…), the opening of a new market (…), the conquest of a new source of supply of raw materials or half-manufactured goods (…) and the carrying out of the new organization of any industry (…).*" Since then, researchers have continued to nurture these definitions of the entrepreneur from three different perspectives based on "*what happens when entrepreneurs act; why they act; and how they act*" (Stevenson & Jarillo, 1990). For example for Drucker (1985):

> "*Entrepreneurs see change as the norm and as healthy. Usually, they do not bring about the change themselves. But -and this defines entrepreneur and entrepreneurship- the entrepreneur always searches for change, responds to it, and exploits it as an opportunity*".

Numerous studies have been undertaken on the types of entrepreneurs and their motivations. Recent work by Gruber & Macmillan (2017) on entrepreneurial behavior has identified three types of entrepreneurs:

> "*The traditional seeker of rent, the entrepreneur who seeks to aid the community, and the entrepreneur who seeks to aid society at large*".

Hence, what kind of entrepreneur is a "startupper"? Does he or she have specific characteristics distinct from those of a "simple" entrepreneur? The term "startup" has been widely used around the world for decades now, and to date there is still no formal, scientific, commonly agreed definition for the terms "startup" and "startupper". Dictionaries give very laconic partial definitions that are applicable to many cases other than that of startups. Here is one of these definitions: "a startup is a small business that has just started up". This type of definition is far from transcribing the original specificities of startups that differentiate them from other types of businesses. For Ries (2011), "*a startup is a human institution designed to deliver a new product or service under conditions of extreme uncertainty*." While extreme uncertainty is an essential dimension of the life cycle of a startup, the latter definition does not take

into account, among other things, the fact that the state of startups is inherently temporary (Spender et al., 2017), as today's startups are tomorrow's SMEs (Schäfer & Ternès, 2016). Furthermore, according to Blank & Dorf (2012), a startup is innovative, characterized by growth and the search for a repeatable and scalable business model. Paul Graham's definition also emphasizes the idea of rapid growth: "*A startup is a company designed to grow fast. Being newly founded does not in itself make a company a startup. Nor is it necessary for a startup to work on technology, or take venture funding, or have some sort of "exit." The only essential thing is growth. Everything else we associate with startups follows from growth.*"[12] Furthermore, unlike large firms that have a relatively traditional approach to business, startups base their activity on "lean thinking" which allows them to create value and be really close to the market demand (Ries & Euchner, 2013).

Considering these salient points from the literature, the definition of the term "startup" proposed in this thesis is as follows:

> *Startups are newly established companies that provide new products or services, are characterised by high and rapid growth potential and are therefore temporarily designated as startups. Their aim is to create value for the customer, to innovate by closely following market demand and to develop new sustainable and scalable business models. They operate in extremely uncertain environments and often have a crucial need for resources, including external financing. Structurally, startups are open, agile, flexible and innovation-driven. Finally, startups do not necessarily operate in the technology sector.*

Thus, due to the nature of their business, startup founders are deeply rooted in novelty, in innovation, which brings them closer to Schumpeter's entrepreneurial vision. Furthermore, these entrepreneurs, due to the particular business model of a startup, have to grow their company rapidly, which has an impact on the entrepreneur's or the team of entrepreneurs' behavior as well as on their decision making process. For these reasons, a startupper is referred to in this thesis as a particular type of entrepreneur, i.e. an innovative entrepreneur subject to particularly

[12] http://paulgraham.com/growth.html

strong time pressure due to the nature of his or her business model, which underlies the need for rapid growth.

The Large Firm

The notion of large firm is more widely accepted than that of a startup and is based on quantifiable criteria. This thesis has adopted the French definition "*defined by the application decree (no. 2008-1354) of article 51 of the law on the modernization of the economy, relating to the criteria for determining the category to which a firm belongs for the purposes of statistical and economic analysis*":

"*A large firm is a firm that satisfies at least one of the following two conditions:*

- *Have at least 5,000 employees;*
- *Have more than 1.5 billion euros of turnover and more than 2 billion euros of total balance sheet.* »[13]

The large firm is thus characterized by the importance of its human and financial resources, and therefore implicitly by its age and history, which determines its trajectory over the years. All types of large firms are considered here, this thesis focusing on the asymmetric dimension of their collaboration with startups (Kohler, 2016), i.e. a collaboration in which the stakeholders differ significantly in size, resources or business experience (Minshall et al., 2010) and age. Thus, no distinction is made between large firms: private, public, multinational, national.

A resurgence of academic interest since 2016 in research on startup - large firms collaboration

A search through the Ebsco database (Business Source Premier) shows the growing academic interest worldwide in the topic of collaboration between startups and large firms (see Figure 2). Calculations were made on the basis of a selection of peer-reviewed articles in the database, totaling 202 articles over the last 50 years (1971-

2020). The selection of articles that gave rise to the figure below was made using the following complex Boolean query to take into account a variety of terms used by researchers to characterize startup - large firm collaboration:

« (alliance* OR collaboration* OR cooperation* OR partnership*) AND (startup* OR start-up*) AND (corporate* OR "large firm*" OR "large compan*" OR incumbent*) »

The request was based on English language terms in order to encompass as many publications as possible, worldwide, as the majority of articles are written in English.

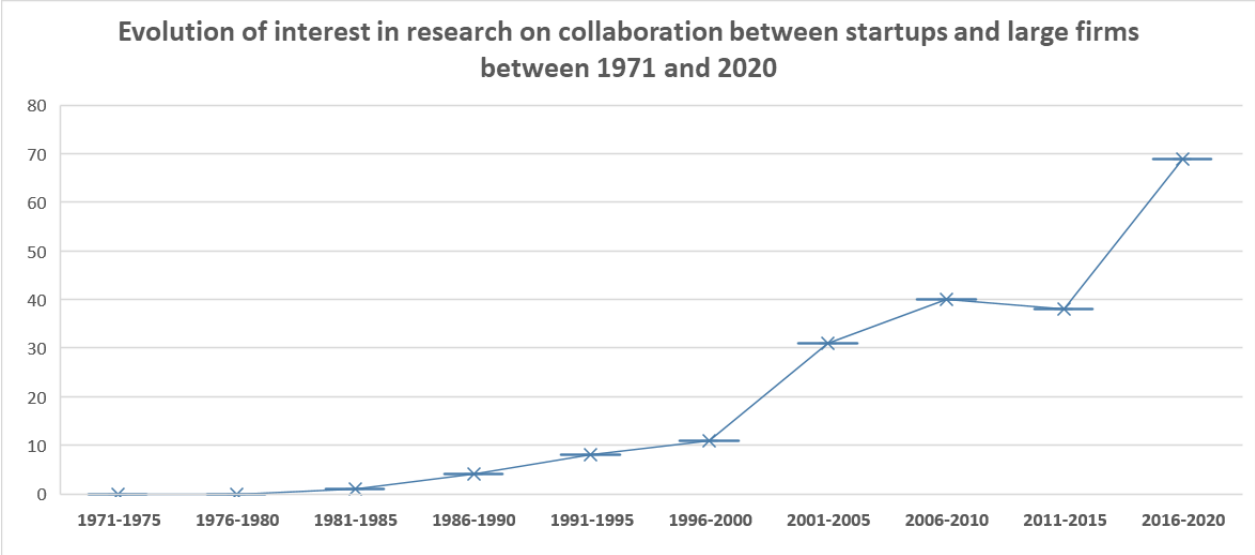

Figure 2 - Evolution of interest in research on collaboration between startups and large firms between 1971 and 2020 (calculated from Ebsco data)

The curve of the evolution of interest in this research topic gradually increases from the years 1996-2000, a period characterized by the beginnings of the Internet, and then more clearly up until 2010. After a period (2011-2015) of a slight decrease in the number of articles, from 2016 on, a rebound in the number of published academic articles can be observed which accelerates very clearly: +81% of articles between 2016 and May 2020 compared to the previous period (2011-2015). This coincides with the "third industrial revolution" as presented by Plihon (2016) (see Figure 3) on the basis of the work of Joseph Schumpeter.

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13 https://www.insee.fr/fr/metadonnees/definition/c1035#:~:text=Une%20grande%20entreprise%20est%20une,euros%20de%20total%20de%20bilan., source consulted 01/06/20.

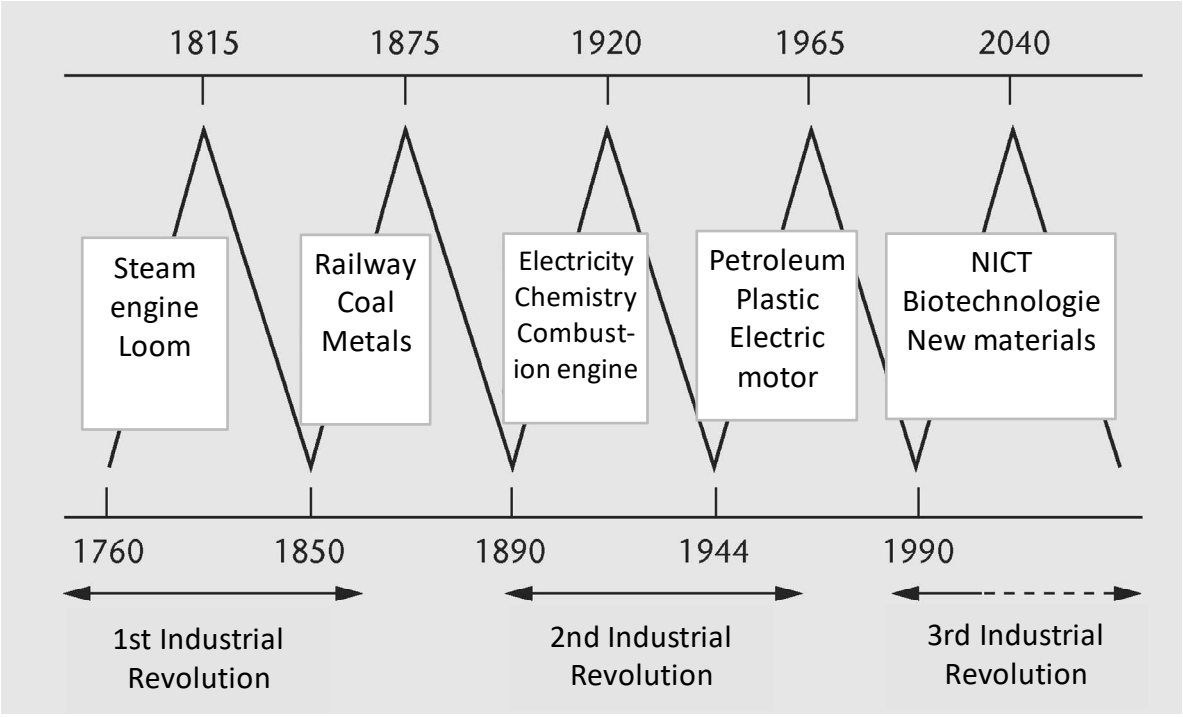


Figure 3 - Technological innovations and industrial revolutions. Source : Plihon, 2016, freely translated

This correlation between a growing interest in this type of collaboration and the evolution of technological innovations is not surprising as large firms are being disrupted in their business models by emerging technologies, and particularly in recent years by the giants at the forefront of these technologies, GAFA(M) and NATU. Therefore, it is logical that researchers are investigating this phenomenon.

The relational dimension of collaboration underexplored

While the transactional dimension (contractualization, financial dimension) of collaboration between startups and large firms is represented in the research work, researchers have pointed out the lack of work on the relational dimension of collaboration despite its importance (Dyer & Singh, 1998; Hill & Birkinshaw, 2014; Yoon & Hughes, 2016). This thesis has attempted to respond to these calls and adopts the definition of the term "relational" as described by Hill & Birkinshaw (2014, p. 1905) :

> "*We use the term relational to refer to ties that are embedded in social relationships, are typically long term in nature, and are evaluated on a subjective basis; relational ties are distinct from transactional ties, which are relatively at arm's length, short term, and objectively evaluated (cf. MacNeil, 1974; Poppo & Zenger, 2002; Rousseau, 1995; Uzzi, 1996, 1997).*"

Without rejecting the transactional dimension, which is essential in many types of alliances, the thesis focuses on the "sustainable", i.e. long-term, relational dimension of collaboration between startups and large firms, which did not receive enough attention to date. To address this relational dimension, the collaboration between startups and large firms was first considered according to their distance links, which underlined their differences. In a second step, an exploration of their possible rapprochement was carried out through the theoretical framework of geographical and non-geographical proximity. Indeed, in order to collaborate, the actors must interact and therefore get closer according to the different forms of proximity (geographical, cognitive, social, and organizational) presented in Chapter 1.

Lack of work on the process-based dimension of startup - large firm collaboration

Time is a precious asset for startups because of the nature of their business, which requires them to strive for rapid growth and therefore a short time to market. Moreover, most of them, like small organizational structures, lack time (Sarasvathy, 2008). Therefore, it is crucial for them to manage it as wisely as possible, especially in the context of developing a collaboration with a large firm where lack of time can be a barrier (Oumlil & Juiz, 2016; Ring & van de Ven, 1992). This type of collaboration is intended to be long-term for the startup (Weiblen & Chesbrough, 2015). It is therefore crucial for the startup to be able to choose the right large firm, the one that will enable it to grow rapidly. Given the importance of this time factor for startups in their collaboration with large firms, this thesis assumes a process-based approach of collaboration. Thus, collaboration is not only considered according to its purpose, the desired outcome, but also according to its life cycle, which is likely to change as collaboration evolves over time:

> "*The structural emphasis of transaction cost economics leads it to neglect important processual issues resulting from their ongoing nature. Alliances are usually not one-off transactions but, rather, entail continuing exchange and adjustments, as a result of which process issues become salient (Khanna, 1997).*" (Gulati, 1998, p. 304)

The idea is to explore each of the different phases of the collaboration in order to better understand and evaluate the quality of the collaboration according to the phase in which the partners are in.

Lack of a holistic approach to startup - large firm collaboration

In line with the choice of a process-based approach, it became clear that a holistic approach to startup - large firm collaboration was necessary as it was almost absent from the literature. Therefore, the thesis adopts a holistic view of this collaboration, just as some firms can do:

> "*Holistic thinking. [These] enterprises constantly scan the ecosystem to ensure that they are able to meet the short-term value delivery goals and simultaneously shape the long-term ecosystem within which the enterprise operates. [This kind of] enterprise requires leaders (and others) to take a holistic approach to considering all life cycle, leadership, and enabling processes in an integrative fashion, being careful not to suboptimize the performance of any one area.*" (Kessler, 2013, p. 439)

This holistic vision has led to the definition of a broad framework for collaboration beyond the startup - large firm dyad. The thesis takes into consideration the ecosystem including the stakeholders of the collaboration, in addition to the main actors, as elements specific to the ecosystem are likely to have an influence on the collaboration itself. Therefore, the thesis proposes to include different levels of analysis: intra-organizational of the startup, intra-organizational of the large firm, inter-organizational and ecosystemic. From this holistic perspective, the analytical frameworks chosen, based on the theory of proximity, as well as on dynamic capabilities, proved to be particularly relevant.

Interest of the research and objectives of the thesis

The contextual elements and existing literature led to the formulation of the transversal research question of the thesis in the following way:

"What factors foster symbiotic collaboration between startups and large firms in an open innovation ecosystem?"

The objective of this research work is to explore, in a context of open innovation, which internal and external factors to the actors foster a symbiotic relationship between startups and large firms, and thus positively influence the quality and success of the collaboration of these asymmetrical partners, which are at the same time different and potentially complementary.

The thesis defends the idea that the driving factors of a symbiotic collaboration can be (co-)constructed if one or both partners lack them. This thesis thus underpins the idea, according to an evolutionary approach and an analogy with biological symbiosis, that the symbiont (large firm or startup) can evolve, either by absolute necessity (no other possible alternative to ensure its survival), or by a conscious and voluntarist intention, to increase its capability to collaborate in a context of open innovation and ultimately satisfy its survival objectives. The reasons behind the orientation towards an analogy with biological symbiosis (in the mutualist sense) are presented in Chapter 1.

The theoretical frameworks used to explore the issue are based on the theory of proximity and on the theory of dynamic capabilities. On the one hand, the thesis is based on the flat hierarchy of forms of geographical and non-geographical proximity developed by Boschma (2005), as well as on the work of researchers from the French School of Proximity (Bouba-Olga & Grossetti, 2008; Kirat & Lung, 1999; Pecqueur & Zimmermann, 2002; Talbot, 2009; Torre & Rallet, 2005; Torre & Wallet, 2014). On the other hand, the theory of dynamic capabilities (Teece, Pisano, & Shuen, 1997) is used to explore the developments necessary for their regeneration to enhance proximity between actors.

The approach to answering the research question of the thesis was organized progressively, in four phases. Starting from the research issue of the thesis, a first

research sub-question gave rise to Article 1 (Chapter 3). This article raised various questions, which led to the emergence and selection of three other research sub-questions, which were then explored through Articles 2, 3 and 4 (Chapters 4, 5 and 6). These four articles and the research sub-questions presented below have structured the progress of this research program:

- **Article 1, Chapter 3**: What are the organizational factors that foster proximity (cognitive, social, organizational, and geographical) between startups and large firms and their capability to collaborate in an open innovation context?

- **Article 2, Chapter 4**: To what extent does the human and social capital developed by startup founding teams influence their capability to collaborate with large firms throughout the innovation collaboration project?

- **Article 3, Chapter 5**: How do large mature firms open up their innovation process to collaborate with startups by developing their dynamic capabilities while reducing their own internal rigidities?

- **Article 4, Chapter 6**: What are the roles of intermediaries in an open innovation ecosystem in regenerating the dynamic capabilities of traditional, highly hierarchical organizations to develop new collaborations with startups?

Epistemological and methodological positioning

The question of epistemological positioning is an important step for the coherence of the research process as such, and also for the quality of the researcher's reflexivity - called "*internal epistemological critique*" by Piaget (Albert & Avenier, 2011, p. 28) - on the latter. Among the five main existing paradigms (rationalism, empiricism, positivism, constructivism and realism), the epistemological paradigm chosen in this thesis is that of constructivism, which "*asserts that social phenomena and their meanings are continually being accomplished by social actors. It is antithetical to objectivism*" (Bryman, 2012). This approach is relevant in the context of this thesis insofar as the "*reflexive work to be carried out throughout [the] research process [...] aims to generate scientific knowledge by mobilizing the experience of practitioners on*

a research question defined with reference to a persistent practical problem" (Albert & Avenier, 2011, p. 23, freely translated).

Research design also requires the researcher to make methodological choices, with a view to ensuring the coherence of the entire research process. For this thesis, the methodology used was mainly qualitative (for three articles). It was supplemented by a quantitative methodology (Article 2), in order to refine the results obtained by the qualitative approach. The use of a qualitative methodology is explained by the nature of the issues raised and by the fact that the approach of this thesis aims to understand a complex phenomenon (Wacheux, 1996).

The reasoning used in this thesis is abduction, which, moreover, is particularly well suited to constructivist approaches (Hallée & Garneau, 2019). Abduction has the advantage of increasing the creativity of reasoning:

> "*Abductive inference allows us to creatively combine empirical facts with heuristic frames of reference. The use of analytic induction and abduction makes it possible to update the creative work of qualitative research while making use of existing knowledge in the field to which the object of study belongs*." (Anadon & Guillemette, 2006, freely translated)

Data collection was organized around case studies. The research question determines the most appropriate selection of cases to answer it. In this thesis, the search for a certain diversity in the cases studied (in particular in terms of industry sector, success or failure of collaboration, number of founders in the startup, different strategies of large firms in terms of open innovation) has been relevant. Indeed, the whole research work is based on differences, the notion of distance between the actors (divergence) and their potential complementarities (convergence). Therefore, the four articles aimed to capture this diversity, the differences between the cases in order to reveal the points of divergence and convergence.

This thesis is mainly based on the framework of the theory of proximity and also on that of dynamic capabilities (cf. Section 3 of Chapter 1). The following conceptual model presents the general articulation of the four articles of the thesis according to this theoretical framework.

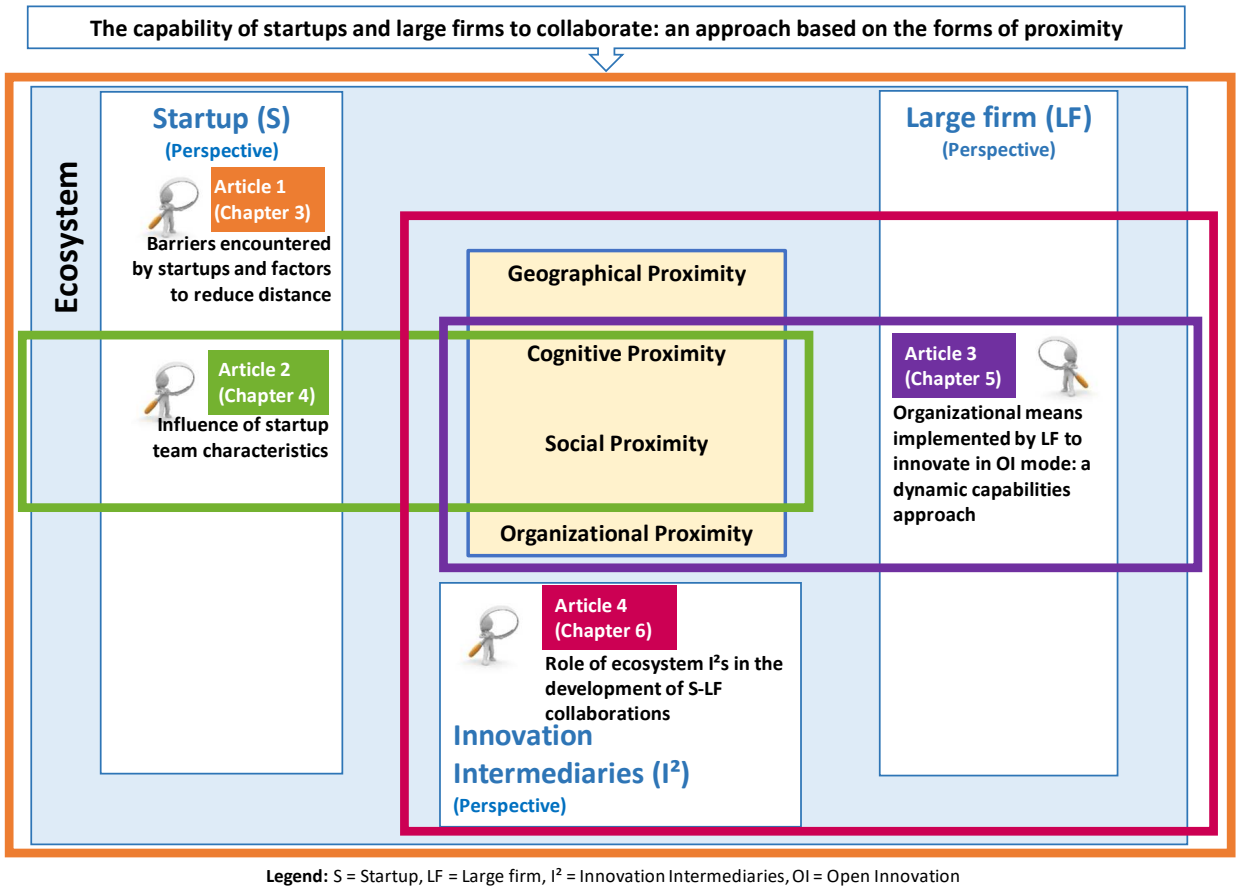


Figure 4 – Conceptual model of the research program

Structure and approach of the research program

This thesis consists of eight chapters. Chapters 3 to 6 are dedicated to the four articles of the thesis. *They defend the thesis explained above: The driving factors of collaboration can be (co-)constructed if they are lacking to one or the other of the actors by a voluntarist adaptation of the latter, although this type of collaboration is not based on hierarchy but on trust, exploration and organizational agility; these factors are similar to those present in symbiotic relations of mutualist type within natural ecosystems*. Each of the four articles addresses the central problem of the thesis. This section presents the structure and general approach of the thesis.

Chapter 1 presents the founding elements of this research work, its objectives and theoretical framework. Section 1 presents the positioning adopted with regard to the literature on collaboration between startups and large firms and the capability to

collaborate in a context of open innovation. Section 2 presents the proposed analogy between collaboration for innovation and biological symbiosis. Section 3 presents the theoretical framework of proximity and dynamic capabilities as a framework for a holistic and dynamic analysis of the collaboration process. This first chapter concludes with the research question of the thesis and the conceptual model developed in this research program.

Chapter 2 presents the epistemological and methodological approach that was adopted in this thesis. First, the choice of the constructivist epistemological paradigm is explained. In a second step, the chosen methodology (mainly qualitative and based on case studies, but also quantitative for one of the articles) is specified, then the research design developed, integrating the data collection methods used, the method for selecting respondents, and finally the data analysis methods employed.

Chapters 3, 4, 5 and 6 present the articles developed throughout this research program to answer the research question of the thesis.

Chapter 3 (**Article 1**, published in February 2019 in Innovations - Journal of Innovation Economics & Management, CNRS 4, FNEGE 3, HCERES C) answers the following research sub-question: *What are the organizational factors that foster proximity (cognitive, social, organizational, geographical) between startups and large firms and their capability to collaborate in a context of open innovation?* This article explores asymmetric startup-large firm collaboration from the startup perspective. It first highlights the obstacles to this type of collaboration induced by their differences, pointing to an initial cognitive distance between them. In a second step, the organizational factors fostering the forms of geographical and non-geographical (cognitive, social and organizational) proximity on this collaboration are studied, at the intra-organizational (of the startup and the large firms), inter-organizational, and ecosystemic levels. This first chapter, focusing on the dyad and on what surrounds and influences it, has made it possible to highlight both the factors hindering and those stimulating this type of asymmetrical collaboration, and to confirm the interest of a holistic vision of the relationship, including a strategy based on the theory of proximity.

Chapter 4 (**Article 2**, presented in peer-reviewed conferences) intends to answer the following research sub-question: To what extent does the human and social capital developed by startup founding teams influence their capability to collaborate with large firms throughout the innovation collaboration project? This article questions the link between the specific resources and skills of technology startup founding teams and their capability to collaborate with large firms to innovate. The objective of this article is to better understand, in line with the results of the previous one, the relationship between the human and social capital of startup founding teams and ultimately the success of their first collaboration with a large firm. This capital of the founding team is measured through a quantitative study. The potential links between the different variables identified and related to this capital and the success of the collaboration with the large firm (during the very first collaboration) on the one hand, and the cognitive and social proximity on the other hand are explored.

Chapter 5 (**Article 3**, published in June 2020 in the book "Managing Digital Open Innovation" published by World Scientific, and previously presented in a peer-reviewed conference) proposes to answer the following question: *How do large, mature firms open up their innovation process to collaborate with startups by developing their dynamic capabilities while reducing their own internal rigidities?* This article explores the difficulties encountered by large organizations, in this case banks, which are disrupted by digital technologies and led to develop open innovation strategies to innovate in this context. As the first article (Chapter 3) highlighted the importance of intra-organizational factors in large firms in the success of collaboration with startups, it seemed relevant to investigate the organizational mechanisms at work within a large organization and between the organization and the external world. This article highlights the structural, organizational and managerial developments carried out by these traditionally highly hierarchical and centralized organizations to develop their capability to collaborate with the outside, in a context of increasing digitalization and race for innovation. This article shows how these organizations are developing their dynamic capabilities in this context.

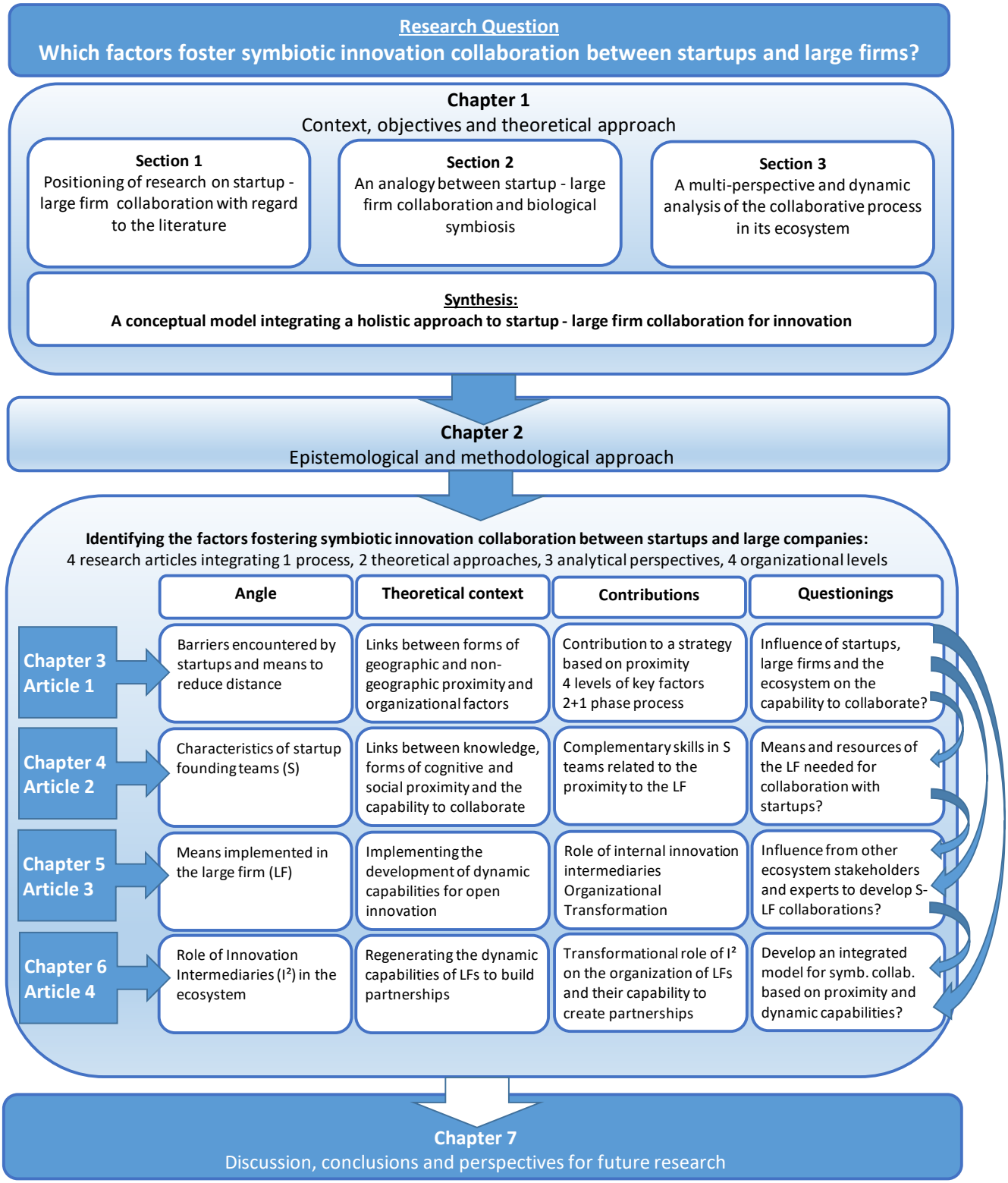
Chapter 6 (**Article 4**, presented in peer-reviewed conferences) focuses on the following research sub-question: *What are the roles of intermediaries within an open innovation ecosystem in regenerating the dynamic capabilities of traditional, highly hierarchical organizations, without a culture of open innovation, to develop new*

collaborations with startups? This article investigates the role of innovation intermediaries from a given ecosystem in the organizational adaptation of large firms. Indeed, as they appeared as keystones in the results as Chapter 3 (Article 1), it seemed relevant to explore further their different roles in the construction of innovation-oriented collaborations with startups, and moreover in a business sector particularly challenged at several levels: the banking sector. The analysis of the different roles of these intermediaries in the transformation of banks' business model is based on the theory of dynamic capabilities.

Chapter 7 proposes a synthesis of the main results obtained through this research work as well as a discussion of the transversal results beyond the contribution of each of the articles of the thesis. The theoretical contribution with regard to the different literatures used in this research (open innovation, entrepreneurship and ecosystems) is then presented, as well as the managerial contribution for the different key stakeholders (startups, companies, structures supporting innovation, public authorities supporting local and regional ecosystems). Finally, the limits of this work and future research avenues are presented, followed by the research project envisaged further to this thesis.

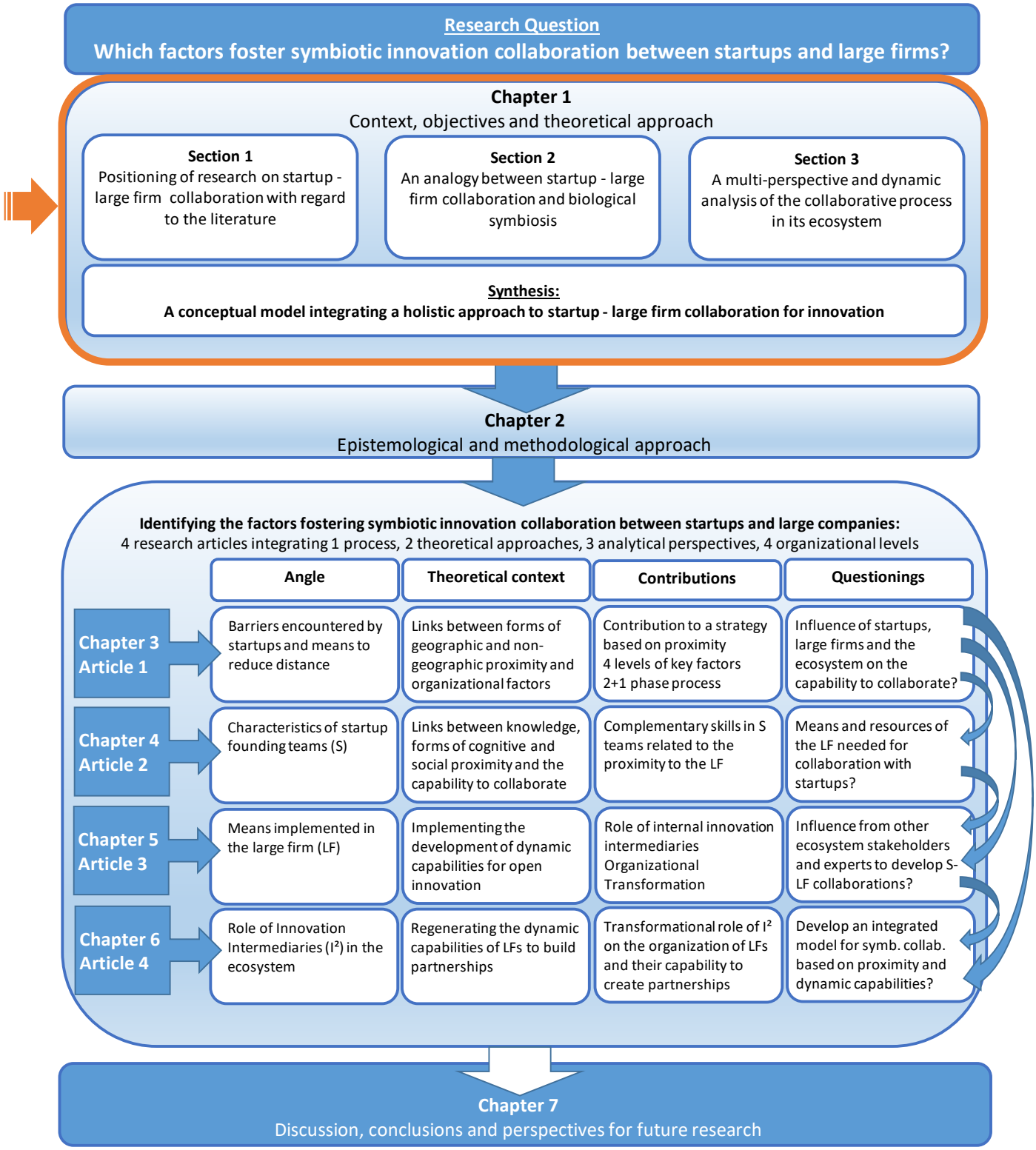
Chapter 8 presents a summary of the thesis in French.

Figure 5 - Structure and general approach of the thesis



- CHAPTER 1 -

OBJECTIVES AND THEORETICAL APPROACH


Research Question
Which factors foster symbiotic innovation collaboration between startups and large firms?
Chapter 1
Context, objectives and theoretical approach
Section 1
Positioning of research on startup - large firm collaboration with regard to the literature
Section 2
An analogy between startup - large firm collaboration and biological symbiosis
Section 3
A multi-perspective and dynamic analysis of the collaborative process in its ecosystem
Synthesis:
A conceptual model integrating a holistic approach to startup - large firm collaboration for innovation
Chapter 2
Epistemological and methodological approach
Identifying the factors fostering symbiotic innovation collaboration between startups and large companies:
4 research articles integrating 1 process, 2 theoretical approaches, 3 analytical perspectives, 4 organizational levels
Angle
Theoretical context
Contributions
Questionings
Chapter 3 Article 1
Barriers encountered by startups and means to reduce distance
Links between forms of geographic and non-geographic proximity and organizational factors
Contribution to a strategy based on proximity 4 levels of key factors 2+1 phase process
Influence of startups, large firms and the ecosystem on the capability to collaborate?
Chapter 4 Article 2
Characteristics of startup founding teams (S)
Links between knowledge, forms of cognitive and social proximity and the capability to collaborate
Complementary skills in S teams related to the proximity to the LF
Means and resources of the LF needed for collaboration with startups?
Chapter 5 Article 3
Means implemented in the large firm (LF)
Implementing the development of dynamic capabilities for open innovation
Role of internal innovation intermediaries Organizational Transformation
Influence from other ecosystem stakeholders and experts to develop S-LF collaborations?
Chapter 6 Article 4
Role of Innovation Intermediaries (I²) in the ecosystem
Regenerating the dynamic capabilities of LFs to build partnerships
Transformational role of I² on the organization of LFs and their capability to create partnerships
Develop an integrated model for symb. collab. based on proximity and dynamic capabilities?
Chapter 7
Discussion, conclusions and perspectives for future research

CHAPTER 1 - Objectives and theoretical approach

Introduction to the research program

Collaboration between startups and large firms is a real challenge (Blomqvist, Hurmelinna, & Seppänen, 2005; Kohler, 2016; Minshall, Mortara, Valli, & Probert, 2010). Because of their intrinsic differences, the relationship is asymmetric in nature (Minshall et al., 2010). This asymmetry manifests itself in terms of differences in size, resources and business experience (Hogenhuis, Van Den Hende, & Hultink, 2016; Minshall et al., 2010). Partners need to manage this asymmetry and combine both trust and contractualization to maintain a viable balance for each partner in the relationship (Blomqvist et al., 2005) and ensure the continuation of the innovation collaboration they are engaged in.

Doz (1987) already highlighted the obvious complementarity between large firms and small technology firms. Kelly, Schaan, & Joncas (2000, p.74) show that this complementarity comes from the complementary fit of resources versus needs of each partner: « *Alliances between small and large technology partners can be extremely beneficial due to the complementary fit of resources versus needs*.». However, according to Doz (1987, p. 32), three main points are problematic and tend to hinder collaboration between startups and large firms. The first point is the convergence of objectives: "*a partnership is almost always partly competitive, the larger firm often attempting to capture the technology of the smaller one, to transfer it to its own operations, and, ultimately, to appropriate it*." As the author notes, "*technology is, after all, the only bargaining strength of the smaller firm*." The second point concerns the interaction and power games between the different actors of the large firm, at all hierarchical levels. Corporate and personal interests are not automatically aligned. These political games within the large firm between individuals perceiving their potential gains or losses from collaborating can impact the quality of collaborations with external partners. The third difficulty is, according to Doz, the

interface: the fact that partnership decisions are taken by top management, and then implemented by middle management can be problematic, as can the cultural differences between the large firm, with its bureaucratic and fragmented tendencies, and the small, agile startup with its close-knit members.

More than thirty years after this work, the same problems remain, creating persistent managerial challenges for both startups and large firms (Sarrazin, 2017). In terms of strategic inter-firm alliances in the broadest sense (i.e. all collaborations combined), failures are numerous (Gulati, Wohlgezogen, & Zhelyazkov, 2012). Moreover, these challenges are increased by external factors that are as constraining as they are dynamic: globalization, the digitalization of activities, the growing demand for technological innovation from hyper-connected customers, and the acceleration of time (Rosa & Scheuerman, 2009). This changing environment, marked by a rapid pace at all levels, generates the need to develop innovations in ever shorter times (acceleration of market needs for innovation, shortened product life cycle) and leads the various economic players to integrate more players from their ecosystem into their innovation processes, i.e. to open up more and more to external players, outside the firm's boundaries (Chesbrough, 2003; Pénin, Hussler, & Burger-Helmchen, 2011). This openness, this open innovation strategy, is an opportunity insofar as it can enable them to cope with the increasing pace of innovation and ultimately to maintain or gain a competitive advantage. Thus, the dynamics of startup - large firm collaboration is played out at several levels and the dyadic dimension of collaboration itself seems to leave a growing place to the open innovation and ecosystem dimension, where the different actors satisfy the needs of other stakeholders in addition to their own, and vice versa, by including more stakeholders in their innovation processes than in the past (Bogers et al., 2017).

It is this dynamic of collaboration with symbiotic features, in its ideal configuration, i.e. mutualist, that is the perspective adopted in this thesis.

Section 1: Positioning of the research in relation to the literature

A review of the literature in the fields of open innovation and entrepreneurship is mobilized through the different chapters of the thesis and covers in particular the following dimensions, presented in Section 1: strategic alliances, the capability to collaborate, and in Section 2: collaboration in an ecosystem in open innovation mode. Section 3 presents the theoretical frameworks mobilized to explore and analyze the research question: the theory of proximity and dynamic capabilities.

1.1. Multiperspective Approach, Strategic Alliances and Capability to Collaborate

This point deals with the transversal founding elements that presided over the construction of this thesis, including a multiperspective approach to startup - large firm collaboration. The first perspective adopted is that of the startup. Indeed, as this thesis is situated at the confluence of open innovation and entrepreneurship, it appeared relevant to adopt this perspective. Moreover, this positioning makes sense with respect to the literature, as it is relatively unexplored. Most of the existing work on the subject of startup - large firms collaboration is indeed carried out from the perspective of the large firm (Usman & Vanhaverbeke, 2017). The perspective of the large firm is also investigated in a second step, in order to explore the precise phenomenon under study, the capability to collaborate with startups to innovate. Finally, a third perspective of key actors in the ecosystem in which the startup - large firm collaboration evolves is studied: that of innovation intermediaries.

With regard to the definition of the central term "collaboration", the one given by Wood & Gray (1991, p. 146) was used in this thesis:

> "*Collaboration occurs when a group of autonomous stakeholders of a problem domain engage in an interactive process, using shared rules, norms, and structures, to act or decide on issues related to that domain.*"

And the complementary one provided by Daugherty et al. (2006, p. 61):

> "*[It] involves two or more independent companies working together to jointly achieve greater success than can be attained in isolation*".

These definitions indicate that the actors of the collaboration are independent from each other. One of the interests of this research work is precisely to show how actors who are both independent, especially in organizational and financial terms, without any hierarchical link, and moreover asymmetrical, manage to organize themselves in a context of open innovation to collaborate. It should be noted, however, that although this type of relationship is not intended to evolve towards dependence, the actors will have to engage in a relationship of interdependence, bound by the common objective underlying the achievement of their own goals. This interdependence, which ultimately benefits the parties involved, is the essence of the mutualist symbiosis presented in Section 2 of this chapter. It is this interdependence that can enable each of the parties involved to become more efficient and competitive (Etemad, Wright, & Dana, 2001). From this perspective, the collaborations studied are strategic alliances in the sense of Gulati (1998, p. 293) :

> *"Strategic alliances [are defined as] voluntary arrangements between firms involving exchange, sharing, or co-development of products, technologies, or services.*"

Moreover, since startup-large firm collaboration is most often approached from a financial perspective, it seemed appropriate to focus this work on the relational dimension of collaboration, which has been much less represented in research to date despite its importance (Dyer & Singh, 1998; Hill & Birkinshaw, 2014; Yoon & Hughes, 2016). Collaborating between asymmetric actors requires special skills and capabilities. Thus, this thesis places the "capability to collaborate" at its core in order to explore its different dimensions in the specific context of startup-large firm innovation collaboration. Blomqvist & Levy's (2006, p. 31) definition was used here:

> *"The collaboration capability is defined as actor's capability to build and manage network relationships based on mutual trust, communication and commitment.*"

Moreover, in line with Wood & Gray's (1991, p. 146) definition of collaboration, this thesis includes two complementary approaches to collaboration: a life-cycle

dimension of the relationship and a teleological dimension, which support the idea that the action of collaborating is essential to the growth and organizational evolution of firms and that it is adaptive. Life cycle theory is based on the fact that the future growth of an organization is determined more by its own history than by 'external forces' (Greiner, 1972, cited in Van de Ven, 1992). Unlike large firms, however, startups are not limited in their development by the weight of their inherently short history. Teleological process theory, on the other hand, assumes that the development of an organization has a final purpose, the quest for strategic growth, and is adaptive either by itself or in interaction with others (Van de Ven, 1992, p. 178). This final purpose is the raison d'être of collaboration between companies, which build it together socially and select from various alternatives a plan of action to achieve it (Van de Ven, 1992, p. 178). Doz (1996, p. 81) suggests to explore the adaptive nature of the evolution of organizations and the ensuing organizational learning by "*[adopting] a view of strategy process that transcends the static vs. dynamic or teleological vs. emergent dichotomies*".

1.2. Collaborations in an open innovation ecosystem

Opening the "black box" of the dyadic determinants of innovation collaboration between startups and large firms is essential to identify precisely its current stakes, and the barriers and potential levers of its success. To be understood in a holistic way, it is also essential to study this relationship in its specific context, including its various stakeholders to be satisfied -some of which may play a crucial role in the development of the partners' activities- as well as a set of contingency factors, for example specific to the country or region concerned, or to the business sector. The ecosystem, in fact, represents the community and the living environment, the biotope in which the partners, the symbionts, (out)live, to refer to the analogy with biology, developed in Section 2 of this chapter. Some elements of this ecosystem may be favorable to them (to one or the other or to both) and thus be sources of opportunities, others unfavorable and sources of threats to their (out)life.

The rise of online technologies and globalization brought in their wake an enormous potential for exchanges between different actors who were previously not destined to interact with each other in a natural way. These opportunities to access new resources, skills and knowledge in order to innovate ever more and faster and thus

maintain existing market shares and gain new ones, have pushed companies to open up their own boundaries more, moving from a closed to an open mode of innovation. Startup - large firm collaboration is also part of this context of openness, and more broadly of an open innovation ecosystem, composed of a set of actors who can have an impact on this collaboration, particularly in terms of opportunities for innovation but also for commercial purposes.

The notion of ecosystem comprises a variety of forms in the literature, and the usefulness of such diversity is questionable. In the field of management science, a number of ecosystem types coexist today, such as business ecosystems, sometimes with biological analogies (Moore, 1993), entrepreneurial ecosystems, knowledge ecosystems, innovation ecosystems, or open innovation ecosystems, to name only the main ones. The researcher is faced with a multitude of concepts (Aarikka-Stenroos & Ritala, 2017), also including sub-categories (as there may be typologies for a given ecosystem), whose differences are not always crystal clear. Some ecosystem types are even sometimes amalgamated with others. For example, Rohrbeck, Hölzle, & Gemünden (2009) in their famous article on the Deutsche Telekom case, take Moore's (1993, p.421) concept of business ecosystem and call it an "open innovation ecosystem" in their research:

> "*By working cooperatively and competitively with other companies in order to co-evolve capabilities, to support new products, satisfy customer needs and incorporate a new round of innovations, the company builds a business ecosystem (Moore, 1993). In the context of our study, this business ecosystem is therefore more specifically called an open innovation ecosystem*."

If we consider this specific case, it turns out that the same definition covers realities that are supposed to be different since the terms used are different (business ecosystem and open innovation ecosystem). And indeed, Moore's definition refers just as much to business, commercial, and therefore transactional, relationships as it does to relationships of another order, more interactional and therefore relational, in a perspective of exploration and innovation. In the same way, Chesbrough, Kim, & Agogino (2014) in their famous study of the Chez Panisse case, mention the term open innovation ecosystem in a context of multi-actor interactions, without however opposing it to the business ecosystem. The ecosystem is so named because it is

based on an open innovation strategy and has evolved to spread geographically: from a local ecosystem, it has become global.

However, Gomes, Facin, Salerno, & Ikenami (2018) have identified differences between the business ecosystem and the innovation ecosystem. The former focuses, according to their work, on value capture and the latter on value creation. Does the designation of an ecosystem really depend on the specific attributes of a signle ecosystem type (and therefore *a priori* excludes other attributes specific to other types of ecosystem)? Or does it depend on the angle from which the researcher observes it? In short, cannot the same ecosystem be both a business ecosystem and an innovation ecosystem, as long as the characteristics specific to the potential emergence of value creation and capture are present within this ecosystem? Furthermore, the literature review conducted by the above-mentioned authors has enabled them to highlight the transition that is currently taking place at the research level, as the authors of the articles they studied increasingly use the term innovation ecosystem in comparison to business ecosystem. This is indicative of a growing interest in value creation and thus innovation. Here is the definition proposed by Gomes, Facin, Salerno, & Ikenami (2018, p.45):

> "*An innovation ecosystem is set for the co-creation, or the jointly creation of value. It is composed of interconnected and interdependent networked actors, which includes the focal firm, customers, suppliers, complementary innovators and other agents as regulators. This definition implies that members face cooperation and competition in the innovation ecosystem; and an innovation ecosystem has a lifecycle, which follows a co-evolution process.*"

Based on all existing concepts in the ecosystem literature, Scaringella & Radziwon (2018) identified four main currents and emerging concepts. They also showed the complementarity between the literature on ecosystems and that on territories. In addition, the authors call for more studies on the life cycle of ecosystems, the processes that guide their creation and their dynamics, in order to better understand the role of the different stakeholders in the different phases. The present research program is in line with this call.

The recent proposed definition of the ecosystem concept by Bogers, Sims, & West (2019) is inclusive, and is therefore in line with the notion of ecosystem as understood in this thesis:

> "*We propose a new definition that links the central goal of an ecosystem – joint value creation – to three constructs: goals of ecosystem members, the network of relations between these members, and the interdependence of their respective goals*. (…) '*[An ecosystem is] an interdependent network of self-interested actors jointly creating value*.'"

This research program is intended to be close to the original biological definition and does not distinguish *strictly* between a business ecosystem and an innovation ecosystem, as some authors (Gomes et al., 2018) advocate. Of course, this distinction makes sense in the context of the study of mechanisms relating either to value creation (innovation) or value capture (business). However, this thesis considers the successful innovation resulting from collaboration between startups and large firms, which is why it integrates *de facto* the two dimensions, value creation and value capture, without any particular distinction, the nature of the actors' (symbionts) objectives being a combined search for innovation and commercialization. Thus, among the definitions of the existing ecosystem in the literature, the one used in this thesis is also close to the definition proposed by Zahra & Nambisan (2012, p.220), which integrates business ecosystem and innovation ecosystem (Gomes et al., 2018): "*a group of companies - and other entities including individuals, too, perhaps - that interacts and shares a set of dependencies as it produces the goods, technologies, and services customers need*." More precisely, the particular ecosystem in which the collaborations studied are embedded has the main organizational characteristics of the so-called "Jam Central" model proposed by Zahra & Nambisan (2012, p.226) and defined as follows:

> "*This [Jam Central Model] involves a collection of independent entities, such as research centers, collaborating to envision and to develop an innovation in an emergent or radically new field. The term 'jam' signifies the improvisational nature of innovation (i.e., the objectives and direction of innovation tend to emerge organically from the collaboration) and the lack of centralized leadership in the ecosystem*".

It appears that the stakeholders studied and operating in this ecosystem are independent from each other at an organizational level. Their collaborations are based on an ad hoc coordination of the actors along the way, as well as on a diffuse governance, thus not based on hierarchical links and powers. One of the interests of this thesis is in particular to try to shed light on the organizational and ecosystemic mechanisms underlying the startup - large firm collaboration based on an organizational and financial independence of the actors and thus a certain form of organic coordination, as can be the innovation process in this context. In this sense, the aim is to understand the strategies of territorial ecosystems that function, along the lines of the work of Scaringella & Radziwon (2018), notably through the empirical study of entrepreneurial perspectives and the roles played by the various stakeholders (large firms, innovation intermediaries, public authorities, in particular) in the dynamics of these ecosystems.

Section 2: An analogy between innovation collaboration and biological symbiosis

1.3. Internal and External Determinants of Symbiotic Collaboration

The objective of this research work is to explore, in a context of open innovation, which internal and external factors foster a symbiotic relationship between startups and large firms, and thus positively influence the quality and success of the collaboration of these asymmetric partners, which are both different and potentially complementary.

The analogy with biological symbiosis makes sense in this context. First of all, the increasingly competitive and, above all, uncertain environment is pushing companies, just like living beings, to adopt more mutualist behaviors in order to survive: "*Competition drives adaptive change"* (Leigh, 2010, p. 2507). Then, whether it is the startup or the large firm, each of these partners is looking for in the other what it does not have, what the other has and what could help it to achieve its own objectives. Thus, the startup, in search of rapid growth by nature for reasons of survival, will seek, for example, human, material or financial resources from the large firm to co-

create or manufacture its product, or fame to legitimize its innovative product and thus commercialize it more quickly, on a large scale and therefore with a greater chance of success. The large firm will engage with startups either proactively, for example by seeking the development of a disruptive innovation, or reactively to deal with innovations from competitors and/or a market in demand for innovation. The work of John Hagedoorn (1993) dating back almost three decades seems to be still relevant towards its findings on forms of alliances and the motivation of firms to collaborate. Indeed, two main categories emerged from the many possible motivations: market and technology. In other words, the need for market share (the need for customers) and the need for technological innovation. In this sense, startup - large firm collaboration based on these two types of needs naturally appears destined to become symbiotic because it is based on the complementary contributions of each of the actors.

Furthermore, the factors explored go beyond the dyadic relationship and take into account those specific to the ecosystem at large and its actors, in particular innovation intermediaries. The territorial ecosystem plays a decisive role in startup - large firm collaboration, as it is also the case for all symbionts in the natural environment. As a result of the local and regional policies implemented, particularly in the field of innovation, it draws and shapes a set of potentials and opportunities for the actors. In the biological sense of the term, the term ecosystem was originally defined in 1935 by Arthur George Tansley and refers to "*all the populations existing in the same environment and presenting multiple interactions between them*".[14] More current definitions, such as that of the Larousse dictionary, have evolved slightly: "*A system formed by an environment (biotope), and by all the species (biocenosis) that live, feed and reproduce there*." The term biocenosis comes from *bio*, "life" and *koinós*, "which lives in common" and can be translated by "community". Figure 6 presents the general model of the proposed analogy with the principle of symbiosis in the biological sense.

[14] https://www.universalis.fr/encyclopedie/ecosysteme-en-bref/, source consulted 15/05/20, text from Jean-Pierre Raffin, freely translated.

1.4. Chronological process of the mutualist symbiotic collaboration

In this thesis, the symbiotic relationship is considered on a time basis, as a process with two phases plus one upstream to the collaboration itself. These "two plus one" phases were identified in the first part of this research program (Article 1, Chapter 3). It is assumed that there are preconditions for successful innovation collaboration between startups and large firms. This is also the biological perspective of symbiosis (Leigh, 2010). According to the thesis, at the level of organizations, it is because the relationship is viewed as mutual symbiosis (and therefore has the necessary preconditions for it to occur) that collaboration can be successful. In this sense, the "determinants of symbiotic collaboration" in question are first located *upstream* to the collaboration and this, at two levels: within (intra-organizational determinants) and outside of organizations (ecosystem determinants). A third level "*in between*" (inter-organizational determinants) is added to the first two during the first phase of the collaboration, here called *collaboration Design*, which begins in principle with the meeting of the protagonists, the "symbionts", and is accentuated during the second phase of the collaboration, called *collaboration Process*, which represents the phase of joint work oriented towards the achievement of the common goal and extends to its final outcome.

The determinants of symbiotic collaboration are present at the intra-organizational level of each stakeholder, startup and large firm. Thus, it is assumed that the antecedents of asymmetrical symbiotic win-win collaboration pre-exist the collaboration itself, either naturally from the start or in a constructed way, the actor(s) having adapted to make it happen for the satisfaction of the common objective and the particular objectives of the stakeholders involved in the collaboration. Similarly, in nature, mutualist symbiosis appears to be a necessary evolution for the stakeholders, where each brings to the other one or more elements that it lacks in order to (over)live. Derived from the Greek σύν sýn, together and βίος bíos, to live, the term symbiosis was coined according to the Encyclopedia Universalis by the German botanist H.A. de Bary in 1879. The same source states that "*in its broadest sense, the notion of symbiosis concerns all forms of interspecific relations, from mutually beneficial union to parasitic antagonism. (...) More generally, however, the term symbiosis is reserved for cases of more or less regular, more or less cooperative*

associations, in which the relations between the two partners tend, for both, towards a balance between profits and losses, or are favorable to one of the partners without appreciably harming the other."[15] These relationships take place between organisms called symbionts. The spectrum of symbiosis is thus relatively broad and is not reduced to mutualism alone, which is the most commonly expressed, implicitly, when it comes to symbiosis. There are four main categories of symbiosis: the *phoresis*, from "*phoros* = to carry", where the other is only a support, *mutualism*, "*mutuus* = reciprocal" and related to "*muto* = (ex)change", where the situation benefits each of the symbionts, *commensalism*, "*co* = together" and "*mensa* = table", where only one of the two benefits without having a positive or negative impact on the other symbiont, and finally *parasitism*, from "*para* = next to" and "*sitos* = food" (which takes the food next to), where one symbiont takes the food, takes advantage of the other to the detriment of the latter. It is important to note that in the case of *commensalism* and *parasitism*, one needs the other to live. On the other hand, in the case of *phoresis* and *mutualism*, the two symbionts are independent and can live without each other. On the other hand, authors such as the biologist Lynn Margulis consider symbiosis (implied mutualism) to be one of the key factors of evolution, which, according to Pierre Kropotkin, is oriented by mutualist cooperation and interaction behaviors, as opposed to Darwin, who based his theory on "ruthless" competition (Kropotkine, in Sapp, 1994, p.22):

> "*Don't compete! Competition is always injurious to the species, and you have plenty of resources to avoid it!" That is the tendency of nature, not always realised in full, but always present. That is the watchword which comes to us from the bush, the forest, the river, the ocean. "Therefore combine, practice mutual aid! That is the surest means of giving to each and to all the greatest safety, the best guarantee of existence and progress, bodily, intellectual, and moral*."

On a more recent note, Lindenfors (2017, p. 40) illustrates that collaboration can be unintended; it is the situation related to a common goal that makes human beings collaborate:

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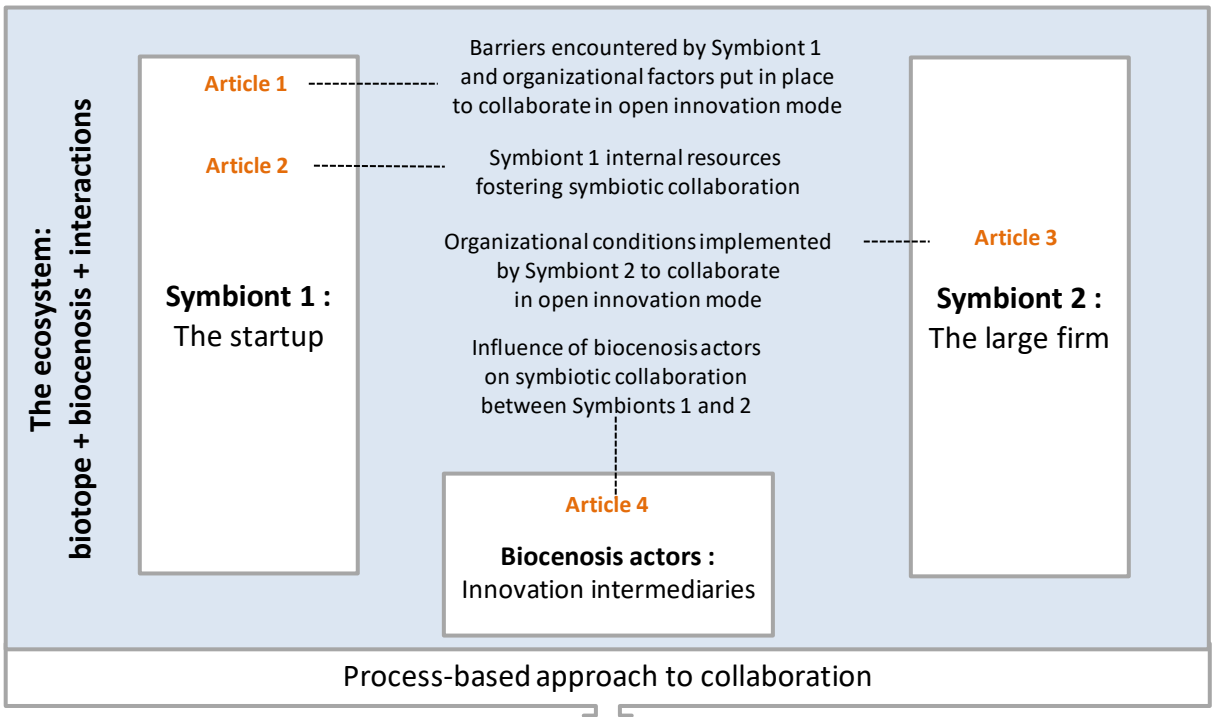
[15] https://www.universalis.fr/encyclopedie/symbiose/, source consulted 07/05/20, freely translated.

> "*But mobile animals can also just happen to be in one place without having chosen cooperation. Think of humans. Why do city dwellers on their way to work flock on roads and in commuter systems? All of us have a common problem—to get to work—but this does not necessarily mean that we want to cooperate with the people surrounding us. We cooperate in this situation only to the degree that we do not bump into, push or sit on our fellow human beings. But would not everything been easier and faster without other people there? This type of flocking, where individuals have similar goals but where the end result for each of us would be better if the others hadn't been there, is competition more than cooperation*."

This thesis focuses on the mutualist symbiosis, the "win-win" relationship, in the context of startup-large firm working together to innovate. As mentioned above, the founding bases of the mutualist symbiosis between startup and large firm are considered to exist prior to the collaboration itself. One of the objectives of the thesis is to show that these bases can also be acquired if one or both partners lack them. This thesis thus supports the idea, according to an evolutionary approach, that the symbiont (large firm or startup) can evolve, either by absolute necessity (no other possible alternative to ensure its survival), or by a conscious and voluntarist intention (which probably marks the major difference with symbioses within the plant and animal sphere), to increase its capability to collaborate in a context of open innovation and ultimately satisfy its survival and competitiveness objectives.

Figure 6 - Model integrating symbionts, biocenosis and biotope involved in the collaboration



Section 3: A Holistic and Dynamic Analysis of the Collaborative Process

1.5. The theory of proximity

The importance of the differences between startups and large firms, which condition the firms' capability to collaborate, can be expressed in terms of distance and proximity between organizations. As previously mentioned, the asymmetry between startups and large firms, due to their differences, is a source of potentially fruitful collaborations because only different actors can be complementary, but it is also associated with a high risk of difficulties to interact due to this asymmetry. In order to study the startup - large firm collaboration in a holistic way and thus to distinguish its different facets, this research program uses proximity theory (Article 1, Chapter 3 and Article 2, Chapter 4).

Proximity reflects a resemblance between actors, which expresses a similarity or proximity of characteristics and the greater or lesser ease with which they can interact (Bourdeau-Lepage, Huriot, 2009). The authors of the French group Proximity Dynamics of the School of Proximity distinguish two types of proximity, geographical and non-geographical proximity, the latter being referred to as 'organized proximity' by some authors (Bouba-Olga, Grossetti, 2008 ; Torre, Rallet, 2005 ; Torre, Wallet, 2014). Organized proximity is defined by an organization's capability to make its members interact (Torre, Rallet, 2005). Other authors, such as Boschma (2005), place all proximities on the same level, according to a 'flat typology' (Bouba-Olga, Grossetti, 2008). For Pecqueur et Zimmermann, 2004 (cited in Bouba-Olga, Grossetti, 2008), organizational proximity is part of organized proximity and represents coordination processes that are based on direct interaction between actors. This is the definition used in this thesis. Recently, Hansen (2015), using Boschma's (2005) model of the five forms of proximity presented below, empirically highlights the fact that certain forms of non-geographical proximity can substitute for geographical proximity, and that, through an overlapping phenomenon, geographical proximity can allow non-geographical proximity. This work shows the complementarity and substitutability of different forms of proximity already highlighted by Boschma (2005).

This research program is based on the notion of proximity as understood by Boschma (2005) as a multidimensional concept, integrating cognitive, organizational, social, institutional and geographical forms of proximity. Article 1 (Chapter 3) focuses on startups' perception of cognitive, social, organizational and geographical proximity and distinguishes between inter-organizational and intra-organizational levels. Article 2 (Chapter 4) examines in particular the links between the resources and skills of startup founding teams, the cognitive and social proximity of these teams and their capability to collaborate with a large firm.

Cognitive proximity includes shared values, goals and culture (Molina-Morales *et al.*, 2014), facilitates the acquisition of external knowledge, as well as its assimilation and exploitation by the absorptive capacity of the firm (Expósito-Langa *et al.*, 2011), and is closely related to other forms of proximity (Molina-Morales *et al.*, 2014). A too weak cognitive proximity between stakeholders, which Nooteboom (2004) refers to as a too strong cognitive distance, can lead to mutual misunderstanding due to a lack of

common experiences and background knowledge, which requires them to invest in this mutual understanding.

Organizational proximity is part of cognitive proximity and was separated from it by the author for the purposes of the analysis (Boschma, 2005). This includes the mechanisms that coordinate transactions, but also the means by which information and knowledge can be transferred and exchanged in a world full of uncertainties. According to Kirat et Lung (1999, p. 30), "*organizational proximity is deployed on the inside of organizations (firms and establishments) and, should the occasion arise, between organizations connected by a relationship of either economic or financial dependence/ interdependence (between member companies of an industrial or financial group, or within a network)*." Boschma (2005) considers organizational proximity as beneficial to learning and innovation because it allows, through strong control mechanisms, to ensure intellectual property rights and a sufficient return on its own investments. However, according to the author, too much organizational proximity can be detrimental to learning and innovation: this is the case with asymmetric relationships where the size and power of stakeholders differ, leading to a strong dependence on specific investments in communication and understanding. The challenge of this type of collaboration is thus to ensure proximity at inter- and intra-organizational levels. Furthermore, *electronic proximity* (Loilier, Tellier, 2001, p.562) is integrated here to organizational proximity, considering that it is part of the means to exchange information and knowledge. These authors define it as "*the possibility for members of the network to consult, exchange and develop computerized data*". According to Torre, 1993 (cited by Loilier, Tellier, 2001), a high degree of electronic proximity can replace a low degree of geographical proximity, thus mitigating the geographical constraint (Loilier, 2010).

Social proximity is defined by Boschma (2005) as socially embedded relationships between individuals involving trust based on friendship, kinship and experience. Shi et al (2016) define social proximity between two enterprises as the social bond between individuals associated with the two enterprises. Huber (2012, p. 1170), through the study of three dimensions of social proximity, suggests that "*social proximity in terms of feelings of personal obligations and emotional closeness is very high, whereas knowing each other in terms of private life is significantly less important."*

Geographical proximity is the proximity usually highlighted in the literature. According to Nooteboom (2004), focusing on geographical distance is essential in a context where tacit knowledge needs to be exchanged, as transfer requires face-to-face interaction, unlike document exchange. Boschma (2005) also argues that geographical proximity tends to foster knowledge transfer and innovation. According to Pecqueur and Zimmermann (2002), this proximity would facilitate coordination and thus have an impact on other forms of proximity. Agrawal et al (2008) showed that geographical proximity and social proximity can -in terms of interactions- substitute each other instead of complementing each other, whereas considered independently, they improve the flow of knowledge between actors.

Institutional proximity can be defined by the similarity of informal constraints and formal rules shared by stakeholders (Torre, Wallet, 2014). This proximity has not been retained here as its framework lies at the macro level (Boschma, 2005), which is not the perspective adopted in this research program. The boundary between institutional and organizational proximity is the subject of "*a recurring theoretical debate (...) between those supporting institutionalist approaches (Gilly, Lung, 2008; Talbot, 2008), who distinguished between institutional proximity and organizational proximity, and supporters of more interactionist approaches (Pecqueur and Zimmermann, 2004; Rallet and Torre, 2005), who broke down organized proximity into a rationale of similarity and of belonging.*" (Shearmur et al., 2016, p.105).

These different dimensions of proximity are used to characterize the influence of the factors conducive to collaboration identified in Chapters 3 and 4.

1.6. The Framework of Dynamic capabilities

The second theoretical framework mobilized in this thesis is that of dynamic capabilities and their regeneration in the race for digitalization of large firms, both in terms of their internal activities and their product offerings to customers. This framework provides a better understanding of the obstacles encountered by large firms, with routines that are often entrenched and difficult to change, and the means they use to overcome this problem. Dynamic capabilities have been studied first from the perspective of large firms (Article 3, Chapter 5), and then from the perspective of

innovation intermediaries in an ecosystem, as potential sources of opportunities for change for organizations (Article 4, Chapter 6).

The digitalization of business activities on a global scale is giving rise to fierce competition between an ever-increasing number of players. The democratization of digital also means that organizations are increasingly needing to change their offerings, to change themselves and to innovate. These considerable and constant changes in the environment are forcing organizations to constantly adapt in order to maintain their competitive advantage. This implies the need to design a new business model, including working with startups, and enabling organizations to create and capture value (Teece, 2018), not just adopt new technology tools. Organizations must therefore develop dynamic capabilities to foster this value creation and capture (Teece et al., 1997). Dynamic capabilities enable organizations to identify and seize business opportunities through a continuous realignment of tangible and intangible assets (Teece, 2007). These capabilities are of a higher order because they are beyond ordinary operational capabilities (Teece, 2018; Winter, 2003). These higher-order strategic capabilities are directly related to the competitive advantage of organizations and to their ability to sustain it over time: this is then a sustainable competitive advantage. According to Teece et al (1997), "*to be strategic, a capability must be honed to a user need (so there is a source of revenues), unique (so that the products/services produced can be priced without too much regard to competition) and difficult to replicate (so profits will not be competed away)*." The dynamic capabilities framework is about sensing, seizing and transforming what will enable an organization to design and then implement its new business model (Teece, 2018). The links between these three dimensions of dynamic capabilities and the digitalization of activities are highlighted below.

Sensing capabilities

The development of digital technologies can lead to threats, but also to the emergence of many new business opportunities, which can conduct organizations to enter new fields of business. The identification and shaping of opportunities is a constant effort of exploration "*across technologies and markets, both 'local' and*

'distant'" (March and Simon, 1958; Nelson and Winter, 1982 in Teece (2009, p.9))." It relates to "*a scanning, creation, learning, and interpretive activity. Investment in research and related activities is usually a necessary complement to this activity*" (Teece, 2009, p.9). For an organization the difficulties associated to the detection and the integration of new fields of business are multiple and call on the development of environmental scanning (Robinson & Simmons, 2018) and foresight activities (Heger & Rohrbeck, 2012), beside the external focus of the organization directed by the current activities which are not oriented towards the detection of the emergence of new fields. Foresight activities are developed by some organizations to increase their ability to identify early new fields of business, which are sensing activities necessary to make strategic decisions that engage the trajectory of the organization on a long-term perspective (Heger & Rohrbeck, 2012).

A peripheral vision is necessary to detect early opportunities and threats which are outside the current focus of the organization (Day & Schoemaker, 2004). Robinson & Simmons (2018) show that scanning is not an individual activity within organizations, but that the ability to engage the organization as a whole to gather information about the evolution of the environment is a key element in environmental scanning activities. Beside strategy teams that use personal and professional networks to gather information, employees who have personal networks and personal relations with customers are also precious sources of information. The authors also show the importance of external sources of information such as industry associations, industrial and market intelligence reports, personal networks and customers. These external information sources complement internal and organized ones.

At the intra-organizational level, the new role of middle managers in firms has been emphasized, beyond their traditional role of being part of a firm's control system (Floyd & Wooldridge, 1994). Three decades ago Wooldridge and Floyd (1990, p.240) have already highlighted that middle managers have to be involved in strategy to improve strategic decision making, and that context and organizational structures and human resource policy have thus to be "articulated (…) [to] encourage middle managers to think strategically." This role is even more crucial in times of redefinition of the organization's strategy, and within a context of openness to external actors. If opening-up their frontiers to external actors is a must in an open strategy context, organizations also have to open up inside their own boundaries by widening the

potential contributors to strategic decisions and thus involving other echelons in the strategic decision making process, such as middle managers (Baptista et al., 2017). Therefore as highlighted by several scholars (Birkinshaw, 2017; Hautz, Seidl, & Whittington, 2017), open strategy as a necessary, collective process goes with both transparency and inclusion.

Seizing capabilities

Based on sensing of an opportunity, the organization must then offer the adequate products, services or processes (Teece, 2007). Seizing capabilities includes the design of business models built to create value for the customer and to capture this value (Teece, 2018). Teece underlines there is no consensual definition of business model and suggests that "*a business model defines how the enterprise creates and delivers value to customers, and then converts payments received to profit*" ; he adds that "*in essence, a business model embodies nothing less than the organizational and financial 'architecture' of a business*" (Teece, 2010). Seizing capabilities also include protection of tangible and intangible (human resources) capital, an attractive incentive policy for employees, together with "*strong relationships [that] must also be forged externally with suppliers, complementors, and customers*" (Teece, 2011).

Transforming capabilities

Transforming capabilities are about threats management and transforming the organization (Teece, 2007). They lead to the sustainability of competitive advantage over time: "*A key to sustained profitable growth is the ability to recombine and to reconfigure assets and organizational structures as the enterprise grows, and as markets and technologies change, as they surely will*" (Teece, 2007). That means organizations must reconfigure even in times of growth with the purpose to maintain their advantage over competitors and despite changes in their environment. The managerial system, skills and knowledge base, technical systems, and values and norms (foundation of the organizational culture) are sources of rigidities that inhibit the evolution and the reconfiguration of the organization. The most important sources

of rigidity is the organizational culture, because it is collectively shared, built over time, intangible and it is made of norms and values that drive unconsciously behaviors of organization members (Greenwood & Suddaby, 2006; Leonard-Barton, 1992). The reconfiguring capabilities rely on the ability of the organization to learn and to overcome core rigidities that inhibit the ability to implement new business models. Organizations have to promote learning and therefore deploy incentive systems to motivate employees to learn and share information and knowledge, to explore new ones too (Teece, 2007).

The dynamic capabilities framework is used in chapters 5 and 6 to capture the internal changes in large firms that foster their capability to engage in mutually beneficial collaborations with startups.

Conclusion of Chapter 1

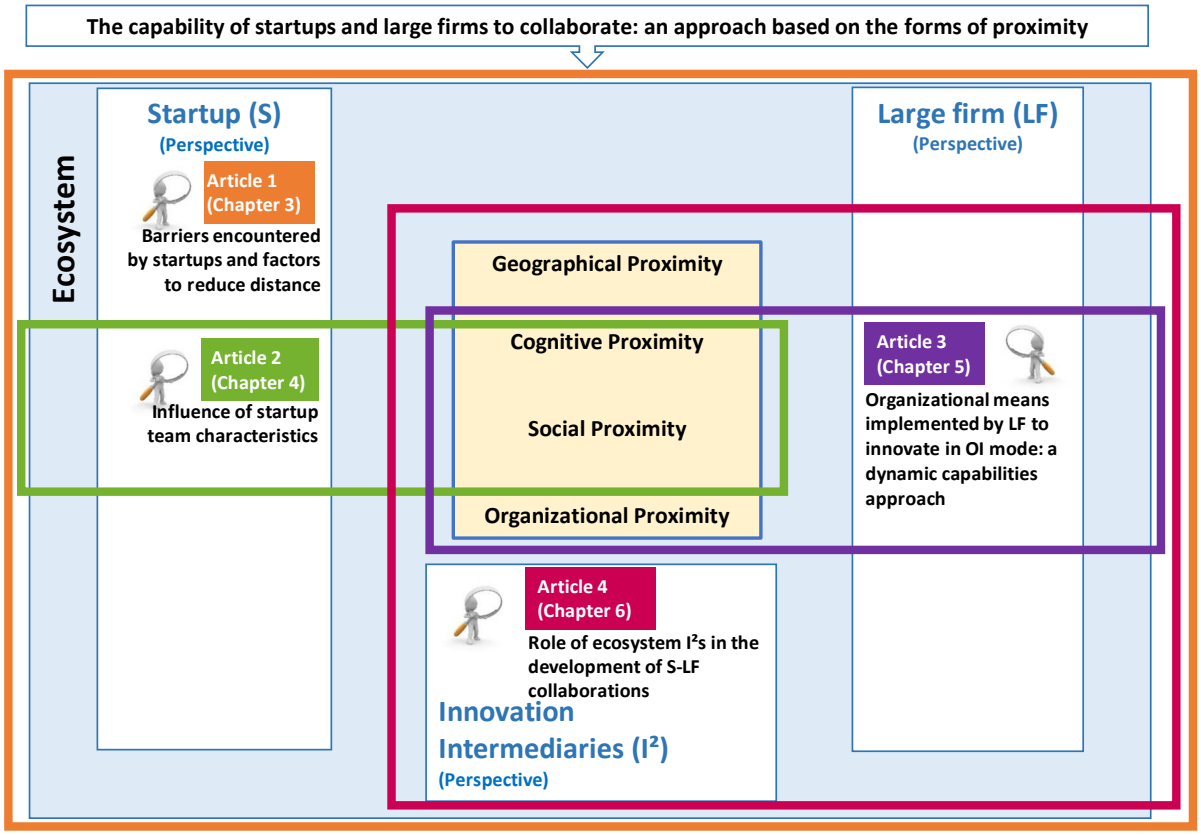
1.7. Research question

Given the state of the art and the positioning of this work in relation to the literature review presented, the research question that this thesis attempts to answer is the following:

"What factors foster symbiotic collaborations between startups and large firms in open innovation ecosystems?

1.8. Conceptual model of the research program

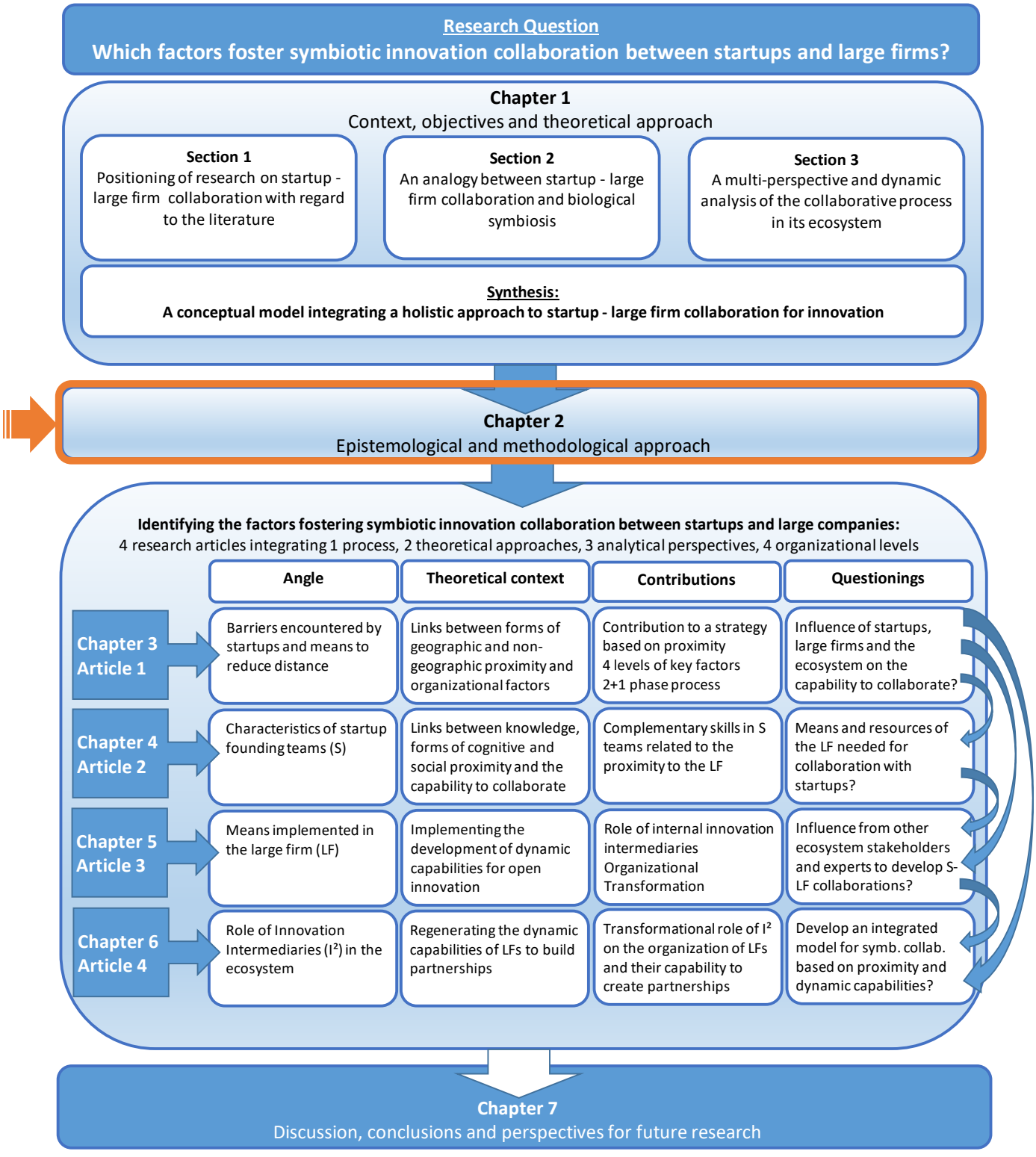
Figure 7 – Conceptual model of the research program



Legend: S = Startup, LF = Large firm, I² = Innovation Intermediaries, OI = Open Innovation

- CHAPTER 2 -

EPISTEMOLOGICAL and METHODOLOGICAL APPROACH


Research Question
Which factors foster symbiotic innovation collaboration between startups and large firms?
Chapter 1
Context, objectives and theoretical approach
Section 1
Positioning of research on startup - large firm collaboration with regard to the literature
Section 2
An analogy between startup - large firm collaboration and biological symbiosis
Section 3
A multi-perspective and dynamic analysis of the collaborative process in its ecosystem
Synthesis:
A conceptual model integrating a holistic approach to startup - large firm collaboration for innovation
Chapter 2
Epistemological and methodological approach
Identifying the factors fostering symbiotic innovation collaboration between startups and large companies:
4 research articles integrating 1 process, 2 theoretical approaches, 3 analytical perspectives, 4 organizational levels
Angle
Theoretical context
Contributions
Questionings
Chapter 3 Article 1
Barriers encountered by startups and means to reduce distance
Links between forms of geographic and non-geographic proximity and organizational factors
Contribution to a strategy based on proximity 4 levels of key factors 2+1 phase process
Influence of startups, large firms and the ecosystem on the capability to collaborate?
Chapter 4 Article 2
Characteristics of startup founding teams (S)
Links between knowledge, forms of cognitive and social proximity and the capability to collaborate
Complementary skills in S teams related to the proximity to the LF
Means and resources of the LF needed for collaboration with startups?
Chapter 5 Article 3
Means implemented in the large firm (LF)
Implementing the development of dynamic capabilities for open innovation
Role of internal innovation intermediaries Organizational Transformation
Influence from other ecosystem stakeholders and experts to develop S-LF collaborations?
Chapter 6 Article 4
Role of Innovation Intermediaries (I²) in the ecosystem
Regenerating the dynamic capabilities of LFs to build partnerships
Transformational role of I² on the organization of LFs and their capability to create partnerships
Develop an integrated model for symb. collab. based on proximity and dynamic capabilities?
Chapter 7
Discussion, conclusions and perspectives for future research

CHAPTER 2 - Epistemological and methodological approach

The way human beings approach reality can be seen as a filter that shapes their thinking and actions. This underlying filter is also at work when conducting research, where the reality approached is more precisely that of science, of knowledge produced. What positioning does the researcher adopt with respect to reality and knowledge of it? Being aware of and choosing the epistemological paradigm underlying his or her own thinking and reasoning is a necessary step in the research process. Moreover, this allows the researcher to show the coherence of the research process. Epistemology will be the subject of the first point of this chapter. Then a point outlining the methodology chosen to resolve the research question will follow, in coherence with the epistemological paradigm chosen.

2.1. Epistemology

Epistemology encompasses different paradigms. The researcher must base his or her methodological choices on one of them and thus justify the coherence of his or her entire approach, from the elaboration of the problem to its resolution. Choosing an epistemological paradigm is not an easy task. First of all, the researcher is confronted with a first choice in relation to the definition of epistemology itself. Indeed, which one to choose between the French (or German, with the term *Wirtschaftslehre*) definition, which makes it a *'theory of science'*, and the Anglo-Saxon definition, prior to the first, which describes epistemology as a *'theory of knowledge'*, with a broader meaning than the first and more oriented towards the philosophical dimension (Blanché, 1972)? Like Piaget, it is the second proposal that is retained in this research program: "*Science and the scientific spirit, both in the evolution of societies and in the development of the individual, are constituted progressively, without ever reaching a state of completion*" (Blanché, 1972, freely

translated). Thus, the approach adopted is based on a rather open definition of epistemology, i.e. including both dimensions: scientific and philosophical.

Thus, to answer my research question: "What factors foster symbiotic collaborations between startups and large firms in open innovation ecosystems?" I do not approach a phenomenon that would be unchanging and stable, but on the contrary that emerges and develops under certain conditions subject to different factors of time, of contingencies specific to the configuration of the ecosystem (biotope and biocenosis) of the actors of the collaboration and that evolves over time.

The paradigm chosen is therefore that of constructivism, which "*asserts that social phenomena and their meanings are continually being accomplished by social actors. It is antithetical to objectivism*" (Bryman, 2012). This approach is relevant to the extent that it makes sense in relation to my research question. This excerpt from the work of Edgar Morin (1990, freely translated) illustrates this underlying vision of the thesis:

> "*Only open reason can and must recognize the irrational (hazards, disorders, aporias, logical breaches) and work with the irrational; open reason is not repression, but dialogue with the irrational. Open reason can and must recognize the a-rational. Pierre Auger pointed out that one cannot limit oneself to the rational-irrational diptych. It is necessary to add the a-rational: being and existence are neither absurd nor rational; they are*."

2.2. Methodology

The methodology presented here is in line with the epistemological paradigm previously presented. The different stages of the methodology are presented, from the design of the research to the analysis of the data collected to elaborate the four articles (Chapters 3 to 6) of this thesis.

2.2.1. Research Design Synthesis

Table 1 - Research Design Synthesis

Thesis research question	"What factors foster symbiotic collaborations between startups and large firms in open innovation ecosystems?"
Research sub-questions	• Article 1, Chapter 3: What are the organizational factors that foster proximity (cognitive, social, organizational, and geographical) between startups and large firms and their capability to collaborate in an open innovation context? • Article 2, Chapter 4: To what extent does the human and social capital developed by startup founding teams influence their capability to collaborate with large firms throughout the innovation collaboration project? • Article 3, Chapter 5: How do large mature firms open up their innovation process to collaborate with startups by developing their dynamic capabilities while reducing their own internal rigidities? • Article 4, Chapter 6: What are the roles of intermediaries in an open innovation ecosystem in regenerating the dynamic capabilities of traditional, highly hierarchical organizations to develop new collaborations with startups?
Methods	• Qualitative (Articles 1, 3 and 4), based on the case method • Quantitative (Article 2)
Data Samples	4 complementary fields: • Article 1: 4 cases of collaboration, 6 interviews of startup leaders • Article 2: 31 startup cases, i.e. 31 exploitable observations of startup

	leaders (founding teams and solos) • Article 3: 2 case studies, 4 interviews of senior executives in two large organizations • Article 4: 1 ecosystem case study, 12 interviews including 5 with bank executives and 7 with innovation intermediaries
Methods for data collection	• Interview guides (case studies) for Articles 1, 3 and 4 • Questionnaire for Article 2
Respondent Selection Criteria	• Information-oriented selection with replication objective (Flyvberg, 2006) • Article 1: Differences between startups in terms of business sector, history, type of innovative solution proposed, strategic objective for collaborating with large firms, and outcome of the collaboration (success vs. failure). • Article 2: Technology-based startups with the same innovation flow (inside-out) and located in the "Greater Region". Differences between the startups in terms of number of founders (team vs solo) and experience (have already collaborated (or attempted) or not) with a large firm. • Article 3: Differences between the two large organizations studied (comparative case study): one is located in France, the other in Luxembourg. One operates at the national level with a strong regional presence, the other at both local and international level. One started its open innovation strategy 7 years ago, the other had just started at the time when data was collected. • Article 4: An ecosystem (Luxembourg) focused on technology, innovation and digitalization, with a substantial pool of startups and fintech. Selection of senior executives and managers, from three different organizations. Selection of innovation intermediaries: the

	former were selected because of their links with certain organizations, the following were recommended by the former.
Data Analysis	• Abductive reasoning • Articles 1, 3 and 4: Gioia method based on data structure • Article 2: Method based on the analysis of descriptive statistics

2.2.2. Methods for data collection

Given the nature of the research question, which aims to understand the how of a phenomenon in order to identify factors fostering its emergence and continuity over time, this thesis adopts a methodology based on case studies aiming to show the stability of the phenomenon being explored. It is therefore a qualitative approach for three of the four articles of the thesis. Indeed, the lessons learned from the first article have made it possible to subsequently develop a second article based on a quantitative approach that remains exploratory, thus allowing for complementarity between the two approaches, qualitative and quantitative, in relation to the object of research. Moreover, the quantity and diversity of the variables explored through this second article made the quantitative method the most appropriate. Thus, this thesis does not oppose qualitative and quantitative research, in line with Dumez (2016, freely translated) :

"*The social is not approached by dissociating and opposing the elements that would constitute it and their proportions. Above all, there is no reason why the qualitative approach should not produce, handle and process figures. For at least three fundamental reasons. The first is that the actors studied by social sciences are calculating agents (Callon, 1998). (...) The question arises even more directly when the agents in question are collective: States, enterprises, organizations, and even non-profit associations. Organizations produce figures on a permanent basis, and are legally obliged to do so. They do so for internal use, in order to make their decisions, to elaborate a strategy, to develop, and for external use in their dialogue and interactions with their environment (...). Finally, third reason, it is one of the tasks of*

the researcher to produce figures himself or herself and to process them, in order to better understand what the actors he or she is studying are doing, in particular to distance themselves from what they say about their actions."

The case study research method is often used when the phenomenon being explored involves "why" or "how" questions. This case method, which requires a rigorous and fair presentation of empirical evidence, should not be confused or equated with the case method in the context of teaching or practice. Moreover, the case method is not only exploratory; it can also be descriptive and explanatory (Yin, 1994). It is also essential to justify why the case method was the most appropriate (Goffin, Åhlström, Bianchi, & Richtnér, 2019). The case studies selected for this research program aim to study a complex phenomenon (Wacheux, 1996) and to bring out the organizational factors that foster this phenomenon. Among the case and sample selection strategies proposed by Flyvbjerg, (2006, p. 230), this thesis positions itself on an "information-oriented" type of selection (as opposed to random selection) that "*maximizes the usefulness of information from small samples and unique cases. Cases are selected on the basis of expectations regarding their information content*."

This conclusion by Flyvbjerg (2006, p. 241), which runs counter to conventional wisdom, highlights the importance and validity of the case method for this type of objective:

> "*Today, when students and colleagues present me with the conventional wisdom about case-study research -for instance, that one cannot generalize on the basis of a single case or that case studies are arbitrary and subjective- I know what to answer. By and large, the conventional wisdom is wrong or misleading. For the reasons given above, the case study is a necessary and sufficient method for certain important research tasks in the social sciences, and it is a method that holds up well when compared to other methods in the gamut of social science research methodology*."

Two complementary approaches: qualitative and quantitative

The box below presents the links between the type of approach (qualitative/quantitative, type of case study) and the objective of the different

chapters, which offer a different but complementary perspective, within a holistic view of the phenomenon studied. The perspective represented are those of startups (Article 1, Chapter 3 and Article 2, Chapter 4), then of large firms (Article 3, Chapter 5), and finally of innovation intermediaries from the ecosystem (Article 4, Chapter 6).

Box 1 - Approaches used throughout the research process

Article 1: A multiple case study from the startup perspective

This first article of the thesis lays the foundation for the following articles. The objective was to capture, through the theory of proximity, the nature of the factors fostering and hindering collaborations between startups and large firms in a context of open innovation. This exploratory qualitative research is based on multiple cases (four cases of collaboration studied in depth) studied according to the case study methodology recommended by Yin, (2003, 2013). It proves to be relevant insofar as it allows converging factors to emerge between the different cases, but also divergent factors in relation to the phenomenon studied: the links between cognitive, social, organizational and geographical proximity and the organizational factors of startup-large firm collaboration in the context of open innovation.

Article 2: A multiple case study from the startup perspective

This article is based on an exploratory quantitative approach. The objective of this work was to understand the role and nature of human and social capital of startup founding teams in their innovation collaboration with large firms, particularly with respect to the success of this collaboration. This dimension related to the resources of startups, their human and social capital, had emerged from the results of the first article as an advantage for startups in terms of cognitive and social proximity with the large firm. Therefore, it appeared relevant to investigate further this dimension in order to confirm or refute these first results and also to show whether being a team of founders, with potentially complementary knowledge, increases the chances of success of collaboration with a large firm, compared to solo founders. The observations are considered as cases and the study is based on 31 exploitable cases.

Article 3: A comparative approach from the perspective of large firms

This exploratory qualitative study is based on two case studies conducted within two large organizations (in this case banks) named Alpha and Beta. Following the results obtained in the first article, which reinforced the idea of the importance of the large firm's preparation of collaboration with startups in the upstream phase of this collaboration, it seemed relevant to investigate in this direction in order to understand the internal and external mechanisms that act as obstacles or, on the contrary, as levers to initiate and develop this type of collaboration in open innovation mode. Senior executives from these two organizations were interviewed retrospectively (Huber & Power, 1985). Moreover, the period during which the interviews started, in 2016, was a period when the pressure from the external environment was already very sensitive for the investigated business sector and posed problems in terms of digital collaborative innovation with Fintechs and startups, and of internal organization to collaborate.

Article 4: A unique case study from the perspective of ecosystem innovation intermediaries

For this fourth article, also based on an exploratory qualitative approach, a unique case study approach was chosen to explore the foundations of a complex organizational phenomenon as part of an ecosystem. As the results of the first article showed the crucial role of innovation intermediaries for startup - large firm collaboration, the objective of this study was to understand the roles of the different types of innovation intermediaries in an ecosystem in building collaborations between banks, as large organizations, and Fintechs or startups. In this respect, the nature of the field and the results of the third article also provided the basis for further reflection on the banking sector, which is undergoing a major upheaval with regard to innovation. This case study has an instrumental value, in that the intention of the research is not to describe all aspects of the case and then mobilize a set of theories to explain the situations observed. This case is used as a field of observation to study the influence of innovation intermediaries on the regeneration of strategic dynamic capabilities, in particular that related to the building of collaborations for innovation, in a mature company that has evolved in a stable context and is faced with the need to

adapt to a rapidly changing environment in the digital age. This phenomenon could have been studied in other contexts with similar characteristics (Stake, 1998).

Data collection methods: interview and questionnaire

The data collection was carried out following two modes: interviews for qualitative data collection, and a questionnaire for quantitative data collection. It should be noted that for each perspective investigated (one per article), the field was different, since either the actors who "held" the perspective investigated changed, or the method chosen required this (qualitative for Article 1 and quantitative for Article 2). Table 2 below summarizes this part of the approach, and Box 2 provides more details on the data collection itself for each of the chapters.

Table 2 - Synthesis of the data collection process

Article/ Chapter	Collection method	Number of cases explored	Volume of data	Other sources
Article 1 (Startup perspective)	Semi-directive interviews	4 cases of collaboration	6 interviews of 30 to 90 minutes each, for a total of 7.07 hours (424 minutes)	Visit of the premises and work spaces. Consultation of websites and LinkedIn profiles of startup leaders
Article 2 (Startup perspective)	Questionnaire with mostly closed-ended	31 cases of startups (founding	4 online respondents, 27 face-to-face	Visit of the premises and work spaces.

	questions and a few open-ended questions	teams and solos)	respondents (approximately 45-120 minutes each)	
Article 3 **(Large firm perspective)**	Semi-directive interviews	2 cases of large firms	4 interviews of 45 to 60 minutes each, for a total of 3.25 hours (195 minutes)	Consultation of websites and press articles available online
Article 4 **(Perspective of innovation intermediaries)**	Semi-directive interviews	1 case study of an ecosystem	12 interviews of 30 to 90 minutes each, for a total of 10.6 hours (635 minutes)	Visit of the premises and work spaces, online press articles

In total, this research led to 21 hours of interviews for qualitative purposes, which were fully transcribed into text. The verbatim transcripts of the articles were also translated into English. The interviews for quantitative purposes represented approximately 37 hours of face-to-face meetings. The responses to the questionnaire thus collected were then entered into the dedicated Sphinx form, in addition to the few observations obtained online. The data were then transferred to SPSS.

Ethics regarding collected data

Concerning the interview-based collection, before the start of each interview, respondents were asked for their agreement to their audio recording, in order to transcribe the interviews into text and then confidentially analyze the verbatim in the framework of this research work. With regard to the questionnaire collection, the anonymity of the data was guaranteed to the respondents and is explicitly stated

directly in the form, whether they responded online or face-to-face: no link was made between the startups' names and the completed questionnaires.

Box 2 - Data collection methods used

Article 1 - Data collection through a first interview guide

Semi-directive interviews were conducted with startup leaders who work or have worked with large firms. The semi-directive interview guide is built around five themes dealing with the organizational dimension of collaboration for innovation: collaboration (purpose, triggers), challenges of collaboration, approach to innovation, perception of external innovation and organizational processes. It includes questions on the objectives of collaboration with the large firm, its start, the access to relevant actors, the obstacles related to collaboration, the impact of differences between startup and large firm, the internal perception of innovation by the large firm, the intervention of a collaboration interface, the links with relevant departments of the large firm, the modalities of information and knowledge exchange, the experienced work processes, the degree of autonomy of the different actors of the project, the involvement of the startup in the processes of the large firm.

In addition to the six interviews, a visit to the premises of the startups was carried out as well as an observation of their way of working. The collection of a series of press articles on key events in the life of the startups made it possible to complete the primary data collected. Each interview, lasting 60 to 90 minutes, began with a historical overview of the startup and its founders. Each respondent was asked to go beyond the questions asked, so that they could relate their experience of the collaboration as accurately as possible. All interviews were transcribed and coded to ensure the reliability of the results. In terms of follow-up, the respondents agreed to exchange views following the interviews in order to clarify or complete certain points.

Article 2 - Data collection by means of a questionnaire

In order to investigate the role and nature of the knowledge and skills of startup founding teams (as opposed to solos), data collection was undertaken by means of a survey to allow for the exploration and comparison of a sufficient number of cases

and variables associated with the phenomenon under study. Indeed, the different variables studied relating to the distinctive resources of the startups, their human and social capital, are numerous. Those relating to their experience with a large firm are just as numerous. The questionnaire was therefore the best way to collect a relatively satisfactory number of observations for a large number of variables, which would have been very complex to implement using a semi-structured interview approach. The majority of the questions asked were closed, with only a few open-ended questions, in order to clarify certain answers for a more detailed understanding. The survey form was designed with Sphinx software so that the data could be easily entered and then retrieved in a flexible format for processing and analysis using IBM SPSS Statistics software. The data set was therefore integrated and coded into the SPSS software.

Prior to administering the questionnaire to the target sample, a pilot test was undertaken to validate the understanding of the survey questions by the targeted startups. Questions that were unclear or potentially ambiguous were reworded and then resubmitted to the testers for validation of understanding. As direct online data collection proved to be rather fruitless, since the online questionnaire was rarely completed in its entirety, face-to-face interviews had to be organized to collect the data online. This allowed for the collection of complete questionnaires and also proved to be a very good way to collect reliable and quality data. Another means of ensuring the reliability and validity of the data set was the design of the measures (mainly 7-point Likert scales and multiple choice scales). The variables measured were: distinctive innovative skills of startups, human capital of startup founding teams (education and professional experience), management know-how, social capital of startup founding teams, successful collaboration with large firms, and cognitive and social proximity between startups and large firms. The final sample of respondents to the full survey is 31 startups, including 25 teams.

Article 3 - Data collection through a second interview guide

Semi-structured interviews were conducted with senior managers of two large organizations (in this case, banks), who were interviewed retrospectively (Huber & Power, 1985). The semi-structured interview guide is built around themes relating to the implementation of digital open innovation in the banks interviewed: the open

innovation process, the departments involved and dedicated to it, the difficulties encountered in implementing this process in the context of collaborations with Fintechs or startups, the internal and external obstacles encountered in relation to digital innovation (internal activities and customer services), the centralization vs. decentralization of decision-making, the systems implemented internally to innovate, external sources of knowledge, and the stakeholders involved in the open innovation process. The interviews, each lasting 45 to 60 minutes, began with a presentation of the role of the managers interviewed within the bank and in the open innovation process. In addition, a consultation of the websites of the two major organizations and an online search for press articles, focusing in particular on open innovation within these two banks, made it possible to complete the primary data collected through the four interviews conducted.

Article 4 - Data collection through a third interview guide

To explore the influence of the ecosystem innovation intermediaries on the regeneration of the large firms' dynamic capabilities, a third interview guide was designed to collect the data. The objective of these interviews was to collect descriptions of the ecosystem in which the respondents operate, in the context of the phenomenon under study, and to share their interpretation of the meaning of this phenomenon (King, 2004; Kvale, 1983). The objective of the first series of interviews within large organizations (banks) was to understand, through the respondents' descriptions and in the light of the results of the third article, the challenges and changes introduced, within this ecosystem, to adapt the banking system to the digital age, but also to gather their perception of the difficulties associated with this transition and with working with Fintechs or startups. The second series of interviews was devoted to the different roles of external innovation intermediaries within this ecosystem and more particularly to the dynamic capabilities of banks to establish new collaborations with startups and Fintechs. The interview guide was thus essentially based on their practices and their processes able to foster these collaborations. According to Kvale (1983), the researcher should not impose a too rigid structure when conducting the interview, but should rather foster exchange, in order to perceive the point of view of the interviewee. Twelve semi-structured interviews were conducted and lasted between 30 and 90 minutes.

2.2.3. Case selection

The research question determines the most appropriate selection of cases to answer it. In this thesis, the search for a certain diversity in the cases studied has been relevant. Indeed, the whole research work is based on differences, the notion of distance between the actors (divergence) and their potential complementarities (convergence). Therefore, the four articles aimed to capture this diversity, the differences between the cases in order to reveal the points of divergence and convergence. The fourth article also aimed at comparing two groups (founders of startups in teams vs. solo founders) with regard to the object of study (startup - large firm collaboration), the startups were targeted accordingly. Box 3 details the respondent selection process.

Box 3 – Selection of respondents

Article 1 - Differentiated startups

This research aimed at a diversity of situations, as much as possible, in terms of startup collaborations with large firms. This made it possible to highlight points of divergence, but also points of convergence between the cases studied. Thus, the selected startups differ in terms of sector of activity, history, type of innovative solution proposed, strategic objective for collaborating with large firms, and outcome (success vs. failure of collaboration). The interviews were conducted in July 2017 with managers of French startups in the Great East region. As these are retrospective studies involving a single respondent per unit of analysis, Huber and Power (1985) recommend ensuring that the respondent is the most competent for the question being studied. Since startup managers are closest to issues of innovation strategy and organization, they are the most competent source of information for the phenomenon studied. According to Weiblen and Chesbrough's (2015) typology, these startups have in common the fact that they are part of a similar type of collaboration aimed at bringing innovation from outside the large firm.

Article 2 - Team-based vs. solo technology startups

The founders of the startup were selected based on their technological innovation, the direction of their innovation flow and their geographical location. Indeed, all the startups were technology-based, had the same innovation flow (inside-out) and were located in the "Greater Region" in Europe. The fact that these startups belong to the same ecosystem and operate in a similar environment avoided biases due to potential contingency factors arising from major differences in their environment. The selected startups had one or more founders. Individual startuppers (called "solos") were included in the sample; they constituted the control group. All the startups had either a first collaboration experience with a large firm or none at all and were financially and organizationally independent from the latter. The direction of the innovation flow was the same for all startups, i.e. inside-out from the startup's perspective (Weiblen & Chesbrough, 2015), which means that the startup offers an innovative solution to the large firm. The sample consists of 31 usable responses to the survey. The startups represented in the sample operate in various fields of activity, such as software development, artificial intelligence, machine learning, cyber security, satellite communication, bioinformatics, data management, application quality management, Edtech, exploration of natural resources, plastics processing, design in the medical-social field, real estate, recruitment, green energy management, human resources, well-being at work, food and tourism.

Article 3 - Differentiated large firms

This study aimed to identify the various difficulties encountered by large organizations (in this case, banks) in terms of open innovation and digitalization in order to ultimately collaborate with startups in particular. The choice of differentiated banks thus appeared relevant to compare the strategies put in place. The Alpha bank has 2,500 employees and Beta more than 2,000 people worldwide. Alpha is located in France, and Beta is in Luxembourg with several subsidiaries around the world. Alpha is a national bank, operating nationally with a strong regional presence, while Beta operates both locally and internationally. The stage of introduction of innovation is different : Alpha started a strategy of opening its borders to innovate seven years ago, and Beta has just started it in early 2016. These differences in approach

between the two large organizations have led to the emergence of divergences in relation to the phenomenon studied and similarities.

Article 4 - Various stakeholders in the innovation ecosystem

The unique case of Luxembourg's innovation ecosystem was chosen for this part of the research program because this ecosystem presents a series of changes consistent with existing theories in terms of business model innovation and open innovation. Several specific characteristics of the Luxembourg ecosystem also led to its selection as a field of study. Indeed, firstly, Luxembourg is clearly focused on technology and innovation, and digitalization is a priority for the Luxembourg government. Secondly, Luxembourg has established an ecosystem of startups and fintech that is currently growing. Thirdly, as a gateway to European markets, notably due to the widespread use of the English language, communication is facilitated within the ecosystem itself, but also with the outside world, making Luxembourg naturally inclined towards global expansion and open innovation. Finally, the actors of the ecosystem are geographically close to each other due to the size of the country, which reduces distances between people. Numerous data such as reports, videos and press releases are publicly available and report on the development and activities of this ecosystem.

The selection of respondents was driven by the objective of this study, which was to understand the influence of innovation intermediaries on the dynamic capabilities of large firms and in particular their capacities to build new collaborations with startups. Thus, the banking sector was again chosen, in order to further understand the evolution of this sector, which is undergoing major upheaval due to its needs in innovation and digitalization. Moreover, this sector is widely represented in Luxembourg and is recognized there for its performance. The respondents were therefore senior executives and managers in this sector, five in total, from three different banks. As for the intermediaries, the first ones were selected because of their links with certain banks. This made it possible to explore the nature of these links and their impact on the creation of new collaborations by banks with Fintechs or startups. The following innovation intermediaries were solicited along the way: indeed, during the first interviews with the intermediaries, some names of other intermediaries emerged during the exchanges. Interviewing these intermediaries

"recommended" by other intermediaries was relevant for this study. Thus, seven innovation intermediaries were interviewed: the director of an open innovation business club, the director of an accelerator from a bank, the director of another similar accelerator, the partnership manager of an accelerator from Fintech, the director of an incubator, the director of the community space grouping several intermediaries as well as Fintechs and startups, and a consultant specialized in digital management.

2.2.4. Data analysis

Deductive, inductive and abductive reasoning

Two main modes of reasoning exist in research: the deductive mode and the inductive mode. One approach combines the two reasoning modes: abduction.

The reasoning used in this thesis is abduction, which, moreover, is particularly well suited to constructivist approaches (Hallée & Garneau, 2019). Abduction has the advantage of increasing the creativity of reasoning:

> "*Abductive inference allows to creatively combine empirical facts with heuristic frames of reference. The use of analytic induction and abduction makes it possible to update the creative work of qualitative research while making use of existing knowledge in the field to which the object of study belongs.*" (Anadon & Guillemette, 2006, freely translated)

Qualitative approach to the construction of the theory

Among the existing analysis methods for developing theory from empirical data, the one used mainly in this thesis is the Gioia method (Corley & Gioia, 2004; Gioia & Chittipeddi, 1991; Gioia, Corley, & Hamilton, 2012). It makes sense from an epistemological and methodological point of view. The entire process of coding and analyzing of this method is based on the data structure, on which the scientific rigour

of this qualitative approach is based; Gioia synthesizes it with this unequivocal "mantra":

"*You got no data structure, you got nothing*" (Gehman et al., 2018, p.186).

This data structure, the basis of the analysis, may emerge following a two-stage coding of the raw data: a so-called first-order coding brings out the concepts, then a second-order coding the themes related to these concepts, and then the aggregate dimensions related to these themes. The dominant elements expressed by the respondents are highlighted during the first level of analysis, then a second, more theoretical level of analysis will subsequently enable the researcher "*to derive an explanatory framework to put the story into a more theoretical perspective*" (Gioia & Chittipeddi, 1991, p. 435). The whole coding process is also based on a graphical representation showing the evolution of coding from raw data to theoretical dimensions, which is one of the pillars demonstrating the rigor of the method.

Gioia's method from data analysis to the emergence of a theory involves the following steps (Gioia et al., 2012, p. 26):

- "Perform initial data coding, maintaining the integrity of the first-order (informant-centric) terms.
- Develop a comprehensive compendium of first-order terms
- Organize first-order codes into second-order (theory-centric) themes
- Distill second-order themes into overarching theoretical dimensions (if appropriate)
- Assemble terms, themes and dimensions into a "data structure".
- Formulate dynamic relationships among the 2nd-order concepts in data structure
- Transform static data structure into dynamic grounded theory model
- Conduct additional consultations with the literature to refine articulation of emergent concepts and relationships".

Other methods of qualitative analysis exist. Those often referred to by researchers in addition to Gioia's method include "building theories from case study research" developed by Kathleen Eisenhardt (Eisenhardt, 1989), and "strategies for theorizing from process data" developed by Ann Langley (Langley, 1999).

Moreover, the methods proposed by Gioia and Eisenhardt present similarities (Gehman et al., 2018, p.288): *"[Building theory from data] almost invariably involves collecting data, breaking it up into what Denny [Gioia] calls first-order and second-order themes, or what I call "measures" and "constructs," and then abstracting at a higher level. Regardless of the terms, this process is at the heart of what most theory-building qualitative researchers are doing."*

Box 4 presents the data analysis methods used throughout the research program and embodied, contextualized through each of the interrelated studies conducted.

Box 4 - Data Analysis Methods

Article 1

The verbatim was analysed using a three-step coding scheme based on the methodology used by Corley and Gioia (2004), in order to structure the results and bring out the aggregate dimensions supporting the analyses conducted (Gioia et al., 2012).

An initial coding of the verbatim was carried out to identify the primary concepts contained in the data. In a second coding phase, higher order categories were identified using proximity characterization criteria (forms of geographical and non-geographical proximity: cognitive, social, and organizational). In the third stage of coding, aggregate dimensions were identified to support the analysis of the foundations of barriers to collaboration and organizational factors fostering different forms of proximity.

To interpret the results, two main phases of collaboration were highlighted, as well as an upstream phase, in order to reflect the chronology of appearance of the identified factors and the dynamic nature of the collaboration. The first phase, the design of the collaboration, represents all of the elements allowing the engagement in the collaboration project, from the meeting to the decision of effective engagement of the

stakeholders. The second phase, the collaboration process as such, represents the joint work on the project, the collaboration itself, the interactions, potential adjustments and ad hoc means implemented to achieve the objective sought by the partners. The upstream phase concerns any factors existing before the relationship begins.

Article 2

The second article is based on a quantitative but exploratory method. The objective is therefore not the generalization of results, but the understanding of a phenomenon: the link between the complementary skills of startup founding teams (compared to solos) and the success of their collaboration with a large firm. As this link is not necessarily linear, the analysis of the dataset was based on the observation of descriptive statistics elaborated using the SPSS software. Contingency tables were produced to allow observation and comparison of the data for the two groups studied, i.e. the startup founding teams and the solo founders of startups. Visuals in the form of box-plots were produced to present the data. This type of graph allows an explicit comparison between two groups by representing the distribution of a variable by the median, the interquartile range, as well as the minimum and maximum value of the distribution. These graphs made it possible to observe the behavior of each of the two groups, the trend as well as the direction of the relationships (positive vs. negative) with respect to the variable explored. Then, in order to confirm the level of significance of the results (through the p-value) on the basis of these contingency tables, an alternative to the Chi-square test was used: the Fisher Exact Test, this test being particularly well adapted to small samples. In some cases and where appropriate, a bivariate correlation matrix was used to further analyze the relationships. The entire process from data coding to data analysis was performed using SPSS software. Conclusions on the validation or rejection of the five hypotheses (based on a conceptual framework developed from the literature) were drawn at the end of each step of this analysis process. Finally, a conceptual model was proposed in the discussion section in light of the analysis results.

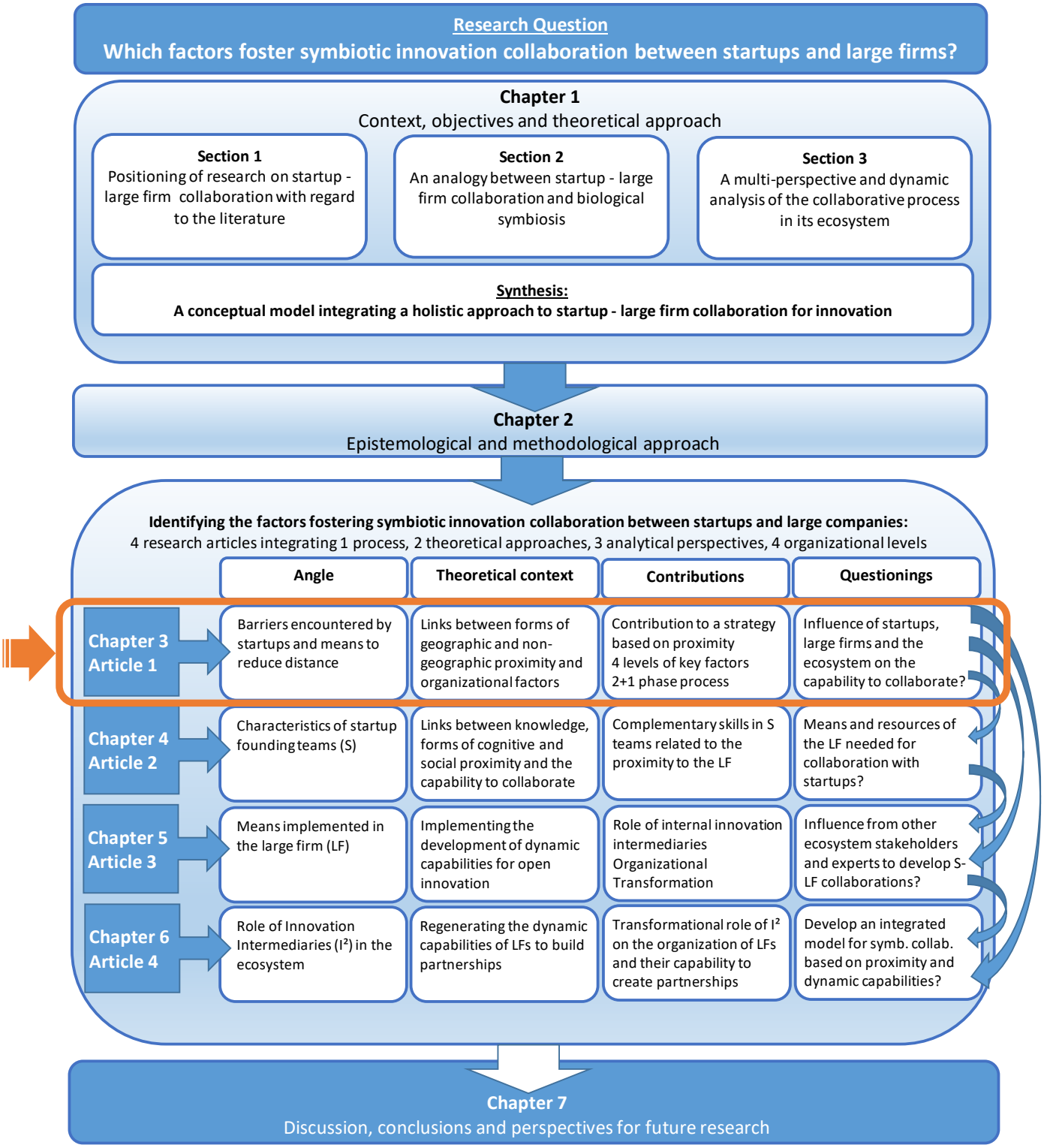
Article 3

The interviews in the third article were also coded using the same systematic three-step coding process (Corley & Gioia, 2004) as in the first article. The analysis led to the identification of three broad categories of outcomes: the challenges that large organizations (here banks) are facing, the ways in which they develop their dynamic capabilities, and the associated rigidities. A micro-foundation approach was used to identify the concrete components of dynamic capabilities. As suggested by Felin et al (2012), the levels of organization, processes and individuals were considered. In a second step, the obstacles encountered by the two organizations studied in managing change at the individual and organizational levels were highlighted, as well as the crucial role played by digitalization.

Article 4

The fourth article was coded using the same three-step Gioia process. The different verbatim, however, were coded with NVIVO software, which had not been used for the other two articles. Indeed, given the number of interviews and the density of information collected, it seemed appropriate to use this software, which proved particularly useful for the first step aimed at identifying the primary concepts contained in all the verbatims. The analysis of the data according to the three-step gioia process thus allowed us to identify first, second and third order codes (Gioia, Corley, & Hamilton, 2012) that describe the main aspects of our theoretical results regarding the role of innovation intermediaries on the regeneration of large organizations' dynamic capabilities, and in particular their capacity to build new collaborations with Fintechs or startups.

- CHAPTER 3 -
PROXIMITY AND ORGANIZATIONAL FACTORS FOR THE COLLABORATION BETWEEN STARTUPS AND LARGE FIRMS IN AN OPEN INNOVATION CONTEXT


Research Question
Which factors foster symbiotic innovation collaboration between startups and large firms?
Chapter 1
Context, objectives and theoretical approach
Section 1
Positioning of research on startup - large firm collaboration with regard to the literature
Section 2
An analogy between startup - large firm collaboration and biological symbiosis
Section 3
A multi-perspective and dynamic analysis of the collaborative process in its ecosystem
Synthesis:
A conceptual model integrating a holistic approach to startup - large firm collaboration for innovation
Chapter 2
Epistemological and methodological approach
Identifying the factors fostering symbiotic innovation collaboration between startups and large companies:
4 research articles integrating 1 process, 2 theoretical approaches, 3 analytical perspectives, 4 organizational levels
Angle
Theoretical context
Contributions
Questionings
Chapter 3 Article 1
Barriers encountered by startups and means to reduce distance
Links between forms of geographic and non-geographic proximity and organizational factors
Contribution to a strategy based on proximity
4 levels of key factors
2+1 phase process
Influence of startups, large firms and the ecosystem on the capability to collaborate?
Chapter 4 Article 2
Characteristics of startup founding teams (S)
Links between knowledge, forms of cognitive and social proximity and the capability to collaborate
Complementary skills in S teams related to the proximity to the LF
Means and resources of the LF needed for collaboration with startups?
Chapter 5 Article 3
Means implemented in the large firm (LF)
Implementing the development of dynamic capabilities for open innovation
Role of internal innovation intermediaries
Organizational Transformation
Influence from other ecosystem stakeholders and experts to develop S-LF collaborations?
Chapter 6 Article 4
Role of Innovation Intermediaries (I²) in the ecosystem
Regenerating the dynamic capabilities of LFs to build partnerships
Transformational role of I² on the organization of LFs and their capability to create partnerships
Develop an integrated model for symb. collab. based on proximity and dynamic capabilities?
Chapter 7
Discussion, conclusions and perspectives for future research

CHAPTER 3 - Article 1: Proximity and Organizational Factors for Startup – Large Firm Collaboration in an Open Innovation Context[16]

The original article was published in French in February 2019 in the journal "Innovations" as follows: BERTIN, Clarice, "Proximité et facteurs organisationnels pour la collaboration startup - grande entreprise en contexte d'innovation ouverte", Innovations - Revue d'Economie et de Management de l'Innovation/Journal of Innovation Economics and Management, February 2019, vol. 58, no. 1, pp. 135-160.

3.0. Extended abstract

Abstract: The objective of this article is to identify the organizational factors that foster proximity between startups and large firms, as asymmetric partners, in order to understand the elements underlying their capability to collaborate, which is essential within a context of open innovation. The proximity theory approach makes it possible to analyze a given collaboration in a holistic way, over time and in geographical and non-geographical spaces. Based on four collaboration cases, this exploratory research adopts the perspective of startups, which is almost non-existent in the literature. The results show the differences that create cognitive distance between startups and large firms and highlight four levels of factors that contribute to their proximity: internal to the startup, internal to the large firm, inter-organizational and ecosystemic. This research is of interest to businesses wishing to collaborate with asymmetric partners in a context of open innovation. It is also intended for regional innovation policies that aim to support innovation and entrepreneurship ecosystems.

Keywords: Capability to Collaborate, Proximity Theory, Asymmetry, Organizational Factors, Startup, Large Enterprise, Open Innovation

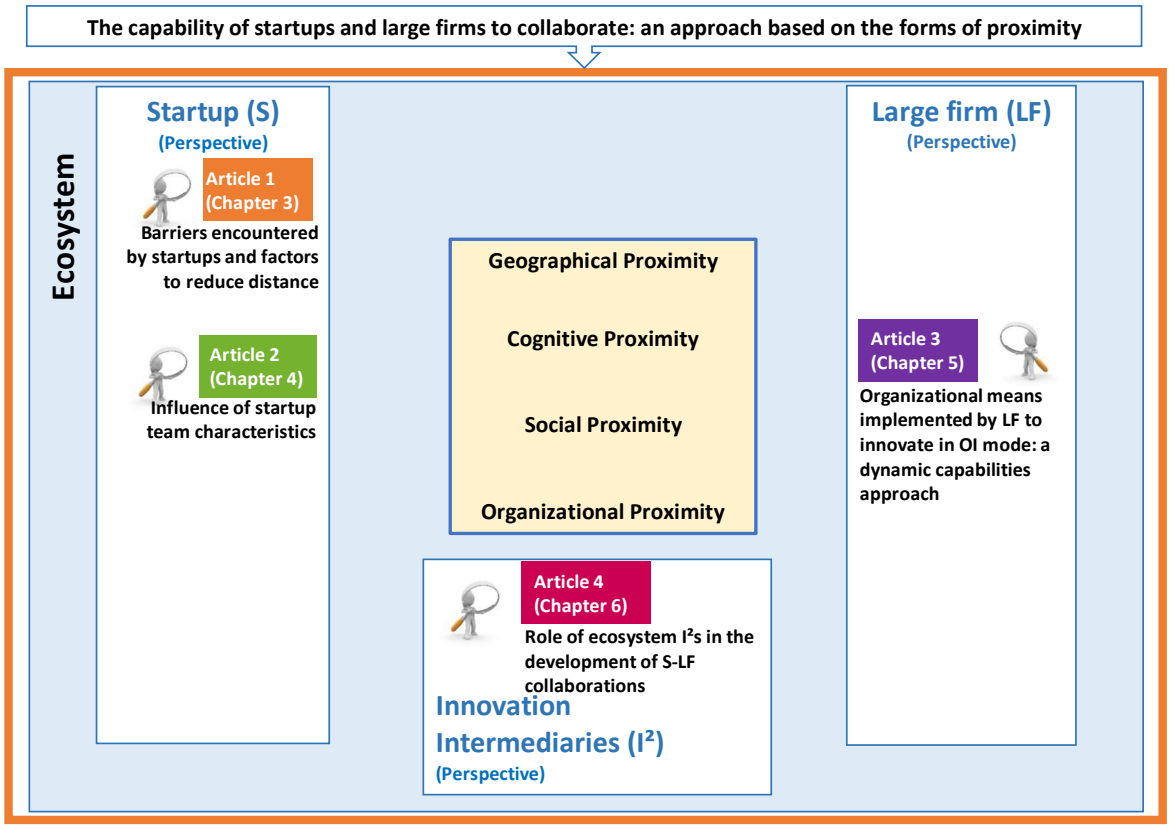
JEL Codes: L20, L26, O31, O32.

[16] This version is the translation by the author of her original article firstly published in French in February 2019.

Positioning of the article within the thesis

This first article establishes the foundations of the thesis. It presents the key elements of the research, shows its interest and introduces the theoretical framework based on the forms of geographical and non-geographical proximity. The figure below illustrates the fact that this first paper (orange frame), while adopting the perspective of the startup, develops, thanks notably to the theoretical framework chosen, a holistic vision of the startup - large firm collaboration in order to perceive its key dimensions, which will be explored in the following papers.

Figure 8 - Positioning of Article 1 in the conceptual framework of the thesis



Legend: S = Startup, LF = Large firm, I² = Innovation Intermediaries, OI = Open Innovation

Key results and originality

The results show that the quality of startup-large firm collaboration depends mainly on the efforts deployed by the large firm to improve its capability to collaborate, and this well upstream of the collaboration. The interface appears to be the catalyst for

several forms of proximity. The cases explored indicate that the consideration of all forms of proximity studied is essential. Taken individually, each proximity is necessary but not sufficient for collaboration, because of their interdependence. The proximity theory approach allows a holistic view of collaboration that is adaptable to each partner. As a result, strategic thinking based on proximity appears relevant for firms wishing to develop their capacity to collaborate with asymmetrical partners in a context of open innovation.

This paper thus contributes to the integration of the proximity theory into strategic thinking in the context of open innovation, and provides a reading grid of the organizational factors that increase the forms of proximity of asymmetrical startup-large firm collaboration. This research shows in particular the essential and central role of the innovation intermediary in all identified phases (Upstream, Design, Process) of collaboration.

Implications for this doctoral work

This first article highlighted the divergences and points of convergence between the cases studied. From the results obtained, the following question emerged: What is the influence of startups, large firms and ecosystem actors on the protagonists' capability to collaborate? The continuation of the research program was thus developed around three main axes: the role of the skills (the intra-organizational dimension) of the startup in this capability to collaborate with large firms, the intra-organizational transformation of the large firm, in connection with the external, to put itself in a position to collaborate with startups, and finally the roles of innovation intermediaries on the capability of startups and large firms to collaborate. These three axes gave rise to the next three exploratory papers.

Research valuation

Publication in a peer-reviewed journal in 2019

"Proximité et facteurs organisationnels pour la collaboration startup - grande entreprise en contexte d'innovation ouverte", *Innovations - Revue d'Economie et de*

Management de l'Innovation / Journal of Innovation Economics and Management, February 2019, vol. 58, no. 1, pp. 135-160 | CNRS Rank 4 | FNEGE Rank 3 | HCERES Rank C.

Article submission process (2017 to 2018)

30/11/2017 Submission of the article entitled: "Impact des proximités cognitive, organisationnelle et géographique sur la collaboration startup-grande entreprise en contexte d'innovation ouverte", within the framework of the special issue on "agile innovation" of the journal *Innovations - Revue d'Economie et de Management de l'Innovation/Journal of Innovation Economics and Management* (I-REMI), rang 4 CNRS, 4 FNEGE, C HCERES.

26/12/2017 Article selected to enter the publication process of the *Innovations* journal.

04/01/2018 Submission of the article on the dedicated online platform of the *Innovations* journal.

26/03/2018 Request for major revisions.

02/05/2018 Submission of the revised version. New title: "Impact des formes de proximité sur la collaboration startup-grande entreprise en contexte d'innovation ouverte".

30/07/2018 Request for minor revisions by one reviewer, major revisions by the second.

14/09/2018 Submission of the revised version. New title: "Proximité et facteurs organisationnels pour la collaboration startup-grande entreprise en contexte d'innovation ouverte".

15/11/2018 Request for minor revisions.

22/11/2018 Submission of the revised version.

04/12/2018 Final decision: article accepted for publication.

01/02/2019 Article published.

Presentation in research seminar in 2017

"Impact of cognitive, organizational and geographical proximities on startup-large firm collaborations in open innovation context", ICN Business School Brown Bag Seminar, Nancy, December 19, 2017.

3.1. Introduction

The open innovation strategies practiced by large firms lead them to become more open to external actors such as startups, which are more agile and innovative (Chesbrough, 2003; Spender et al., 2017; Weiblen, Chesbrough, 2015). While open innovation brings opportunities, it is also a source of new challenges (Pénin et al., 2011), particularly in terms of managerial and organizational barriers (Oumlil, Juiz, 2016). One of the current challenges is how to develop win-win relationships between a large firm and a startup (Sarrazin, 2017).

Startup-large firm collaboration is often considered from a financial perspective. The importance of the relational dimension is highlighted by Hill and Birkinshaw (2014), Dyer and Singh (1998) and Yoon and Hughes (2016). The ability to collaborate (Blomqvist, Levy, 2006; Snow, 2015) is related to this dimension and is central for exploring new knowledge spaces and innovating. This capacity is all the more difficult to develop when partners are asymmetrical (Kohler, 2016), i.e. differ significantly in size, resources or business experience (Minshall et al., 2010) and age. According to Hogenhuis et al (2016), work on asymmetric relationships has so far ignored the obstacles encountered by startups and large firms at different stages of the innovation process. Bogers et al (2017) point out that special attention should be paid to the differences between stakeholders in an open innovation ecosystem. Moreover,

open innovation among startups is a relatively unexplored dimension in research and studies focusing on collaborative innovation between startups and large firms are almost exclusively conducted from the latter's perspective (Usman, Vanhaverbeke, 2017).

As a follow-up to these calls, the objective of this article is to explore how startups and large firms organize their collaborations and increase their capability to collaborate. We use the proximity theory to characterize the different dimensions of the asymmetry between the actors involved in a collaborative relationship and thus provide an analytical understanding of the factors conditioning the capability to collaborate. In order to collaborate, asymmetrical actors, initially distant, must manage to get closer. The theory of proximity makes it possible to characterize the cognitive, social, organizational and geographic dimensions of this closeness, and thus to develop a holistic vision of collaboration. Our research question is the following: What are the organizational factors that foster proximity (cognitive, social, organizational, and geographic) between startups and large firms and their capability to collaborate in a context of open innovation?

The article presents in a first part the theoretical foundations of the research on the capability to collaborate and the theory of proximity and, in a second part, the methodology used, based on exploratory research, and the cases analyzed. The results are presented in the third part, and discussed in the final part.

3.2. Theoretical foundations

3.2.1. Capability to collaborate in the context of open innovation

According to Wood and Gray (1991, p. 146), "*collaboration occurs when a group of autonomous stakeholders of a problem domain engage in an interactive process, using shared rules, norms, and structures, to act or decide on issues related to that domain."* This definition underpins two complementary approaches: a life-cycle dimension of the relationship and a teleological dimension, both of which support the

idea that the action of collaborating is essential to the growth and organizational evolution of firms and that it is adaptive. The life cycle theory is based on the fact that the future growth of an organization is determined more by its own history than by 'external forces' (Greiner, 1972, cited in Van de Ven, 1992). However, unlike large firms, startups are not limited in their evolution by the weight of their history, which is short by nature. The teleological process theory, on the other hand, assumes that the development of an organization has a purpose, the quest for strategic growth, and is adaptive either by itself or in interaction with others (Van de Ven, 1992, p. 178). This purpose is the raison d'être of collaboration between firms, which build it together socially and select from various alternatives a plan of action to achieve it (Van de Ven, 1992, p. 178). Doz (1996, p. 81) suggests exploring the adaptive nature of organizational evolution and the organizational learning that ensues by *“[adopting] a view of strategy process that transcends the static vs. dynamic or teleological vs. emergent dichotomies.”*

The business world has entered the era of collaboration (Snow, 2015). A complex and ever-changing environment, the densification of collaborative networks and the democratization of online exchanges are driving companies to increase their own capability to collaborate. This requires them to change the way they operate and become ambidextrous organizations, capable of both exploiting their own knowledge internally and exploring new knowledge beyond their boundaries (O'Reilly, Tushman, 2008; Tushman, O'Reilly, 1996). To do so, companies need to develop and foster their dynamic capabilities to detect and seize business opportunities through the continuous realignment of tangible and intangible assets (Teece, 2007), and thus adapt to change dynamically and rapidly. The capability to manage internal and external knowledge, which is *“a firm’s ability to successfully manage its knowledge base over time*", appears to be a dynamic capability (Lichtenthaler, Lichtenthaler, 2009, p. 1315) and implies that actors succeed in interacting and collaborating with each other.

According to Blomqvist and Levy (2006, p. 31), the capability to collaborate is an *"actor’s capability to build and manage network relationships based on mutual trust, communication and commitment."* Intra-organizational collaborative capabilities can

be seen as antecedents to inter-organizational collaboration (Blomqvist, Levy, 2006). Doz suggested already in 1987 (p. 56) that the risks of failure in startup-large firm partnerships are due more to managerial than technical reasons. He concludes on the importance of the role of the top management team in the active management of this type of partnership: managers must ensure the convergence of objectives between the two firms, be aware of the issues of power and personal interests within their own firm to avoid that the partnership suffers from them, and be attentive -much more than in the case of acquisitions or joint ventures- to the requirements of the interaction between the two firms. The management of the internal (intra-organizational level) and the management of the external (inter-organizational level) are thus closely intertwined and interdependent.

Moreover, as Ring and van de Ven (1992) point out, alliance relationships and similar types of collaborations differ significantly from relationships governed by markets or hierarchies. They also pose very different problems to researchers and managers. Ring and van de Ven (1992, p. 495) have developed a model for choosing governance mechanisms according to the levels of risk and trust in these relationships. They show that "*the emergence of these relational contracts is a dynamic process. Levels of risk in deals and reliance on trust between parties can and will change over time, and with these changes parties will alter their choices in governance structures and accompanying safeguards.*"

The context of open innovation requires organizational changes (Tushman et al., 2012) to be able to collaborate with the external community. Thus, the question of organization, coordination and control of activities between stakeholders with intrinsic and organizational differences arises. The importance of these differences, which condition the ability of firms to collaborate, can be expressed in terms of distance / proximity between organizations. The asymmetry between startups and large firms, due to their differences, is a carrier of potentially fruitful collaborations because only different actors can be complementary, but it is also associated with a strong risk of difficulties to interact due to this asymmetry. This research proposes to use the proximity theory and to identify the links between forms of proximity and the intra-organizational and inter-organizational factors of asymmetrical collaboration that

influence the stakeholders' capability to collaborate. We plan to contribute in this way to the development of a reflection on proximity strategies, as suggested by Talbot (2009), with a view to improving the quality of asymmetrical collaborations.

3.2.2. Forms of proximity

This article is based on proximity theory. Proximity reflects a resemblance between actors, which reflects a similarity or proximity of characteristics and the greater or lesser ease with which they interact (Bourdeau-Lepage, Huriot, 2009). The authors of the French group Proximity Dynamics of the School of Proximity distinguish two types of proximity, geographical and non-geographical proximity, the latter being referred to as 'organized proximity' by some authors (Bouba-Olga, Grossetti, 2008; Torre, Rallet, 2005; Torre, Wallet, 2014). Organized proximity is defined by the capacity of an organization to make its members interact (Torre, Rallet, 2005). Other authors, such as Boschma (2005), place all proximities at the same level, according to a 'flat typology' (Bouba-Olga, Grossetti, 2008). Following Pecqueur and Zimmermann, 2004 (cited in Bouba-Olga, Grossetti, 2008), organizational proximity is part of organized proximity and represents coordination processes that are based on direct interaction between actors. We use this definition in this article. Recently, Hansen (2015), based on Boschma's (2005) five forms of proximity model presented below, empirically highlights the fact that certain forms of non-geographical proximity can substitute to geographical proximity, and that, through a phenomenon of overlapping, geographical proximity can allow non-geographical proximity. This work shows the complementarity and substitutability of different forms of proximity already highlighted by Boschma (2005).

We base our work on the notion of proximity as understood by Boschma (2005) as a multidimensional concept, integrating cognitive, organizational, social, institutional and geographical forms of proximity. In this article, we focus on the perception of cognitive, social, organizational and geographic proximity by startups and distinguish what relates to inter-organizational and intra-organizational.

Cognitive proximity includes shared values, goals and culture (Molina-Morales et al., 2014), facilitates the acquisition of external knowledge, as well as its assimilation and

exploitation through the absorption capability of the firm (Expósito-Langa et al., 2011), and is closely related to other forms of proximity (Molina-Morales et al., 2014). Too little cognitive proximity between stakeholders, which Nooteboom (2004) refers to as too much cognitive distance, can lead to mutual incomprehension due to a lack of common experience and knowledge base, which requires them to invest in this mutual understanding.

Organizational proximity is an integral part of cognitive proximity and was separated from it by the author for the purposes of the analysis (Boschma, 2005). This includes the mechanisms that coordinate transactions, but also the means by which information and knowledge can be transferred and exchanged in a world of uncertainty. According to Kirat and Lung (1999, p. 30), *"Organizational proximity is deployed on the inside of organizations (firms and establishments) and, should the occasion arise, between organizations connected by a relationship of either economic or financial dependence/interdependence (between member companies of an industrial or financial group, or within a network). Institutional.*" Boschma (2005) sees organizational proximity as beneficial to learning and innovation because it allows, through strong control mechanisms, to secure intellectual property rights and a sufficient return on one's own investments. However, according to the author, too much organizational proximity can be detrimental to learning and innovation: this is the case with asymmetric relationships where the size and power of stakeholders differ, leading to a strong dependence on specific investments in communication and understanding. The challenge of this type of collaboration is thus to ensure proximity at inter- and intra-organizational levels. Furthermore, we integrate electronic proximity (Loilier, Tellier, 2001, p.562) with organizational proximity, considering it as part of the means to share information and knowledge. These authors define it as "the possibility for members of the network to access, exchange and develop computerized data". According to Torre, 1993 (cited by Loilier, Tellier, 2001), a high degree of electronic proximity can replace a low degree of geographical proximity, thus mitigating the geographical constraint (Loilier, 2010).

Social proximity is defined by Boschma (2005) in terms of socially embedded relationships between individuals involving trust based on friendship, kinship and

experience. Shi et al (2016) define social proximity between two firms as the social link between individuals associated with the two firms. Huber (2012, p. 1170), through the study of three dimensions of social proximity, suggests that "*social proximity in terms of feelings of personal obligations and emotional closeness is very high, whereas knowing each other in terms of private life is significantly less important*."

Geographical proximity is the proximity usually highlighted in the literature. According to Nooteboom (2004), focusing on geographical distance is essential in a context where tacit knowledge must be exchanged, since transfer requires face-to-face interaction, unlike document exchange. Boschma (2005) also argues that geographical proximity tends to foster knowledge transfer and innovation. According to Pecqueur and Zimmermann (2002), this proximity would facilitate coordination and thus have an impact on other forms of proximity. Agrawal et al (2008) showed that geographical proximity and social proximity can -in terms of interactions- substitute each other instead of complementing each other, whereas considered independently, they improve knowledge flow between actors.

Institutional proximity can be defined by the similarity of informal constraints and formal rules shared by stakeholders (Torre, Wallet, 2014). We have not retained this proximity, as its framework is at the macro level (Boschma, 2005), which is not the perspective adopted in this article. The boundary between institutional and organizational proximity is subject to a "*recurring theoretical debate (...) between those supporting institutionalist approaches (Gilly, Lung, 2008; Talbot, 2008), who distinguished between institutional proximity and organizational proximity, and supporters of more interactionist approaches (Pecqueur and Zimmermann, 2004; Rallet and Torre, 2005), who broke down organized proximity into a rationale of similarity and of belonging."* (Shearmur et al., 2016, p.105).

3.3. Methodology

This exploratory research is based on four cases that we studied using the case study methodology (Yin, 2003, 2013). It proves to be relevant insofar as it allows converging factors to emerge between the different cases, but also divergent factors in relation to the phenomenon studied: the links between cognitive, social, organizational and geographical proximity and the organizational factors of startup-large firm collaboration in the context of open innovation.

In order to explore this phenomenon, we carried out semi-directive interviews with managers of startups collaborating or having collaborated with large firms. We then analyzed the verbatim by carrying out a three-step coding according to the methodology used by Corley and Gioia (2004), in order to structure the results and to bring out aggregated dimensions supporting the analyses conducted (Gioia et al., 2012).

3.3.1. Selection of respondents

The selected startups differ in terms of their history, the type of innovative solutions they offer and their strategic focus for working with large firms. The interviews were conducted in 2017 with managers of French startups in the *Grand Est* region. As these are retrospective studies involving a single respondent per unit of analysis, Huber and Power (1985) recommend ensuring that the respondent is the most competent for the question being studied. Since startup managers are the closest to questions of innovation and organization strategy, they represent the most competent source of information for the phenomenon under study. Table 3 presents the cases studied. According to Weiblen and Chesbrough's (2015) typology, the common feature of these startups is that they are part of a similar type of collaboration, aimed at bringing innovation from outside the large firm.

Table 3 - Presentation of the four cases studied

Name	**Startup 1 (Case 1a)**	**Startup 1 (Case 1b)**	**Startup 2 (Case 2)**	**Startup 3 (Case 3)**
Solution proposed by the startup	Competency mapping		Logistics optimization	Sustainable Transportation
Creation	2017		2015	2015
Previous experience of the startup's creator	No significant experience	Experience of collaboration 1a	Another startup created and sold. 8 years experience in a large firm	2 years experience in a large firm
Sector of the large firm	Rental of machinery, equipment and material goods	Electrical installation work	Electricity distribution	Courier Service
Origin of the collaboration	BigUp For Startup Contest	BigUp For Startup Contest	Direct solicitation from the startup	Call for projects from the large firm
Final outcome of the collaboration	Stop at the initiative of the startup	Commercial success	Commercial success	Stop at the initiative of the startup

Action after this collaboration	Collaboration 1b	Buyout of the startup by a competitor	New collaboration with a large firm	New collaboration with an SME: commercial success

3.3.2. Data collection

The semi-structured interview guide is built around five themes that address the organizational dimension of collaboration for innovation: collaboration (purpose, triggers), challenges of collaboration, approach to innovation, perception of external innovation, and organizational processes. It included questions on the objectives of collaboration with the large firm, its launch, access to relevant actors, obstacles related to collaboration, the impact of differences between startup and large firm, the internal perception of innovation by the large firm, the intervention of a collaboration interface, links with relevant departments of the large firm, information and knowledge exchange modalities, experimented work processes, the degree of autonomy of the different project actors, the involvement of the startup in the processes of the large firm.

In addition to the six interviews, we visited the premises of the startups and were able to observe their way of working. The collection of a series of articles published in the media on key events in the life of the startups allowed us to complete the primary data collected. Each interview, lasting 60 to 90 minutes, began with a historical overview of the startup and its leader. Each respondent was asked to go beyond the questions asked, so that they could relate their experience of the collaboration as accurately as possible. All interviews were transcribed and coded to ensure the reliability of the results. In terms of follow-up, the respondents agreed to exchange following the interviews in order to clarify or complete certain points.

3.3.3. Data analysis

We proceeded to a first coding of the verbatim to identify the primary concepts contained in the data. In a second coding phase, we identified higher order categories using the proximity characterization criteria presented in Table 4. In the third coding stage, we identified the aggregate dimensions supporting our analysis of the foundations of obstacles to collaboration (Table 5) and of organizational factors fostering different forms of proximity (Table 6 to Table 14). To interpret our results, we have highlighted two main phases of collaboration, as well as an upstream phase to reflect the chronology of appearance of the factors identified and the dynamic nature of the collaboration. The first phase, the *design of the collaboration*, represents all of the elements that enable engagement in the collaboration project, from the meeting to the decision of the stakeholders to effectively engage. The second phase, the *collaboration process* as such, represents the joint work on the project, the collaboration itself, the interactions, potential adjustments and ad hoc means implemented to achieve the objective sought by the partners. The upstream phase concerns any factors existing before the relationship begins.

Table 4 - Criteria grid for forms of proximity

Proximity forms	Criteria
Cognitive proximity	Shared values
	Shared Goals
	Shared culture
	Common technological knowledge
Social proximity	Relationships involving trust, friendship, social, or professional ties
Organizational proximity	Coordination and control mechanisms: degree of autonomy (action and decision) of the actors in the collaboration
	Means and frequency of exchange and transfer of information and knowledge via a dedicated human interface
	Means and frequency of exchange and transfer of information and knowledge electronically
Geographical proximity	Distance (km) / travel time (frequency of face-to-face meetings)

3.4. Results

The coding of the data revealed the nature of the differences that constitute obstacles to collaboration, as well as four levels of factors that foster collaboration by increasing the proximity between partners: intra-organizational of the startup, intra-organizational of the large firm, inter-organizational and ecosystemic.

3.4.1. Differences related to asymmetry, sources of cognitive distance

Table 5 shows the differences related to asymmetry between partners that are sources of cognitive distance.

Table 5 - Sources of cognitive distance

Differences	Case 1a	Case 1b	Case 2	Case 3
Difference in the strategic importance given to the joint project	X	X		
Difference in relation to risk		X		
Difference in relation to time		X	X	
Difference in available resources		X		
Difference in organizational agility[17]		X	X	X
Cultural difference relative to innovation[18]				X
Difference in internal communication			X	X

Verbatim analysis showed that the sources of difference identified all relate to cognitive distance, which was the most spontaneously mentioned obstacle in the interviews. It also shows what the concrete foundations of this cognitive distance are.

[17] *Organizational agility can be defined as "a capability of organizational reconfiguration enabling the exploitation of the opportunities offered by change."* (Charbonnier-Voirin, 2011, p.120).
[18] We include the *culture of innovation* as an element of organizational agility, but its importance leads us to approach this factor separately.

The differences feeding cognitive distance between actors were described in the four cases studied, whether the collaborations led to failure (cases 1a and 3) or success (cases 1b and 2). Depending on the case, the nature of the differences was not the same, but they were systematically presented as a potential obstacle to the collaboration's success. The factors perceived by the stakeholders as fostering the success of the collaboration thanks to an increase in cognitive proximity are presented in the following section.

3.4.2. Factors fostering proximity

The third phase of coding highlighted four levels of factors that foster collaboration by increasing proximity: internal to startups, internal to large firms, inter-organizational and ecosystem-specific. For each of these levels, we present the salient elements of the cases studied, which we illustrate with the most representative verbatim.

3.4.2.1. Intra-organizational factors of startups that foster proximity

The intra-organizational factors of startups that foster proximity are mainly related to their cognitive learning (Table 6) and their social capital (Table 7), which result from their experience through collaborations. The design phase of the collaboration is decisive for the startup's continuation of the collaboration.

Table 6 - Intra-organizational factors of startups increasing cognitive proximity

Factors	Case 1a	Case 1b	Case 2	Case 3
Carry out watch activities on the open innovation strategies of large firms in order to understand their objectives before committing to them		X	X	
Have significant previous experience in a large			X	

firm				
Adapting to the constraints of large firms, showing empathy and understanding towards them	X (empathy)	X (empathy)	X (understanding)	X (understanding)
Gaining the trust of the large firm by proving the capabilities of the startup and its integrity		X	X	

Table 7 - Intra-organizational factors of startups increasing social proximity

Factors	**Case 1a**	**Case 1b**	**Case 2**	**Case 3**
Personal networks of the startup's creators	X	X	X	
Quickly identify the person in the field who will understand the added value offered by the startup			X	
Communication skills, pedagogy and patience of startuppers	X	X	X	X

Case 2 shows that the startup's understanding of the large firm (Table 6) can help overcome the difference in the relation to time (Table 5):

> *"The difference in size can be seen in organizations in the long journey to action and decision. (...) We have a financial and economic need to move forward, whereas large groups do not have this need because they have a*

process that exists and they have more time to think. So the approach is a bit out of step."

Case 2 meets all of the identified intra-organizational factors (Table 6 and Table 7), unlike the other cases. The creator of Startup 2 is the only one to have significant professional experience within a large firm and to proactively seek out the key person (interface) within the large firm. In addition, his social capital is high (Table 7).

Case 1a shows (Table 6) how the startup tries to find out, but too late, if the defined common goal is real for the large firm, which in the end was not the case (hidden agenda) :

"We went through our personal network to find out what was going on. We did a watch to try to understand the how and why of the rapprochement."

On the strength of this initial experience, its exchanges with its personal network and its empathy with large firms (Table 6 and Table 7), the startup carried out a watch prior to the next collaboration (case 1b, Table 6).

Case 3 shows how, despite the startup's pedagogy, patience (Table 7) and understanding of the large firm (Table 6), communication is impaired by the difference in innovation culture (Table 5):

"Startup-large firm communication, I think, is about a lot of patience at the moment And a lot of pedagogy to explain that this particular innovation is a change, and that it involves mutations that are not always easy at the beginning...".

Compared to other startups, Startup 3 was slowed down by relatively low initial social capital (Table 7):

"It requires a lot of patience, a lot of networking... I was starting from scratch, so we had to build the network from A to Z. A lot of relational..."

This first experience quickly led Startup 3 to disengage from this collaboration and to start a new one, this time with an SME, closer to it at both cognitive and organizational levels.

3.4.2.2. Intra-organizational factors of the large firm fostering proximity

The intra-organizational factors of the large firm that foster proximity (Table 8 to Table 11) are mainly the result of profound changes made in the upstream phase of the collaboration. The cases show that proximity during the design and then the collaboration process depends on these changes.

Table 8 - Intra-organizational factors of the large firm that increase cognitive proximity

Factors	Case 1a	Case 1b	Case 2	Case 3
Strategy aiming to get closer to startups to challenge the organization			X	
Prior to the collaboration, identify the needs of the large firm, the problems to be solved		X	X	
Role of the open innovation department and/or interface, which help to reconcile partners' goals, facilitate mutual understanding and manage the difference in relation to time		X	X	
Long-term vision of the collaboration project		X	X	

Table 9 - Intra-organizational factors of the large firm that increase social proximity

Factors	Case 1a	Case 1b	Case 2	Case 3
Interface (person, team) of the large firm dedicated to open innovation (frequent interactions)		X	X	
Participation in local contests to meet startups outside the large firm	X	X	X	

Table 10 - Intra-organizational factors of the large firm that increase organizational proximity

Factors	Case 1a	Case 1b	Case 2	Case 3
Empowering local branches to speed up decision making		X	X	
Creating a culture of innovation through in-house training to reduce resistance to change and facilitate absorption capability				X
Competent interface (person or team) dedicated to open innovation to facilitate project coordination		X	X	
Aligning organizational resources with the identified need			X	
Giving autonomy of action to the startup in the		X	X	X

defined or in creation project				
Encouraging exchanges between the field teams of the large firm and the startup during external events			X	

Table 11 - Intra-organizational factors of the large firm that increase geographical proximity

Factors	Case 1a	Case 1b	Case 2	Case 3
Close local branches to facilitate the frequency of interactions		X	X	

The early identification of its own needs by the large firm increases cognitive proximity and speeds up decision-making (Table 8):

> *"Working with them hand in hand was the solution that best met that need." (Case 1b)*

> *"As soon as we deploy a job-related problem and it is the decision-maker who issues that problem, it's faster." (Case 2)*

The deployment of an interface, or even an open innovation department, facilitates the links between internal and external partners and plays a decisive role in the cognitive, social and organizational proximity of the partners during the design and process of collaboration (Table 8 to Table 10):

> *"It was Mr. X, the open innovation manager of the large firm, who directed us to the different players... to the internal R&D part, to the competitiveness clusters... So it helped that there was a main contact person who knew the different players well." (Case 1b)*

"There's a contact person, a project manager who makes things easier... And there too, he/she often appreciates this agility." (Case 2)

Geographical rapprochement via a local branch and accompanied by a decentralization of power was also essential (Table 10 and Table 11):

"The organization of the large firm is conducive to effective collaboration when you have large groups like this that have local branches with a high degree of autonomy." (Case 1b)

"At the local level, it's easier to do the POC [Proof of Concept], but it's more complicated afterwards to be able to set up the POC at the national level. On the other hand, at the national level it is harder to set up a POC, because they have to look at the regional level, but on the other hand the decisions will be made more quickly." (Case 2)

Cases 1a and 3 show the effect of the absence of proximity factors that leads to failure.

These cases demonstrate the lack of prior identification and agreement on need (Table 8):

"They are looking for startups to whom they can sell this technology brick and are trying to find a real, relevant, commercial use for this technology." (Case 1a)

"They really let us free and they don't communicate about their need...(...) I think they have no idea what their clients need and they rely on us, the startups, for that." (Case 3)

Both startups also reported a relatively short-term view of the project by the large firm (Table 8):

"The large firm wanted a return on investment in the short to medium term..." (Case 1a)

The interface was rarely present and geographically distant in case 1a and non-existent in case 3 (Table 8 to Table 10):

> *"There is only the technique there to accompany the startup." (Case 1a)*

> *"No, there's no one dedicated to innovation locally. And what works a lot is when these large groups manage to set up [local] branches dedicated to innovation...." (Case 3)*

In addition, Startup 1a interacted directly with the geographically distant headquarters and Startup 3 interacted infrequently and with a distant, non-flexible and centralized organization (Table 10 and Table 11):

> *"After that, with technology X, it was managed at the national level..." (Case 1a).*

> *"It's a managerial vision where everything is very vertical and very specialized. A startup, typically, will inevitably try to explore something more transversal. (...) It's long. The management between the different departments... As everyone is confined to their missions etc., as exchanges are very complicated, it's very slow..." (Case 3)*

The fact of giving autonomy of action to the startup in the project was noted in all cases (Table 10), with the exception of case 1a, where the startup quickly ended the collaboration due to the lack of proximity factors:

> *"We did not see the future functioning of the collaboration at the point we are at today." (Case 1a)*

Startup 3 had no experience with local contests (Table 9) and was the only one that did not mention the participation of large firms in these contests as a positive factor for collaboration.

Startup 3 is also the only one to mention the lack of development of the necessary internal innovation culture within the large firm, which proved to be a major obstacle to the continuation of collaboration (Table 8 and Table 10):

> *"Is it the head office that is looking for innovation... or has this DNA really been put into the employees, the collaborators? And are they really inclined to innovate? (...) We talk to them about digital, we talk to them about Chinese... "*

3.4.2.3. Inter-organizational factors fostering proximity

The inter-organizational factors that support cognitive proximity (Table 12) are crucial to successfully completing the design phase of the collaboration.

Table 12 - Inter-organizational factors increasing cognitive proximity

Factors	**Case 1a**	**Case 1b**	**Case 2**	**Case 3**
Exchanging a lot informally, communicating through traditional means		X	X	
Clearly defining the strategic objectives of the collaboration from the start		X	X	
Establish good contracts based on a win-win relationship to be able to engage in a long-term relationship		X	X	
Establish a roadmap at the start and define the scope of action for each person	X	X	X	

Cognitive proximity is increased by regular and rather informal interactions:

> *"There are really exchanges with the field teams... That's what makes it work and that's also what I appreciate, because we are in project mode." (Case 2)*

> *"[The interface], we often see him at a lot of innovation and startups events in the region. So yes, it could happen to us at an event to re-discuss the project... The fact of meeting him often is very effective..." (Case 1b)*

The discourses of cases 1b and 2 also show the need to clarify the common objective and the scope of action of each from the start. The startup does not continue the collaboration if a win-win relationship established in the design phase proves to be unbalanced during the work process:

> *"It was a win-win situation for the first six months. And then it was 80% for them, 20% for us." (Case 1a)*

3.4.2.4. Ecosystem factors fostering proximity

Factors related to the regional innovation ecosystem appeared to foster cognitive (Table 13) and social (Table 14) proximity, particularly during the upstream (networking) and design phases of the collaboration.

Table 13 - Ecosystem factors increasing cognitive proximity

Factors	Case 1a	Case 1b	Case 2	Case 3
The ecosystem fosters collaborative behaviors		X		
Construction of common goals fostered by competitiveness centers		X		

Table 14 - Ecosystem factors increasing social proximity

Factors	Case 1a	Case 1b	Case 2	Case 3
Entrepreneurship programs in schools		X		X
A regional call for projects has led to a meeting of partners		X		
Competitiveness center network		X		
Banks Network				X
Startup contests that help create links	X	X		
Local events and clubs that foster meetings		X	X	

The regional ecosystem shapes the behavior of the partners and increases cognitive and social proximity (Table 13 and Table 14):

> *"The startup-large firm relationship does not exist without all the other actors around it, the Chamber of Commerce and Industry (CCI), the Investment Public Bank (BPI), and local authorities. Their behavior will greatly influence the behavior of large groups and startups. (...) The regional call for tenders has enabled a closer relationship with the competitiveness centers and to delve into the details of the projects."(Case 1b)*

The various intermediaries in the ecosystem enable networking and social proximity (Table 14):

> *"I belong to a local club of executives... We meet regularly and thanks to that, I am aware of opportunities and I meet a lot of interesting people." (Case 2)*

Schools offering entrepreneurship programs also emerge as a factor increasing social proximity (Table 14):

"We already knew Mr. X [the interface] when we were students. We had met him before in the context of our entrepreneurial project." (Case 1b)

3.5. Discussion

Our results show the importance, for the startup, of ambidextrous, defined as the simultaneous pursuit of exploitation and exploration (Raisch, Birkinshaw, 2008), and of the key role of interfaces, intermediaries of innovation, set up by the large firm and by the innovation ecosystem.

3.5.1. Ambidexterity: a matter of survival for the startup

Our results show that, to save valuable time in relation to their own rapid growth objectives, startups learn to assess their potential compatibility with the large firm in terms of cognitive, organizational and geographical proximity. The efforts made by startups to ensure (design phase) and then maintain (process phase) cognitive and social proximity determine organizational proximity. Indeed, being naturally agile, the startups studied did not have to deploy specific means to get organizationally closer to large firms. Their cognitive learning and social capital enable them to understand and adapt quickly to the large firm once trust has been established and maintained.

Because it is necessary for its survival, the startup's capability to collaborate is naturally built up through experience. The learning that ensues positively modifies the startups' behavior during future collaborations and thus reinforces their capability to collaborate.

The natural openness and agility of startups makes them capable of both exploring and exploiting knowledge. Ambidexterity appears to be a necessity to connect the internal and external (Lichtenthaler, Lichtenthaler, 2009) and thus foster the improvement of their capability to collaborate. To ensure their growth, which is vital, the startups studied actively seek proximity with key players. The relationship to time

appears to be the driving force in the continuous adaptation of the startups. By their very nature, which forces them to seek rapid growth, they deal with urgency on a daily basis. This urgency pushes them to quickly find effective adaptation solutions to grow while avoiding the pitfalls that are a source of time loss. These adaptations are also facilitated by the small size of their structure and the low weight of their history in their processes.

3.5.2. The interface: key to increasing organizational agility in large firms

Our results show that the capability of a large firm to collaborate with startups depends above all on the adaptations, sometimes heavy, made upstream to open its boundaries to external and asymmetrical players. These adaptations enable it to increase its organizational agility and proximity to startups. We identify five success factors common to the cases studied:

- *The development of an innovation culture internally* increases organizational, cognitive and social proximity. Startup contests, for example, are an effective way to stimulate entrepreneurial activities internally (Schaeffer, 2015).
- *The definition of the need for an innovative solution identified by the large firm upstream to the relationship* facilitates and accelerates cognitive proximity, insofar the startup can provide a technological solution, and organizational proximity, as decision-making is faster.
- *Geographical proximity facilitates social and cognitive proximity when the regional branch is relatively autonomous and power is decentralized.* The work of Rangus and Slavec (2017) shows, moreover, that decentralization has a positive and significant influence on a firm's innovation performance.
- *The deployment of a competent interface (person or team), which acts as a link between the internal and the external*, facilitates social, cognitive and organizational proximity between the startup, the large firm and also the actors of the ecosystem. Various authors (Hägerstrand, 1952; Rogers, 1962; Howells,

2006) have pointed out that innovation intermediaries strongly influence the speed of diffusion and adoption of new products and services. They have more than a bridging role. They also help transform the ideas and knowledge to be transferred (Hargadon, Sutton, 1997). Our research supports these elements of the literature. The intermediary represents the keystone of collaboration by enabling the construction and then the progress of the project through regular exchanges with partners, understanding and knowledge of the partners and the ecosystem network. This intermediary would facilitate absorption capability according to Kokshagina et al. (2017) and play the crucial role of “trust builder” (Gómez et al., 2016). In this way, he/she helps to improve the firms' capability to collaborate, since he/she also helps to maintain trust and relationships between actors throughout the collaboration process. However, to be effective, this intermediary must be highly present and have proven skills in innovation systems management, networking and communication. Otherwise, proximity between stakeholders does not occur (Case 1a and Case 3). Large companies that do not have the necessary skills internally can also use external intermediaries (De Silva et al., 2018), who are part of the innovation ecosystem. Barlatier et al (2016) identified two types of open innovation intermediaries: those oriented towards information management (connectors of innovation actors) and those oriented towards knowledge management (contributors to knowledge production). The latter type would even be “*an architect of collective exploration and creation of knowledge*” (Agogué et al., 2013, cited by Barlatier et al., 2016, p. 60).

- *The link to a dynamic regional innovation ecosystem.* The facilitation of proximity with key actors and experts accelerates the connection of partners and thus increases the opportunities for collaboration. This presupposes the existence of an organized and dynamic ecosystem. According to Walrave et al (2017), the success of the innovation ecosystem results from the internal alignment and external viability of the ecosystem, which depend on the value proposition of the ecosystem and its model. The role of innovation intermediaries in the dynamism and sustainability of the open innovation ecosystem appears to us as fundamental.

3.6. Conclusion and perspectives

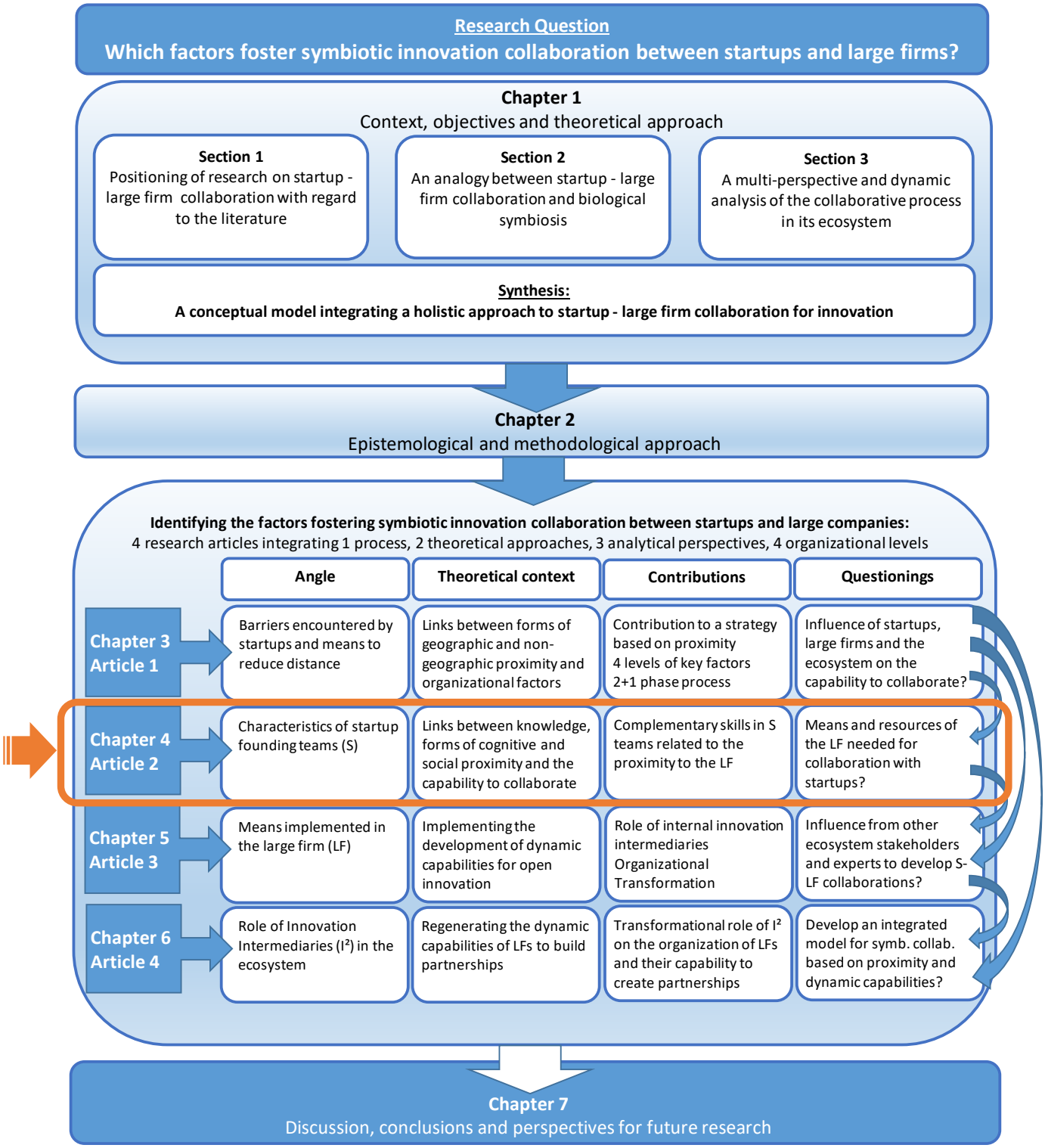
Our results show that the quality of startup - large firm collaboration depends mostly on the efforts deployed by the large firm to improve its capability to collaborate, and this well upstream to the collaboration. The interface appears as the catalyst of several forms of proximity. The cases explored indicate that the consideration of all the proximities studied is essential. Taken individually, each proximity is necessary but not sufficient for collaboration, because of their links of interdependence. The approach using proximity theory allows a holistic vision of collaboration that can be adapted according to the partners. As a result, strategic thinking based on proximity appears relevant for firms wishing to develop their capability to collaborate with asymmetrical partners in a context of open innovation.

We thus contribute to the integration of the proximity theory into strategic thinking in the context of open innovation. We provide a framework for understanding the organizational factors that increase forms of proximity in asymmetrical startup - large firm collaboration, and show in particular the essential and central role of the innovation intermediary in this type of collaboration.

Concerning the limits of our study, as it is exploratory and based on four cases, it does not intend to claim generalization. On the other hand, our article focuses only on the viewpoint of startups, as it is almost absent from the literature: putting our results into perspective with the viewpoint of large firms would shed additional light. Finally, it would seem interesting to continue this work with studies on linkages between the characteristics of the different intermediaries in the innovation ecosystem and the proximity to other asymmetric partners. This would enable regional innovation policies to support the diversity of organizational factors fostering proximity, and thus collaboration, within the open innovation ecosystem.

- CHAPER 4 -

THE NATURE OF STARTUPS' KNOWLEDGE AND THEIR INNOVATION COLLABORATIONS WITH LARGE FIRMS


Research Question
Which factors foster symbiotic innovation collaboration between startups and large firms?
Chapter 1
Context, objectives and theoretical approach
Section 1
Positioning of research on startup - large firm collaboration with regard to the literature
Section 2
An analogy between startup - large firm collaboration and biological symbiosis
Section 3
A multi-perspective and dynamic analysis of the collaborative process in its ecosystem
Synthesis:
A conceptual model integrating a holistic approach to startup - large firm collaboration for innovation
Chapter 2
Epistemological and methodological approach
Identifying the factors fostering symbiotic innovation collaboration between startups and large companies:
4 research articles integrating 1 process, 2 theoretical approaches, 3 analytical perspectives, 4 organizational levels
Angle
Theoretical context
Contributions
Questionings
Chapter 3 Article 1
Barriers encountered by startups and means to reduce distance
Links between forms of geographic and non-geographic proximity and organizational factors
Contribution to a strategy based on proximity
4 levels of key factors
2+1 phase process
Influence of startups, large firms and the ecosystem on the capability to collaborate?
Chapter 4 Article 2
Characteristics of startup founding teams (S)
Links between knowledge, forms of cognitive and social proximity and the capability to collaborate
Complementary skills in S teams related to the proximity to the LF
Means and resources of the LF needed for collaboration with startups?
Chapter 5 Article 3
Means implemented in the large firm (LF)
Implementing the development of dynamic capabilities for open innovation
Role of internal innovation intermediaries
Organizational Transformation
Influence from other ecosystem stakeholders and experts to develop S-LF collaborations?
Chapter 6 Article 4
Role of Innovation Intermediaries (I²) in the ecosystem
Regenerating the dynamic capabilities of LFs to build partnerships
Transformational role of I² on the organization of LFs and their capability to create partnerships
Develop an integrated model for symb. collab. based on proximity and dynamic capabilities?
Chapter 7
Discussion, conclusions and perspectives for future research

CHAPTER 4 - Article 2: The nature of startup teams' knowledge and their innovation collaborations with large firms

4.0. Extended abstract

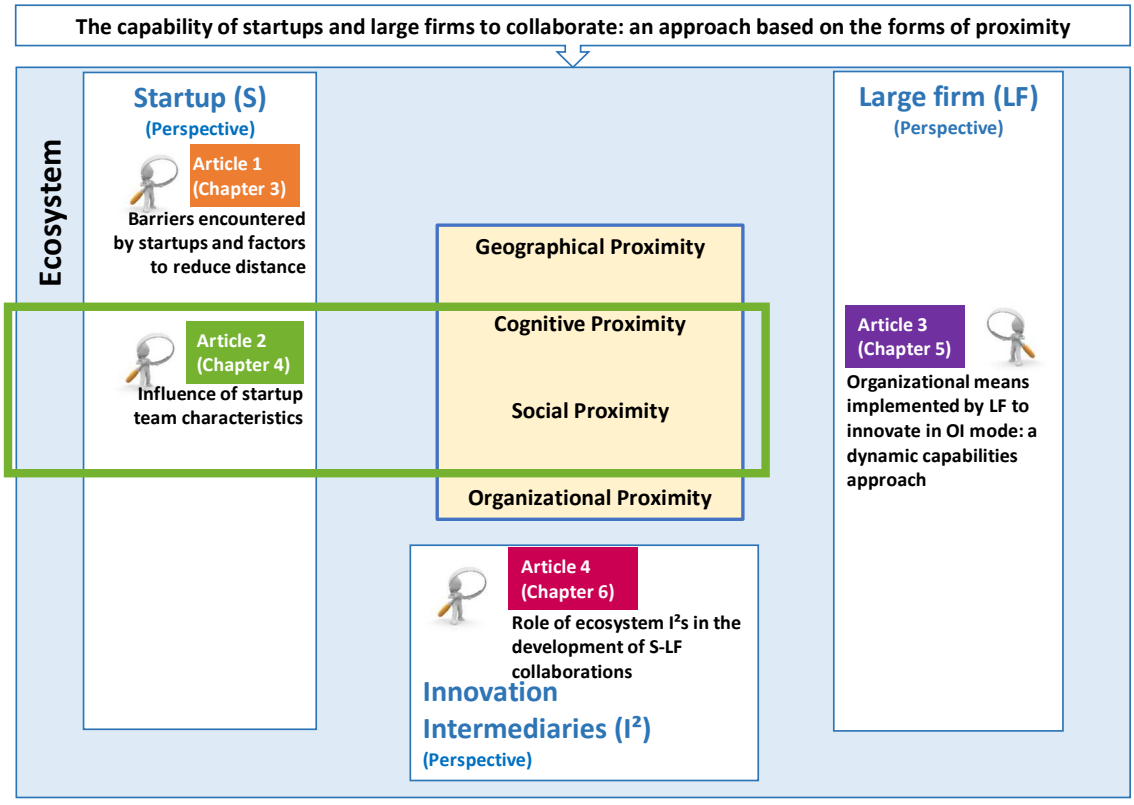
Abstract: This paper aims to investigate in which way the human and social capital as knowledge-based resources developed by startup founding teams influence their capability to collaborate with large firms in an open innovation context. Researchers have not studied this issue yet. The objective of this research work is to better understand the role and nature of knowledge-based resources of startup founding teams in their innovation collaboration with large firms, especially regarding their success. The theory of proximity is used to approach this issue as it represent relevant and central indicator of both the interaction potential and reality between asymmetric partners involved in innovation collaboration projects. This research results to a framework that takes into consideration the temporal dimension of the collaboration. The results should be of interest to startups and to businesses for their approach of strategic collaborations with asymmetric partners in a context of open innovation. They are also intended for regional innovation policies to support drivers of open innovation and entrepreneurial ecosystems throughout the phases of the entrepreneurial process.

Keywords: Startup founding teams, Technology-based startups, Open innovation, Collaboration capability, Human capital, Social capital, Knowledge complementarity, Cognitive distance, Proximity.

Positioning of the article within the thesis

Following the lessons and questions raised by the first article, this second article explores the influence of the only resources startups have, their human and social capital, on their capability to collaborate with large firms. The forms of cognitive and social proximity of startups having emerged in the previous qualitative article as essential to the success of their collaboration with large firms, the idea of this second article is to further explore, through a quantitative method, the factors from the human and social capital of startups that would be linked to these forms of proximity and to the capability to collaborate of startups. This article, like the previous one of which it is a direct extension, adopts the startup perspective. The figure below shows the positioning of the article (green frame) within the conceptual framework of the thesis.

Figure 9 - Positioning of Article 2 in the conceptual framework of the thesis



Legend: S = Startup, LF = Large firm, I² = Innovation Intermediaries, OI = Open Innovation

Key results and originality

First of all, this study showed a propensity of startup founding teams to have more complementary and essentially higher level skills than solo founders, at all levels, namely education and career path, and at the social level, especially with regard to the density of their network. The study also showed a potential advantage of founding teams over solo founders in terms of capability to collaborate with large companies, but only during the design phase of the collaboration, not the process phase. Moreover, since R&D alliances are rarely associated with successful collaboration, further research in this area would be necessary to better understand the obstacles and levers at work in the particular context of asymmetric collaborations between startups and large firms. This study has also shown, through a process-based view of collaboration, the problems likely to arise at each phase (*Upstream, Design, Process*) and which it is interesting for startups to anticipate.

Implications for this doctoral work

This second article has identified key factors related to the capability of startups to collaborate with large firms, based on a quantitative analysis of their skills. On the one hand, the startup adapts to the large firm through a certain amount of empathy towards the latter, on the other hand, its access to large firms is facilitated thanks to its personal network built upstream to the collaboration. This article has also highlighted the strength of complementary skills within startup founding teams compared to solo founders. However, it seems that other contingency factors than those explored in this article contribute to the proximity between the actors and to the success of the collaboration. A question arises from this work and the first article: what are the means and resources deployed by the large firm to develop its capability to collaborate with startups? This question is explored in article 3.

Research valuation

Communications in peer-reviewed conferences in 2018 and 2019

"Knowledge-based resources of startup teams and their capability to collaborate with large firms in open innovation context", *17th OUI -Open & User Innovation-Conference*, University of Utrecht, The Netherlands, July 8-10, 2019.

"Antecedents and impact of startupper teams' skills on their collaborations with large firms", *2018 Research Network in Innovation (RNI) Congress - Innovation Forum VIII*, Nîmes, June 4-5, 2018.

"Influence of startupper teams' skills on their collaborations with large firms to innovate", *The Global Interdisciplinary Conference: Green Cities, Business, Engineering, Architecture, Design & Technology*, Nancy, June 27-30, 2018.

4.1. Introduction

After the eras of competition and then cooperation, organizations have entered the era of collaboration (Snow, 2015). Following Snow, collaboration is characterized by a high level of trust, intrinsic motivation, open and shared information and communications, and a goal being to work together to find out new solutions. To achieve their objective of rapid growth and scalable innovation, innovative entrepreneurs have to choose the right strategic options for their respective startups among which collaborating with large firms (Gans, Hsu, & Stern, 2002) or seeking to be acquired by them (Henkel, Rønde, & Wagner, 2015). This paper focuses on strategic alliances, which are defined by Gulati (1998, p. 293) as "*voluntary arrangements between firms involving exchange, sharing, or co-development of products, technologies, or services.*" Depending on situations, collaborating with a large firm can meet various needs of startups: a need for financial or material resources, for external complementary knowledge (technical resources), for recognition and legitimacy towards targeted customers, and/or for rapid commercialization where the large firm plays then the role of either a direct customer

or a sales intermediary. For their part, large firms are increasingly opening their boundaries to startups as partners for they can benefit through them from what they lack internally, namely a great agility and the ability to innovate as quickly as the market demands (Chesbrough, 2003; Spender, Corvello, Grimaldi, & Rippa, 2017). Hence, there is a strategic objective for both partners to collaborate, which is closely related to their respective competitive advantage.

Collaboration alliances between startups and large firms represent asymmetric relationships due to their intrinsic and organizational differences (Minshall, Mortara, Valli, & Probert, 2010). These differences, when they are too strong and numerous, generate a too large cognitive distance between the partners, making them unable to understand each other and to interact; however, a certain level of cognitive distance is necessary to generate mutual learning (Nooteboom, Van Haverbeke, Duysters, Gilsing, & van den Oord, 2007) and make the collaboration a success. Cognitive distance can be defined as "*a difference in domain, range, or mapping. People could have a shared domain but a difference of mapping: two people can make sense of the same phenomena, but do so differently*" (Nooteboom, 2000).

In the interactive process of collaborations, where knowledge is exchanged, social capital is crucial (Nooteboom, 2000). Marvel, Davis, & Sproul (2014) have also highlighted the importance of human capital throughout the entrepreneurial process and claim for more research on the interactive role played by human capital in relationships. Clough, Fang, Vissa, & Wu (2019) claim as for them for theorizing that "*embraces a process perspective that reflects the evolutionary nature of the resource mobilization process*". Moreover, research on collaborative innovation between these asymmetric partners has rarely been undertaken from the startup perspective (Usman & Vanhaverbeke, 2017), and scholars have mostly focused on the financial dimension of collaboration while the relational dimension has been neglected despite its importance (Dyer & Singh, 1998; Hill & Birkinshaw, 2014; Yoon & Hughes, 2016). Although both are necessary and not contradictory to each other (Powell, 1998), this paper focuses on the relational perspective.

In line with these calls, this paper aims to investigate in which way human and social capital -as knowledge-based resources- developed by startup founding teams

influence their capability to collaborate with large firms throughout the innovation collaboration project. Researchers have not tackled this research question yet. The purpose of this study is to contribute to the understanding of the role and nature of knowledge-based resources of startup founding teams in the success of their asymmetric collaborations. The theories of cognitive distance and proximity are used to approach the issue as they represents relevant indicators of both the interaction potential and reality between asymmetric partners involved in innovation projects. The first section presents the theoretical background. The hypotheses and the framework developed from there focus on the competencies developed by teams vs solo startups, on their engagement to large firms and the success level of collaborations, and on the underlying cognitive proximity to this success. The second section details the methodology used for this quantitative research, the third one presents the results obtained, which are then discussed in a fourth section. Finally, conclusions and perspectives for future research are provided.

4.2. Theoretical framework and hypotheses

4.2.1. Human capital, social capital and startup founding teams

Innovative entrepreneurial projects immerse their founders in the process of discovering, evaluating, and exploiting opportunities to develop new products or services (Shane & Venkataraman, 2000). They often start their business from their only available resources -namely from "*who they are, what they know and whom they know"*- to choose the appropriate goals and courses of action possible (Sarasvathy, 2008). The assumption in this paper is that some of these resources based on startup founding teams' knowledge help them building and maintaining their collaboration projects with asymmetric partners such as large firms. Basing on Harper's (2008) definition of entrepreneurial team, the following definition is proposed to designate an innovative entrepreneurial team: *An innovative entrepreneurial team is a group of innovative entrepreneurs with the common goal to make their business grow rapidly which can only be achieved by appropriate combinations of individual*

entrepreneurial skills and actions. Among the knowledge-based resources possessed by startups, human and social capital are crucial for the future decisions and growth -nay survival- of startups. Human capital enables startups capabilities to discover and exploit business opportunities, plan, and access to external resources (Unger, Rauch, Frese, & Rosenbusch, 2011). It enables them also to be attractive to large firms. Indeed, the roots of startup teams' innovation proposals lie in their knowledge combinations. The latter allow them then to demonstrate innovative skills in creating new or improved products, new production methods, new markets, new marketing or sales methods, new channels of distribution (Yan & Yan, 2016). Distinctive innovative skills owned by startups are indeed crucial to be attractive for large firms: innovative technological know-how, creativity and problem-solving skills can offer great assets to large firms to achieve their innovation goal at the early stage of the innovation process (Hogenhuis, Van Den Hende, & Hultink, 2016). Moreover, technology is considered by Doz (1987) as "*the only bargaining strength of the smaller firm*". However, as mentioned by Hogenhuis et al. (2016), project management skills and manufacturing capabilities, needed later in the innovation process and commercialization, are often not mastered by startups.

Following Marvel, Davis, & Sproul (2014, p. 18), human capital consists of three outcomes: knowledge which "*is the possession and understanding of principles, facts, processes, and the interactions among them*" ; skills which "*refer to observable applications or know-how*" and ability which "*is an underlying or enduring characteristic useful to performing a range of tasks.*" These outcomes of human capital relate at the same time to the stock of knowledge (explicit knowledge) possessed by individuals and the use they make of this stock over time through practice, namely tacit knowledge anchored in skills and abilities and developed through repetitive use and exchanges. Existing empirical studies have distinguished generic and specific human capital possessed by founders (Colombo & Grilli, 2005): Generic human capital relates to education level, years of work experience before the startup creation, and to founders' age; specific human capital relates to business experience in the same sector of the startup, of previous self-employment or managerial experiences. In this paper, human capital developed by startup founding teams is viewed under the perspective of theoretical and practical background.

Therefore, it is split in educational background on one side, as manifestation of theoretical learning in the broadest sense, and in professional background on the other side, as the expression of practical learning.

To explore the propensity of startup founding teams to collaborate with a large firm, the following hypotheses related to human capital are stated:

> *H1a: Startup founding teams have a higher level of distinctive innovative skills than solo startup founders do.*
>
> *H1b: Startup founding teams have a complementary educational background.*
>
> *H1c: Startup founding teams have a complementary professional background.*

The human capital embedded in startup teams is a great asset as it provides to these startups competitive advantages (Barney, 1991). Jin, Kraiczy, Kellermanns, Crook, & Xi (2017) found that "*all entrepreneurial team composition characteristics (in terms of education, experience, knowledge, and skills) are positively related to new venture performance but differ in strength of effect. Aggregated entrepreneurial team characteristics have the strongest effect, followed by entrepreneurial team size and heterogeneity of entrepreneurial team characteristics*." To report on the influence of knowledge complementarity on the collaboration capability of startups, this paper considers the nature of knowledge embedded in the team. Given the multifaceted roles of startup members to innovate and make their business grow rapidly at a large scale, it seems also important to investigate whether knowledge available within startup founding teams relates to both entrepreneurial and managerial prior knowledge, in addition to distinctive innovative skills. Indeed, innovative entrepreneurship implies an effectual logic (Sarasvathy, 2008) 'resting on control', and management a causation logic as "*it rests on predication*" (Sarasvathy, 2001). The latter is considered as the most common logic in most firms. This echoes the research work of Cohendet & Llerena (2010, p.45) in the framework of the evolutionary view of the firm and the knowledge-based entrepreneur: "*When the environment is constantly changing, the process of allocation of resources cannot be*

separated from the process of creation of resources. Thus the role of the entrepreneur and the role of the manager also converge in such turbulent cases." One sub-question of this research study is whether there is a link between the existence of the two logics in innovative startup teams and their ability to collaborate with large firms. Hence, it is hypothesized:

> *H1d: Startup founding teams have more management skills than solo startup founders do.*

Collaborating involves also abilities to connect and communicate with networks of actors. Baron & Markman (2000) claim that a high level of social capital is necessary but not enough to interact with external actors. Indeed, specific social skills are determinants for effective interactions, such as "*the ability to read other persons accurately, to make a good first impression on them, and to persuade or influence them*." These social skills allow entrepreneurs to discover opportunities in their environment and to exploit them. Basing on the work of Nahapiet & Ghoshal (1998), Baron & Markman (2000, p. 107) define social capital as "*the actual and potential resources individuals obtain from knowing others, being part of a social network with them, or merely from being known to them and having a good reputation*." Hence, although the collaboration occurring between a startup and a large firm is considered here as a dyadic relationship, it is crucial to consider it also as part of an ecosystem, a network of actors who can have an influence on it, upstream to and during the collaboration project itself. Indeed, "*by channeling information, social networks enable firms to discover new alliance opportunities and can thus influence how often and with whom those firms enter into alliances*" (Gulati, 1998). Thus, the density and frequency of connections to social networks -in the broadest sense- to which startups are connected are taken into account in this study. Hence, it is hypothesized:

> *H1e: Startup founding teams have a higher level of social capital than solo startup founders do.*

4.2.2. Capability to collaborate and collaboration success of startup founding teams

Collaboration is an interactive process between actors focused on a common objective (Wood & Gray, 1991) and "*involves two or more independent companies working together to jointly achieve greater success than can be attained in isolation* (Daugherty et al., 2006, p. 61)." Although the partners are financially and structurally independent, the achievement perspective of their respective strategic objectives through the collaboration -thus beyond the common objective of the collaboration itself- creates an interdependency that pushes them to develop their own capability to collaborate. This collaboration capability can be defined as an "*actor's capability to build and manage network relationships based on mutual trust, communication and commitment*" (Blomqvist & Levy, 2006, p. 31). Some firms have developed a collaboration capability while others have not: "*firms differ [indeed] in their ability to do relational contracting*" (Powell, 1998). Given its importance for startups survival and growth and its evolving character, the capability to collaborate can be considered as a dynamic capability, and consequently as a crucial asset for startups in their development process. Indeed, dynamic capabilities are of critical strategic importance for firms to gain and maintain competitive advantage (Helfat & Peteraf, 2015; Teece, 2007). Helfat et al. (2007, p. 1) define dynamic capabilities as "*the capacity of an organization to purposefully create, extend, and modify its resource base*." This capability requires from firms to be able to exploit their own knowledge and explore new knowledge spaces over time (Lichtenthaler & Lichtenthaler, 2009). Startups focus on "*strategic alliances and precommitments from stakeholders as a way to reduce and/or eliminate uncertainty and to erect entry barriers*", which is a characteristic of the effectual logic (Sarasvathy, 2001) in which startups are involved. Being able to build alliances with large firms and manage these alliances over time can thus be vital for some startups.

Hence, the capability to collaborate is dynamic and therefore evolves over time. This paper integrates this temporal dimension of startup-large firms collaborations, and considers that it embraces two main phases completed by an upstream phase (Bertin, 2019). These phases are presented hereafter from the startup perspective:

- The *upstream phase*: what the startup initially possesses in terms of actionable resources before identifying a potential partner to collaborate with,
- The *design of the collaboration*: from the identification of a potential partner to the engagement of both partners in the common project,
- The *process of collaboration*: the collaboration as such on the common project, with its work routines and interactions, (normally) until the achievement of the common objective.

When partners are asymmetric as is the case for startups and large firms, a too large cognitive distance can be generated by their differences, hindering the design and/or process phases of the collaboration. Hence, it is assumed here that some specific abilities from these partners -developed in the upstream phase- are underlying the collaboration capability to enable their interactions. The propensity of startup founding teams to engage more in collaborations with large firms (*design phase*) and succeed in it more (*process phase*), compared to solo founders of startups, will be investigated. Hence, it is hypothetized:

> *H2: Startup founding teams engage more in collaborations with large firms than solo startup founders do.*
>
> *H3: Startup founding teams engaged in collaborations with large firms succeed more in these collaborations than solo startup founders do.*

Differences between asymmetric partners might constitute obstacles to their collaboration (Hogenhuis et al., 2016; Kohler, 2016; Minshall et al., 2010). Some differences lead to e.g. divergence of views or misunderstandings, and might endanger and hinder the collaboration. Other differences can however be considered as opportunities with regard to the potential complementarity these differences can bring to the partners and that they are initially looking for. Das & He (2006) have identified nine intrinsic differences between startups and large firms, namely: resources, innovativeness, status in competition, legitimacy, history/track record, economic/political power, organizational characteristics, business focus, and

planning horizon. The authors have also retrieved six alliance differences: control over technology, confidence in technology, inter-organizational interfacing, criticality in alliancing, strategic objective, and consistency of commitment. These differences translate into cognitive distance.

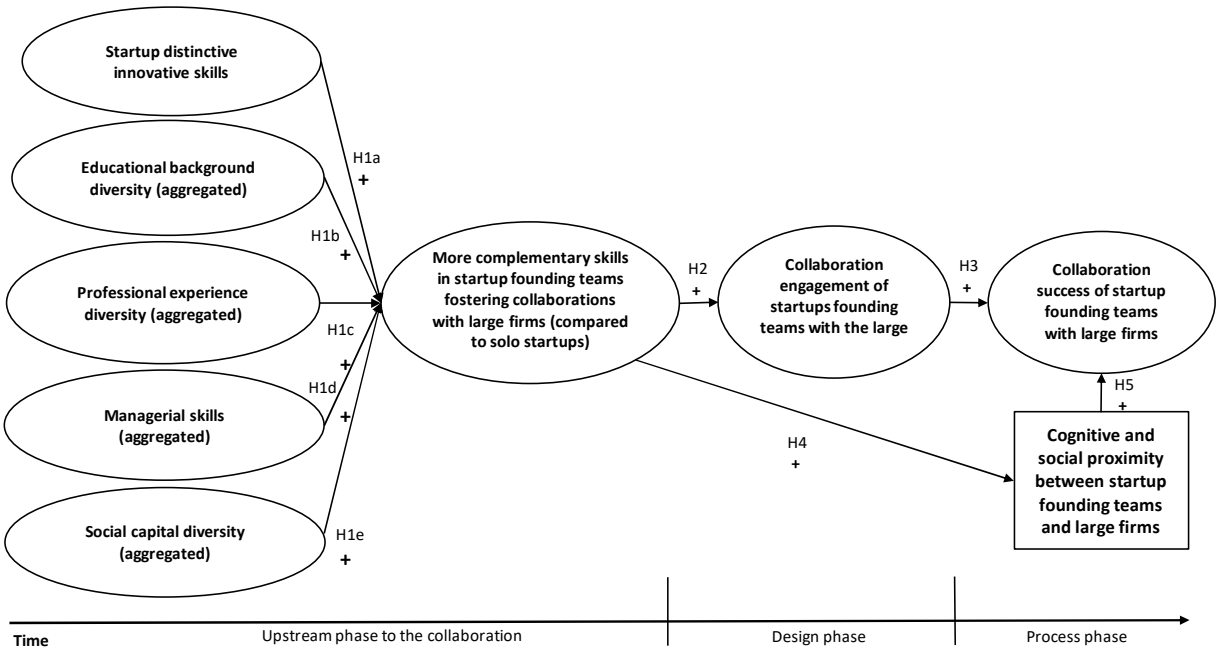
Cognitive distance is on one hand necessary to collaborate in the sense that some differences are prone to enhance the collaboration learnings -which are the "*mathematical product of novelty value and understandability"* (Nooteboom, 2004)- between startups and large firms throughout the whole process. On the other hand, other types of differences hinder the collaboration if the partners do not achieve to overcome the cognitive distance induced by these differences. The stakeholders have thus to manage this cognitive distance originating from differences in order to be able to interact and collaborate. Nooteboom (2000, p. 73) points out that "*there is a difference between reducing cognitive distance and bridging it. Bridging cognitive distance is communication*". It is assumed in this paper that specific underlying abilities of collaboration capability allow startups to reduce *and* bridge cognitive distance. These abilities reflect the propensity of startups to interact, and originate from their knowledge-based resources, as the latter are often the only resources of startups. In order to measure the propensity of startup founding teams in comparison to solo founders to interact smoothly with large firms and succeed, the theory of proximity is used here, especially cognitive and social forms of proximity. Scholars (Boschma, 2005; Molina-Morales, García-Villaverde, & Parra-Requena, 2014; Nooteboom, 2004; Torre & Wallet, 2014) have indeed already shown their crucial role in quality of interactions. Therefore, it is hypothetized:

H4: There is a relationship between skills present in startup founding teams and cognitive and social proximity to large firms

H5: Collaborations success is fostered by cognitive and social proximity between startup founding teams and large firms.

The following conceptual framework results from the theoretical background previously presented and the hypotheses drawn:

Figure 10 - Conceptual Framework



4.3. Methodology

4.3.1. Sample

The startup founders were selected according to their technology-based innovation, their innovation flow direction, and their geographical situation. Indeed, all startups were technology-based, had the same innovation flow, and were situated in the so-called *Greater Region* in Europe. The fact that these startups belonged to the same ecosystem and evolved in a similar environment avoided biases due to potential contingency factors originating from major differences in their environment. The selected startups had one or several founders. Indeed, solo entrepreneurs were included in the sample; they constituted the control group. All startups had either one first collaboration experience with a large firm or none, and were financially and organizationally independent toward the latter. The direction of innovation flow was

the same for all startups, namely inside-out from the startup perspective (Weiblen & Chesbrough, 2015), meaning that the startup proposes an innovative solution to the large firm.

The sample consists of 31 workable responses to the survey. Startups represented in the sample are for 29% (9) of them led by single founders, and for 71% (22) by a team of founders (2; 3 or 5 people). The mean of the founders' age is 36, the minimum age being 24 years old and the maximum 54. Most startups of the sample are evolving in services (94%, namely 29) and only two (6%) in industries. They operate in various business areas, such as software development, artificial intelligence, machine learning, cyber-security, satellite communication, bio-informatics, data management, app quality management, Edtech, natural resources exploration, plastics processing, design in the medico-social field, real estate, recruitment, green energy management, human resources, well-being at work, food, and tourism.

Not all responding startups had a first collaboration (or attempt) with a large firm: 19% (6) had none and 81% (25) had at least one first collaboration with a large firm. Among these 25 startups, 56% (14) declared the collaboration's nature was a business deal (customer-supplier relationship) and 44% (11) an R&D alliance (solution co-development). The origin of the first collaboration was very varied. However, "personal network" of founders appeared as the most frequent response (60%). The diversity of third-party support was also noticeable; the most frequent responses (one or several possible per startup) were incubator for 58% of startups, accelerator for 28%, expert in intellectual property rights for 28%, and business incubator for 17%. In addition, 48% of startups declared they had shared a working space.

4.3.2. Reliability and validity

In order to ensure reliability and validity of the dataset, several means were put in place. First, before administering the questionnaire to the targeted sample to collect the data, a pilot test was undertaken to validate the right understanding of the survey

questions by the targeted startuppers. Unclear questions were reformulated and immediately resubmitted to ensure their proper understanding by respondents. As online data collection proved difficult because the online questionnaire was rarely fully completed, face-to-face meetings were organized. They allowed to collect entirely completed questionnaires, what was a very good mean to gather high quality, reliable data. Another mean to ensure reliability and validity of the dataset was the design of the measures (see next section).

4.3.3.Measures

The variables measured were identified from the theoretical framework previously presented (see Figure 1). The variables were: distinctive innovative skills of startup, human capital in startup founding teams (educational background and professional experience), management know-how, social capital in startup founding teams, the collaboration success with large firms, and the cognitive and social proximity between startups and large firms. To measure the various items, a quantitative method was used. The questionnaire form that was designed to collect the data contained mostly closed questions, e.g. dichotomous questions or 7-point Likert scales. Only some questions remained open in order to precise insights regarding specific topics. As mentioned in the previous point, the survey was firstly administered as a pilot test to founders of startups to review and validate the questionnaire. This test was done in face-to-face mode to gather additional useful comments from the founders and directly discuss possible misunderstandings or questionings. The survey was revised following this pilot test to be finally administered to a panel of startups founding members among whom respondents had been selected for their strong linking role (communication, negotiation, etc.) between the startup and the large firm.

The measurement of the items of variables are presented in Table below. The way the measures were constructed is explained hereafter.

Table 15 - Measurement model

Variable	Item	Measurement item
Distinctive innovative skills	Technology, Creativity, Problem-solving	Among the main skills usually necessary to the development of an innovation project, what do you think is the degree of expertise of your startup in the following elements? (Creativity, technological know-how, problem-solving, project management, manufacturing) – 7-point Likert scale
Aggregated educational background	Degree level	What is the level of education (highest degree obtained) of the founding members? – Scale from none to Doctorate: None (Self-taught), BEP or CAP, A-Level, Bac+2 (BTS, DUT, DEUG, etc.), Bac+3 (Bachelor), Bac+4 (Master Year1), Bac+5 (Master2, MBA, etc.), Doctorate
	Degree field(s)	What disciplines do these degrees cover (Engineering, Life Sciences, Management, Arts, Other)? - Several possible answers
	Entrepreneurial education	During your initial training course, did you (or other founding members) have any specific courses on entrepreneurship? – Yes/no

		How many hours did these courses represent? – Ranges from 1 to over 200 hours
Aggregated professional experience	Prior professional experience as an entrepreneur	How many startups have you created so far? How long have you (and the other founding members) been an entrepreneur? - Scale from less than one year to more than 10 years
	Prior professional experience with large firms	In which type(s) of company have you worked so far? Very small businesses (<10 employees), SMEs (10 to 249 employees), mid-cap firms (250 to 4999 employees), large firm(s) (>5000 employees) For how long (cumulative experience, expressed in years) have you worked in one or more large firms? - Scale from less than one year to more than 7 years
	Variety of jobs and functions	How many different jobs have you (and the other founding members) held so far? What function(s) have you (and the other founding members) held so far? MCQ composed of socio-professional categories

	Variety of industries	In which industry sector(s) have you (and the other founding members) worked so far?
	Know-how in management	What are the skills of your startup's management team? (several possible answers) – Technology, management, marketing, finance
Aggregated social capital	Involvement in networks (variety and quantity)	If you are present on social networks (LinkedIn, Viadeo, etc.), how many contacts do you have in total (about)? Do you have any entrepreneurs or business leaders in your immediate surroundings? - Several possible answers: Classmates, Friends, Family, Former colleagues
	Contact frequency with networks	How often does your startup interact with other startups (at various events or more informally)? - Scale from never to more than once a week
	Prior support from an incubator, accelerator or other experts / Nature of networks	Have you been accompanied by third parties in your startup project? - Several possible answers: Yes/No If so, in what context? - Several possible answers: Incubator, Accelerator, Shared workspace, Business incubator, Competitiveness cluster, Intellectual

		Property Expert, Other
Cognitive (CP) and social proximity (SP) to large firms when collaborating for the first time	Watch (shared values) (CP)	We carried out a watch on the large firm before collaborating with it – 7-point Likert scale
	Shared culture (CP)	We understood each other very easily – 7-point Likert scale
	Common road map (CP)	We had established a common roadmap – 7-point Likert scale
	Common objectives (presence of a need from the start) (CP)	The need of the large firm was clearly defined – 7-point Likert scale
	Closeness of technological knowledge (CP)	We had close technological knowledge – 7-point Likert scale
	Empathy (level of cognitive adaptation) (CP)	During the collaboration my startup adapted to the reality of the large firm, showing a certain empathy – 7-point Likert scale
	Informal exchanges (frequency) (SP)	Our interactions were done in face-to-face mode most of the time – 7-point Likert scale
	Strength of social ties (SP)	We had strong social ties, nay friendly to one or several people from the large firm – 7-point Likert scale
Collaboration or	Existence of at least a	Did you ever collaborate or attempt

attempt of collaboration with a large firm	first collaboration	to collaborate with a large firm? Yes/No
Collaboration success with the large firm (first collaboration)	Collaboration outcome (commercialization and/or implementation success and/or gain of technological maturity)	Would you say this first collaboration or attempt of collaboration was a success? – 5-point Likert scale from "not at all" to "completely" Why? – Open question

Description of the variables

The term 'aggregated' related to the variables described hereafter means that the data related to startup founders were cumulated.

Distinctive innovative skills

Startups' distinctive innovative skills are crucial to make startups attractive to large firms, and possibly provoke an engagement from both stakeholders. The perception of startups' innovative skills was measured through 7-point Likert scales.

Aggregated educational background

Educational background of startup team members was measured through three observed variables, namely: degree level, degree field(s), and prior entrepreneurial education. The latter has the purpose to go beyond 'classical' fields that were identified through the degree field, and investigate the contribution level of entrepreneurial education to startup-large firm collaboration outcomes.

Aggregated professional experience

Prior professional experience of startup founders, combined to their educational background is linked to startups competitive advantage because of the distinctive capabilities it provides them (Colombo & Grilli, 2005). Four observed variables were

measured, namely prior professional experience as an entrepreneur, prior professional experience with large firms, variety of jobs and functions occupied, and variety of industries known (by the experience).

Know-how in management

Know-how in management is specifically explored to shed light on the potential importance of this factor in startup – large firm collaborations.

Aggregated social capital

The involvement in networks (nature, variety and quantity) and the contact frequency with networks were measured, including those developed thanks to third parties such as incubators, accelerators, and experts.

First collaboration or attempt of collaboration with a large firm

The choice was made for this study to focus on first collaborations, so that startups can provide insights regarding their experience at a same, comparative level.

Collaboration success with the large firm

It is understood that a so-called successful collaboration means that the stakeholders managed to interact throughout the phases of the collaboration project, namely the design of the collaboration and the collaboration process. The success of collaborations is considered as an evidence for the capability to collaborate. This success was measured both quantitatively and qualitatively in terms of outcomes (see Table 4).

Cognitive and social proximity between startups and large firms

Cognitive and social forms of proximity are considered as underlying to the collaboration success in the framework developed (see Figure 1). The level of cognitive and social proximity between a startup and a large firm engaged in a collaboration project is measured through the six following items: Watch (search for shared values), shared culture (mutual understanding), common road map, common

objectives (presence of a need from the start), closeness of technological knowledge, empathy (cognitive adaptation), informal exchanges frequancy, and strength of social ties. These items base on a research work on startup-large firm collaborations founded on the theory of proximity and identified as fostering the collaboration success (Bertin, 2019).

The level of closeness of technological knowledge is of importance in collaborations between startups and large firms. If the proximity level is too high, the partners will not learn much from the collaboration and there will be no 'novelty value of the interaction' (Nooteboom et al., 2007). And if it is too low, they will not be able to understand each other and connect their respective knowledge.

The level of mutual understanding is central as it allows partners to interact and collaborate on projects. Its measure is based on the fact that startups did a watch or not on the large firm upstream to a potential collaboration, on the fact that a common roadmap has been drawn or not from the start of the collaboration project (design phase), and on the perception of startups of this mutual understanding (during or downstream to the collaboration). The presence of a need from the start on the large firm side is considered as an accelerator of collaboration that materializes common objectives and thus mutual understanding.

The level of cognitive adaptation is linked to the potential of startups to adapt cognitively to the large firms' reality and constraints although they are not necessarily the same as theirs.

The level of face-to-face interactions and *the strength of social ties* report if interpersonal relationships to the large firm are maintained during the collaboration. Informal exchanges throughout the project are considered as crucial in the collaboration sustainability.

4.3.4. Data analysis

Data collection was undertaken means a survey that was designed with Sphinx software so that data could be retrieved under a flexible format for the treatment and analysis means SPSS. The dataset was thus integrated and coded in SPSS software. Data analysis method and tests were chosen considering the sample size. Firstly contingency tables were performed to allow the observation and comparison of data for both groups investigated, namely startup founding teams and startup solo founders. Visuals were used to present data. Indeed, box-plots (2 x 2 and 2 x 3) were provided in the results part as they are very explicit and highly informative on both groups' behavior and on the relationships' tendency and direction (positive vs negative). Then, in order to confirm the significance level of the results based on contingency tables, the Fisher's Exact Test (2-sided) was performed. This test is particularly well adapted for small samples. A table (Table 16) summing up the values for this Fisher's Exact Test (FET) for the variables explored is provided at the beginning of each hypothesis presentation and uses the following codification:

Table 16 - Significance levels of the Fisher's Exact Test

Strength of significance	Level	Sign
Strong significant association	≤ 0,05	***
Moderate significant association	≤ 0,10	**
Slight significant association	≤ 0,15	*

The usual levels of significance (of 0.001 and 0.05) were raised and extended (from 0.001 to 0.15), given the small sample size and of the exploratory nature of this study. For some cases and when appropriate, a bivariate correlation matrix was used to go further in the analysis of relationships. The whole data analysis process was performed with SPSS software. Conclusions on hypotheses' validation or rejection were drawn at the end of this analysis process.

4.4. Results

4.4.1. Distinctive innovative skills (H1a)

H1a: Startup founding teams have a higher level of distinctive innovative skills than solo startup founders do.

Table 17 - Fisher's Exact Test related to variables of H1a

Variable X Team vs Solo founders	FET
Technology level	0,267
Creativity level	0,253
Problem-solving level	0,664

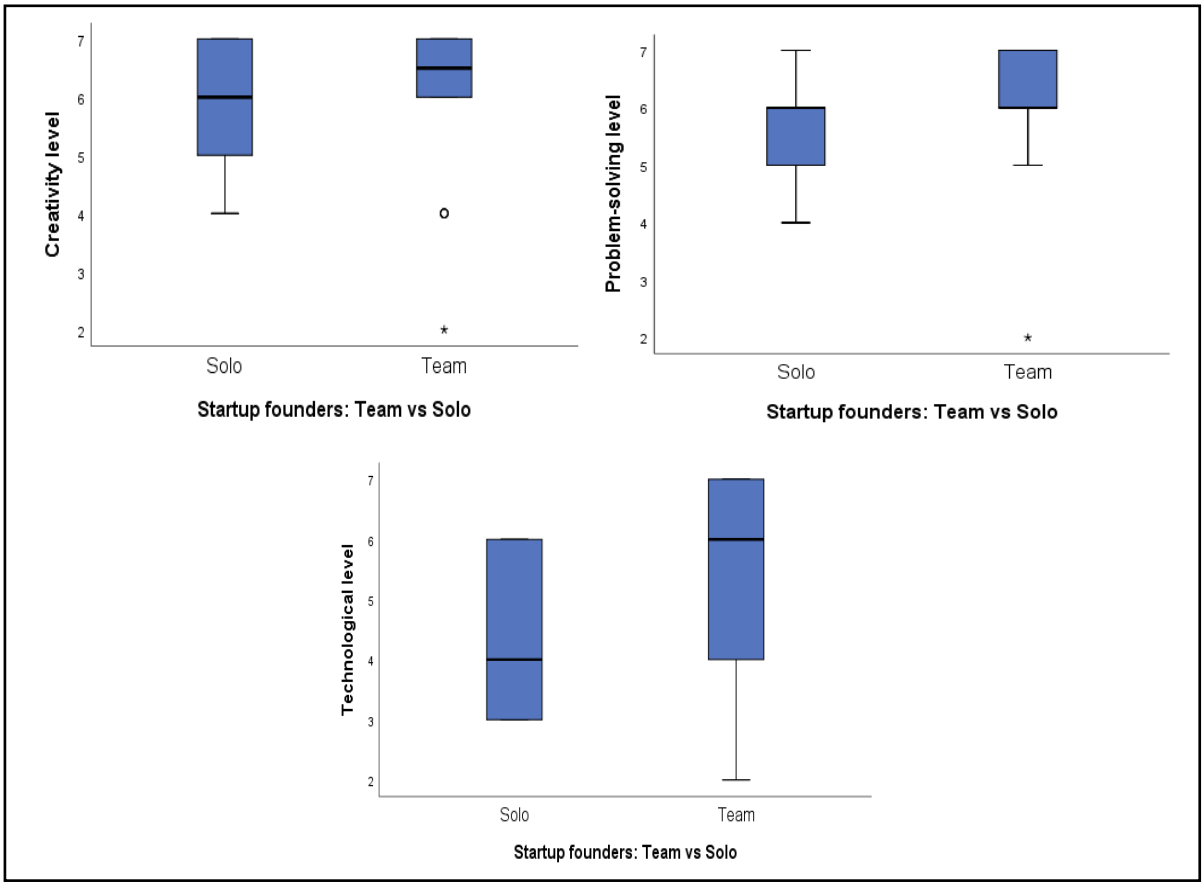


Figure 11 - Startups' distinctive innovative skills

Based on a dataset consisting of 31 cases, the level of distinctive innovative skills appears higher in founding teams than in solo startups (see Figure 11).
This is valid for creativity as well as for problem-solving and technological knowledge. Indeed, box-plots indicate a higher median values in teams than in solos. Data also indicate a higher level of creativity in teams (81,8% ≥ 6) than in solos (66,7% ≥ 6). The same occurs for problem-solving (77,3% ≥ 6 in teams, and 66,7% ≥ 6 in solos) and technological level (54,5% ≥ 6 in teams and 33,3% ≥ 6 in solos).
However, the FET shows no significant association.

H1a is thus not validated, the level of the distinctive innovative skills explored being not higher in startup founding teams than the one of solo founders.

4.4.2. Educational background (H1b)

H1b: Startup founding teams have a complementary educational background.

Table 18 - Fisher's Exact Test related to variables of H1b

Variable X Team vs Solo founders	FET
Degree level	0,099**
Fields of education (Engineering)	0,019**
Diversity of fields known	0,002***
Training in entrepreneurship	0,106*

The overall educational background appears higher in founding teams than in solo startups (see Figure 12).

Degree level: Concerning the *degree level*, both groups have degrees of high level. However, data show that teams do have higher degree level (95,5% ≥ 3) compared to solos (66,7% ≥ 3).

Fields of education: Concerning *engineering* as the degree field, the box-plot indicates that it is much more present in teams than in solos. Furthermore, 81,8% of teams and only 33,3% of solos count one founder (or more for teams) with a degree in engineering. There is also the evidence of a very strong significant positive correlation between the variables Startup founders: Team vs solo and Engineering (r=0,536; p=0,002). The strong significant association is confirmed by the FET. There is no significant association for *management*, *life sciences* or *arts* as degree fields.

Diversity of fields known: The median of the box-plot related to *the number of fields known within the startups* (among engineering, life sciences, management and arts) shows a significant difference between solos and teams. All solo startups know a single field as 68,1% of startup teams know two or three fields and 31,8% of them a single field. Given the strong significance shown by the FET regarding the number of fields known, team startups can be considered as more complementary than solo startups.

Training in entrepreneurship: *In terms of training in entrepreneurship,* startup founding teams also have a propensity to be more trained in comparison to solo startups: 54,5% of teams (at least one founder) have taken entrepreneurship training whereas only 22,2% of the solos have done so. The correlation between both variables is as follows: r=0,295; p=0,107. Concerning the *duration of training in entrepreneurship*, founders in teams have taken longer courses: 22,7% in teams have taken training of 50 to 200 hours as no solo startup is represented in this modality. Shorter trainings, namely between 1 and 50 hours, were followed by 22,2% of solo startup founders and 31,8% of startup team founders (at least one of them). However, the FET shows no significant association.

H1b is thus validated, the educational background explored being complementary in startup founding teams.

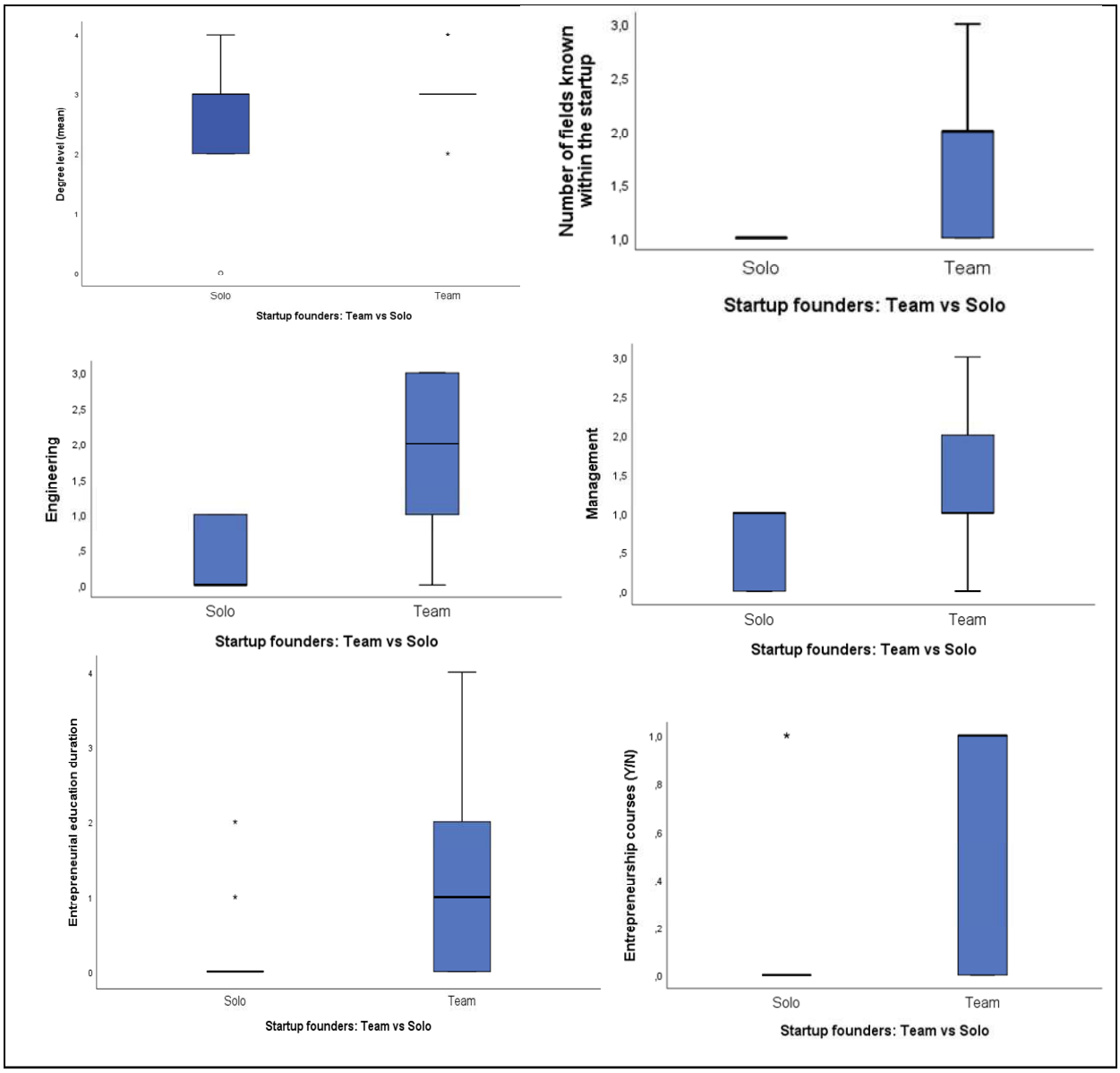


Figure 12 - Startups' educational background

4.4.3. Professional background (H1c)

H1c: Startup founding teams have a complementary professional background.

Table 19 - Fisher's Exact Test related to variables of H1c

Variable X Team vs Solo founders	FET
Previous experience in large firms	0,016***
Duration of previous professional experience in large firms	0,039***
Number of functions held previously by founders	0,069**
Number of firms where the founders worked	0,002***

The overall professional background appears higher in founding teams than in solo startups (see Figure 13).

Concerning the experience as entrepreneur(s) (mean in years) the box-plot indicates that startup team founders have more experience. No solo startup founder has more than 3 years of experience as entrepreneurs whereas 36,1% of founders in team startup do. However, the FET indicates no significant relationship. The number of jobs held previously by founders tends to be higher among solo than teams: 77,7% of solos held 3 or more jobs previously to the creation of their own startup than startup teams did (58,8%). However, the FET indicates no significant relationship. Regarding previous experience in large firms, solo founders had almost all (88,9%) previous experience in at least one large firm, whereas 68,2% of founders of startup teams did. The FET confirms a strong significant relationship. Concerning the duration of founders' previous professional experience in large firms the box-plot indicates that it is much higher among solo startups. Indeed, 88,8% of solo founders worked more than 3 years in a large firm whereas 40,7% of founders of team startups did. The FET shows a strong significance of association.

Concerning the number of functions held previously by founders startup teams are overrepresented: 77,3% of them held 3 or more functions in the past as solo

founders did not at all (0% ≥ 3 and 100% ≤ 2). and the correlation matrix shows a moderate significant positive relationship: r=0,346; p=0,057. The FET indicates a moderate significant association. Considering now the number of firms where the founders worked previously, it is noticeable that founders of startup teams' experience of firms is more diverse than the one of solos: All solo founders have worked in 1 or 2 firms whereas founders of startup team have worked for 81,7% of them in 3 firms or more. There is also an evidence of a very strong positive relationship (r=0,565; p=0,001). The FET confirms a strong significance of association. The number of industries where founders worked is also higher for startup teams compared to solo startups: 50% of founders of startup teams worked in more than 2 industries (3 to 6 max.) whereas 22,2% solo founders did (3 to 4 max.). It might be an expected effect related to the previous variable: the number of firms where founders worked. However, the FET indicates no significant relationship.

Concerning the number of startups created so far, there is no noticeable difference between startup teams and solo startups: 22,2% of solos and 31,8% of teams have created 2 or 3 startups so far. No relationship could be seen through the FET.

H1c is thus validated, the professional background explored being complementary in startup founding teams.

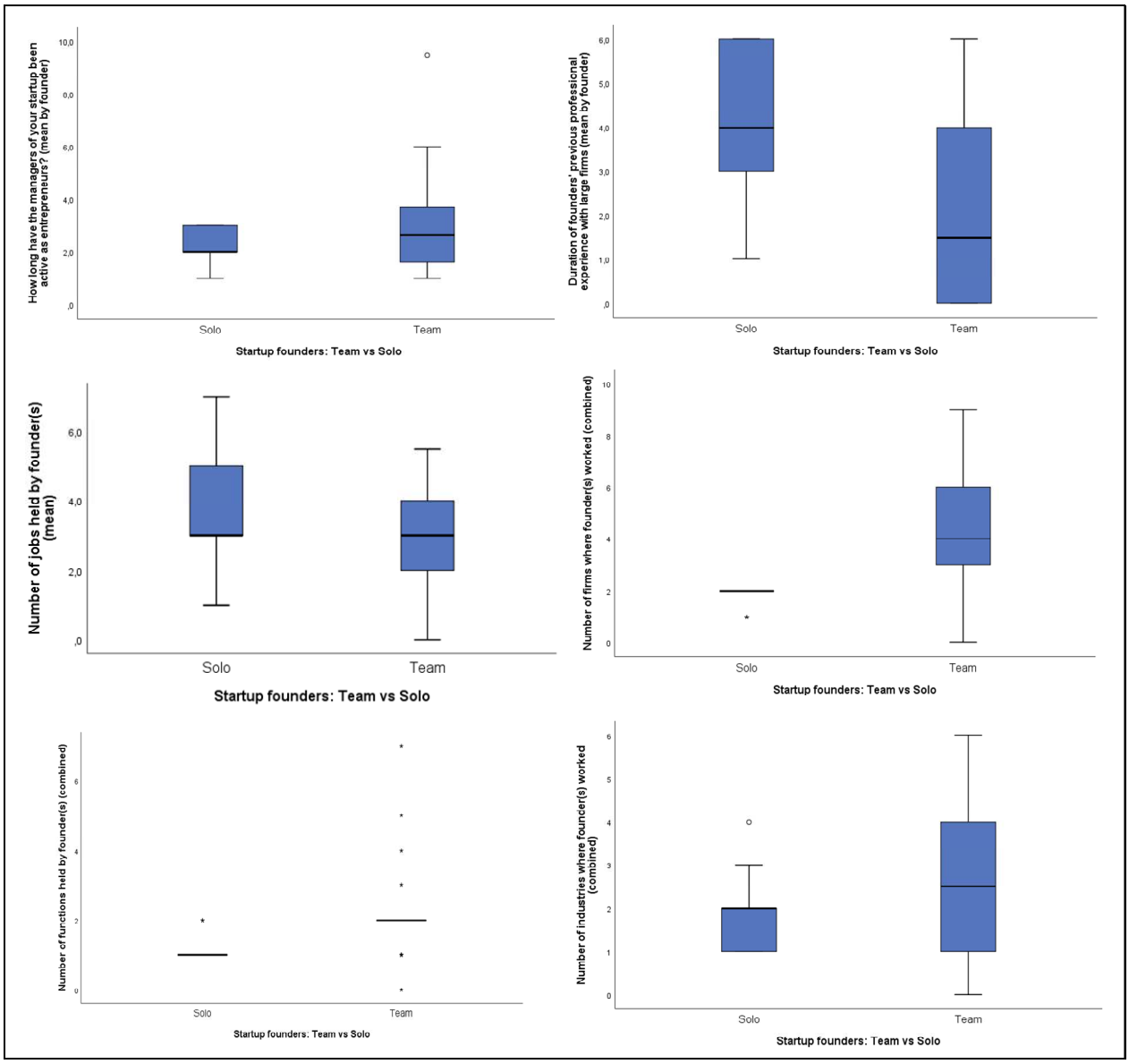


Figure 13 - Startups' professional background

4.4.4. Management skills (H1d)

H1d: Startup founding teams have more management skills than solo startup founders do.

Table 20 - Fisher's Exact Test related to variables of H1d

Variable X Team vs Solo founders	FET
Know-how in management	0,010***
Know-how in technology	0,013***
Know-how in finance	0,085**

This box-plot (see Figure 14) shows that teams have more often founders with management skills than solos: 55,6% solo founders have management know-how whereas 95,5% of startup teams do (concerns 1 or several founders). There is also an evidence of a very strong significant positive correlation (r=0,560; p=0,001). The FET confirms a strong significance.

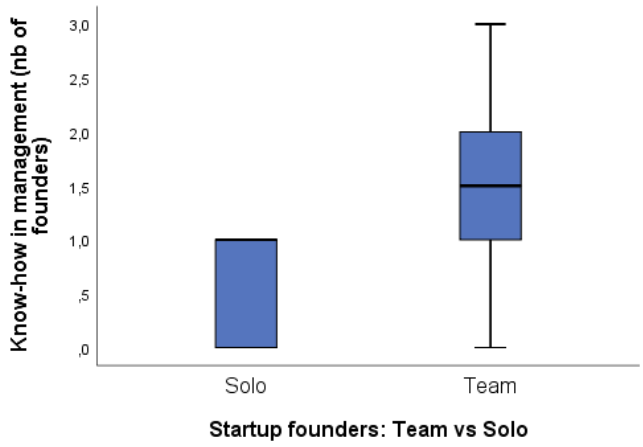


Figure 14 - Startups' management skills

It is also noticeable that the FET shows a strong significant relationship between startup founding teams and know-how in technology, and a moderate one between startup founding teams and know-how in finance. No significant relationship could be found concerning know-how in marketing or in design.

H1d is thus validated, startup founding teams having more management skills than in solo founders' startups.

4.4.5. Social capital (H1e)

H1e: Startup founding teams have a higher level of social capital than solo startup founders do.

Table 21 - Fisher's Exact Test related to variables of H1e

Variable X Team vs Solo founders	FET
Support from an incubator	0,106*
Support from incubator X shared working space	0,048***
Competitive cluster X Expert in IPR	0,077**
Entrepreneurs in close circle (classmates)	0,018***

Prior support from an incubator, an accelerator or other experts

Among the startups investigated, 90,9% of startup teams and 88,9% of solo startups benefited from one or several prior support.

Among the diverse supports they received, startup founders cited: incubator, accelerator, business incubator, shared working space, competitive cluster, LornTech Association, expert in Intellectual Property Rights, mentor, coaching after contest, networks for entrepreneurs and innovation, public authorities, SATT, expert in seed capital raising or bank, University, consultants, family, accountant expert, development.

Solo startups were more accompanied by incubators (77,8%) than startup teams (45,5%), which is confirmed by the FET. In contrast, startup teams were more accompanied by accelerators (31,8%) than solo startups (11,1%). However, the significance of a relationship could not be shown by the FET.

Several of the diverse supports received by startups and cited above show evidence of significant strong positive correlation with each other. This is mostly due to the fact that some services are offered by the main accompanying structure, e.g. incubator or

accelerator. For example, incubator and shared working space are correlated (r=0,433; p=0,015), with a strong significant relationship for teams following the FET. There is also a correlation between competitive cluster and expert in IPR (r=0,543; p=0,002) with a moderate significant relationship for teams following the FET. All these correlations are a reflection of the interactions occurring among startups' supporting actors. This gives also rise to a greater potential actors' network for startups.

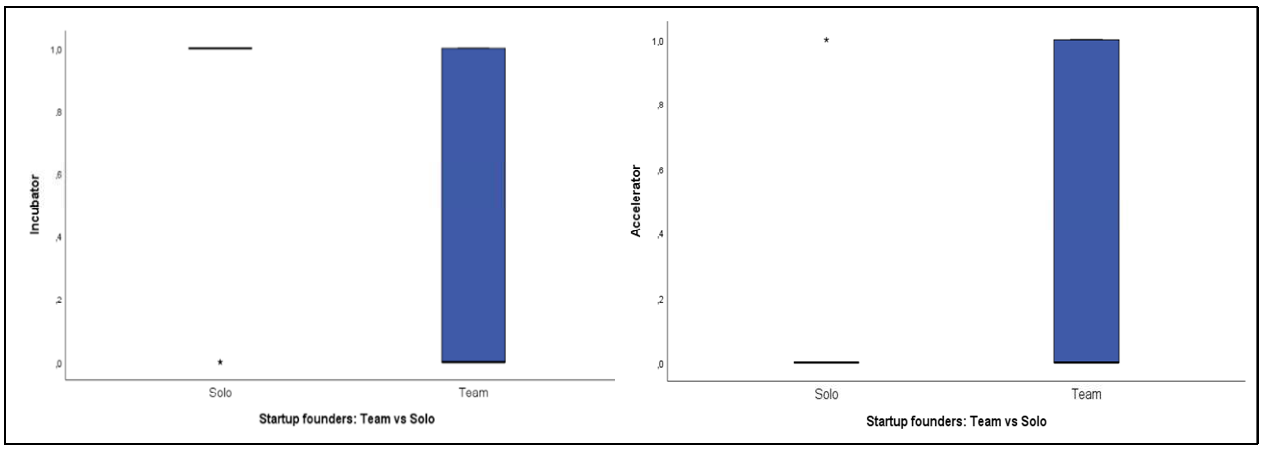


Figure 15 - Startups' third-party support

Involvement of startups in networks

Entrepreneurs in founders' close circle

The startup teams founders surveyed (one per team) tend to have more entrepreneurs in their own close social circle (classmates, former colleagues, and friends) than solo founders, who in contrast tend to have more entrepreneurs in their family that startup teams founders do (see Figure 16). These results might be attributed to a higher level of socialization or interactions with others from startup team founders.

Founders of startup teams have more often classmates who are entrepreneurs (59,1%) than solo founders (11,1%). The FET shows a strong exact significance.

Although data indicates that founders of startup teams tend to have more often former colleagues who are entrepreneurs (40,9%) than solo founders (22,2%), that they tend to have a bit more often friends who are entrepreneurs (72,7%) than solo founders (66,7%), the FET indicated no significant relationship regarding these variables.

In contrast, solo startup tend to have more often family members who are entrepreneurs (77,8%) than founders of startup teams (54,5%), but the FET shows no exact significance.

In addition to these results, it is noticeable that 68,2% of startup team founders have more than one entrepreneur in their entire close circle whereas 55,5% of solo founders do so.

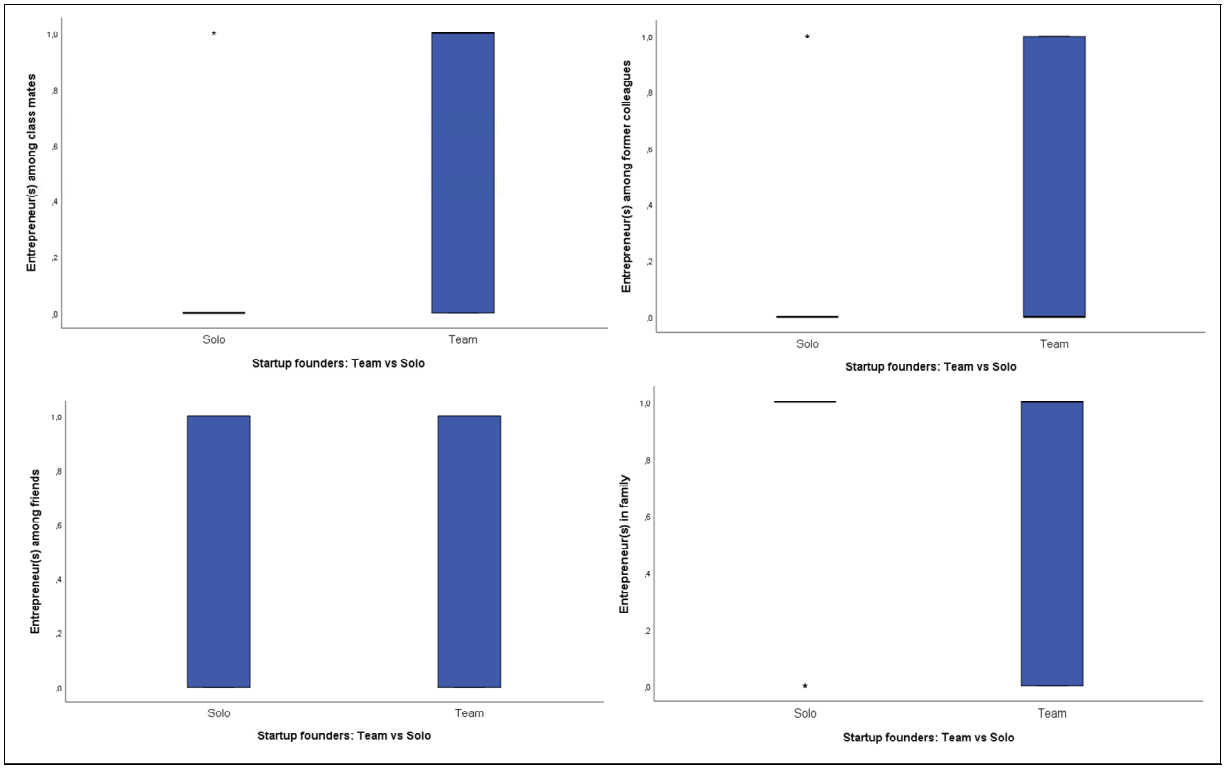


Figure 16 - Entrepreneurs in founders' close circle

Involvement in social networks: stock and activation

Startup team founders tend to have a larger social network than solo startups, although the latter activate their close relations more frequently (see Figure 17).

Startup team founders have higher "stock of contacts" on social networks: 40,8% have more than 2000 contacts as only 22,2% of solo founders do. However, the FET shows no significance.

Regarding activation of networks, solo founders interact more frequently (88,9% of them) with other startups than startup team founders (68,2% of them) do. However, the FET shows no significance. This result might be due to the propensity of solo founders to integrate incubators, where they can thus interact easily with other startuppers.

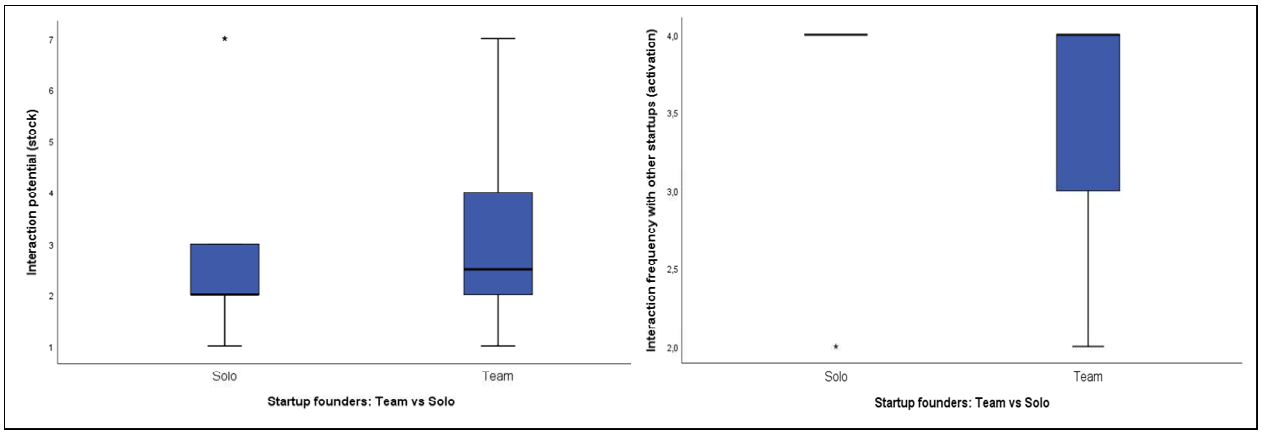


Figure 17 - Startups founders and social networks: stock and activation

H1e is thus validated, the social capital being essentially higher among startup teams' founders than the one of solo startups' founders is.

4.4.6. Engagement in collaborations with large firms (H2)

H2: Startup founding teams engage more in collaborations with large firms than solo startup founders do.

Table 22 - Fisher's Exact Test related to variables of H2

Variable X Team vs Solo founders	FET
Collaboration (or attempt) with a large firm	0,043***

Based on a dataset consisting of 31 cases, data (see Figure 18) indicates that startup teams collaborate (or attempt to) with a large firm more often (90,9%) than solo startups (55,6%). The FET (Table 22) shows a strong exact significance. The correlation matrix shows also the evidence of a strong significant positive relationship between both variables (r=0,406; p=0,023).

Have you ever collaborated with a large firm (or attempted to)? * Startup founders: Team vs Solo Crosstabulation

			Startup founders: Team vs Solo		
			Solo	Team	Total
Have you ever collaborated with a large firm?	No	Count	4	2	6
		% within Startup founders: Team vs Solo	44,4%	9,1%	19,4%
	Yes	Count	5	20	25
		% within Startup founders: Team vs Solo	55,6%	90,9%	80,6%
Total		Count	9	22	31
		% within Startup founders: Team vs Solo	100,0%	100,0%	100,0%

Figure 18 - Cross-table Collaboration with a large firm*Team vs solo startup

H2 is thus validated, startup founding teams engaging in collaborations with large firms more than solo founders' startups do.

4.4.7. Engagement in collaborations and success (H3)

H3: Startup founding teams engaged in collaborations with large firms succeed more in these collaborations than solo startup founders do.

Table 23 - Fisher's Exact Test related to variables of H3

Variable X Team vs Solo founders	FET
First collaboration with a large firm X Success level of collaboration	0,433

Based on a dataset consisting of 25 cases of startups having once collaborated (or attempt to do so) with a large firm, data indicate that solo startups tend to succeed more (60%) than teams (55,5%) when collaborating with a large firm. Furthermore, 20% of solo startup collaborations failed as 35% of startup teams collaborations did. The box-plot confirms these results. However, the FET (Table 23) shows no significant relationship.

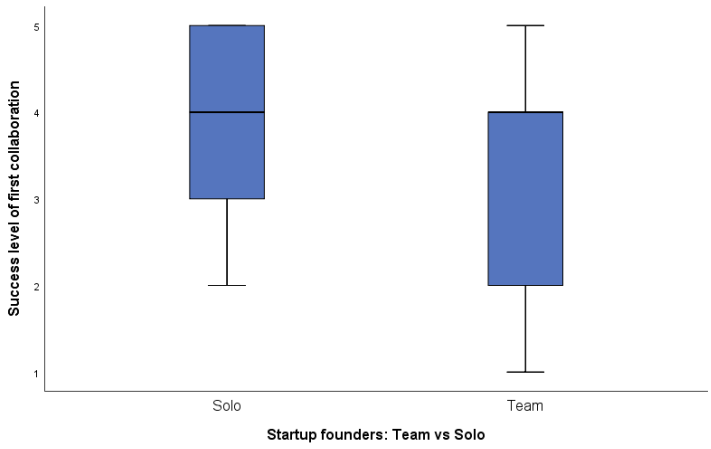


Figure 19 - Startups founders and collaboration success

Thus, being a startup founding team engaging more in collaborations does not seem to be linked to the success of these collaborations.

H3 is thus not validated, startup founding teams engaging in collaborations with large firms succeeding no more than solo founders' startups.

4.4.8. Team skills and cognitive and social proximity to large firms (H4)

H4: There is a relationship between skills present in startup founding teams and cognitive and social proximity to large firms

Table 24 - Fisher's Exact Test related to variables of H4

Variable X Team vs Solo founders	FET (teams only)
Cognitive and social proximity to the large firm X Duration of entrepreneuship courses	0,040***
Cognitive and social proximity to the large firm X Technological level as distinctive innovative skill	0,047***
Cognitive and social proximity to the large firm X Number of industries where founders worked previously	0,047***
Cognitive and social proximity to the large firm X Number of close circle categories with entrepreneurs	0,048***
Cognitive and social proximity to the large firm X "Stock" of contacts on social networks	0,103*
Cognitive and social proximity to the large firm X Support from an accelerator	0,084**

The Fisher's Exact Test was performed between the variables explored related to startup founding teams' human and social capital and the cognitive and social proximity level to the large firm (mean). The results show significant relationships regarding the following variables:

- The duration of entrepreneurship courses
- The technological level as distinctive innovative skill
- The number of industries where the founders worked previously
- The number of close circle categories with entrepreneurs

All these relationships are positive as the box-plots below show it.

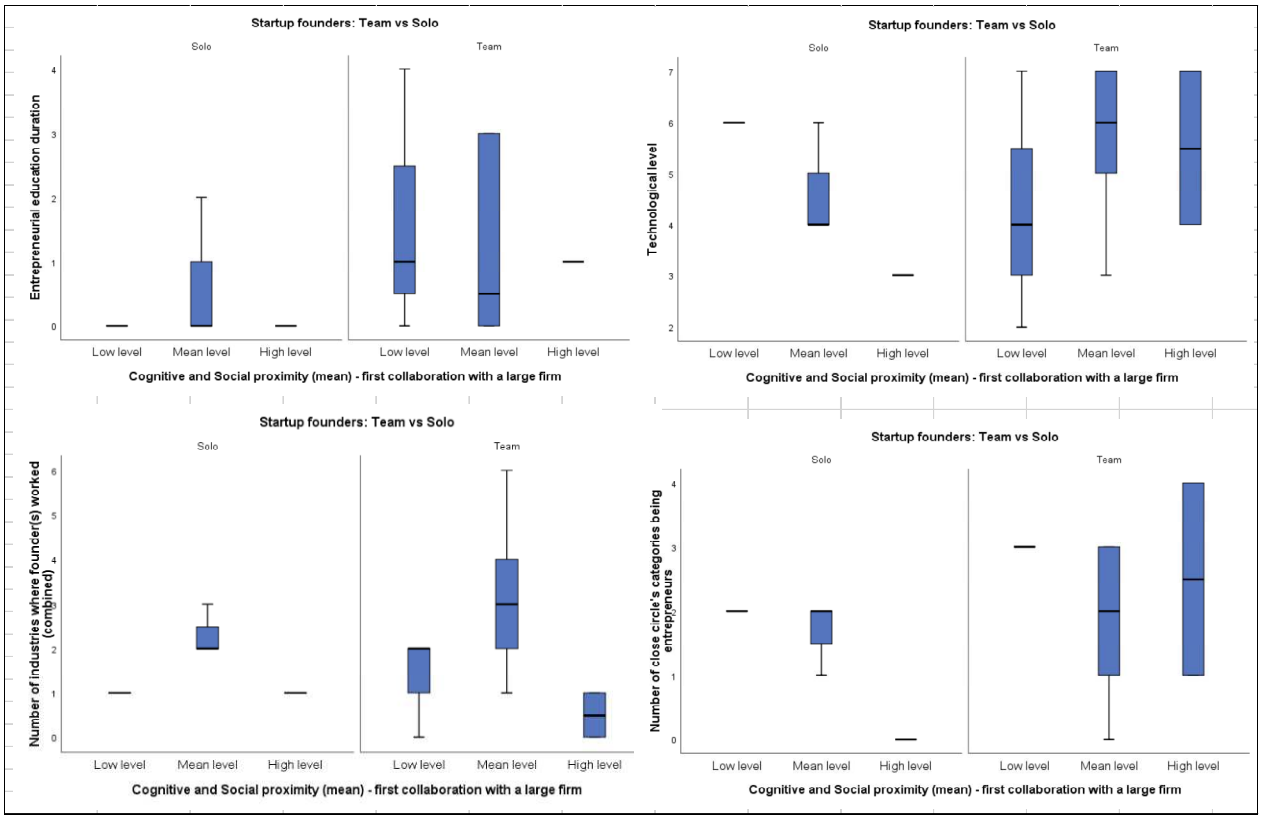


Figure 20 - Significant relationships between skills in teams and proximity to large firms

A slight significant relationship also exists for the following variable:

- The interaction potential ("stock" of contacts)

Such significant relationships could not be found for solo startups.

Although this variable does not pertain to startup teams skills, it is worth to notice that accelerator is also slightly significantly related to cognitive and social proximity level: p=0,084 for teams.

H4 is thus validated, cognitive and social proximity to large firms being significantly related to several skills of startup founding teams.

4.4.9. Collaboration success and cognitive and social proximity (H5)

H5: Collaborations success is fostered by cognitive and social proximity between startup founding teams and large firms.

Table 25 - Fisher's Exact Test related to variables of H5

Variable X Team vs Solo founders	FET
Collaboration success level X Cognitive proximity: Empathy	0,119*
Collaboration success level X Social proximity: Social ties	0,133*

Beyond the fact of being a startup founding team, other factors have to be taken into account to explain the success level of collaborations between startups and large firms, especially the cognitive and social proximity of these partners engaged in collaborations. These are the variables explored hereafter.

Collaboration success level and cognitive proximity

In Figure 21, the box-plots show that the factors "upstream watch", "common objectives", "common road map", "shared culture", and "closeness of technological knowledge" as part of cognitive proximity are not linked to the success level as the FET shows no significant relationships.

However, some relationships might exist but without being linear. Indeed, concerning "closeness of technological knowledge" especially, either a too low or a too high proximity regarding technological knowledge would give no sense to the startup-large firm collaboration, which is often sustained because of this technological difference, as a source of innovation for large firms and of progress in terms of technological maturity for startups.

The box-plot shows that the factor "empathy" as part of cognitive proximity seems to be linked to a high success level, but not being sufficient to succeed: indeed, 38,9%

of cases with high level of empathy also have a low level of success. However, the FET indicates a slight significant relationship.

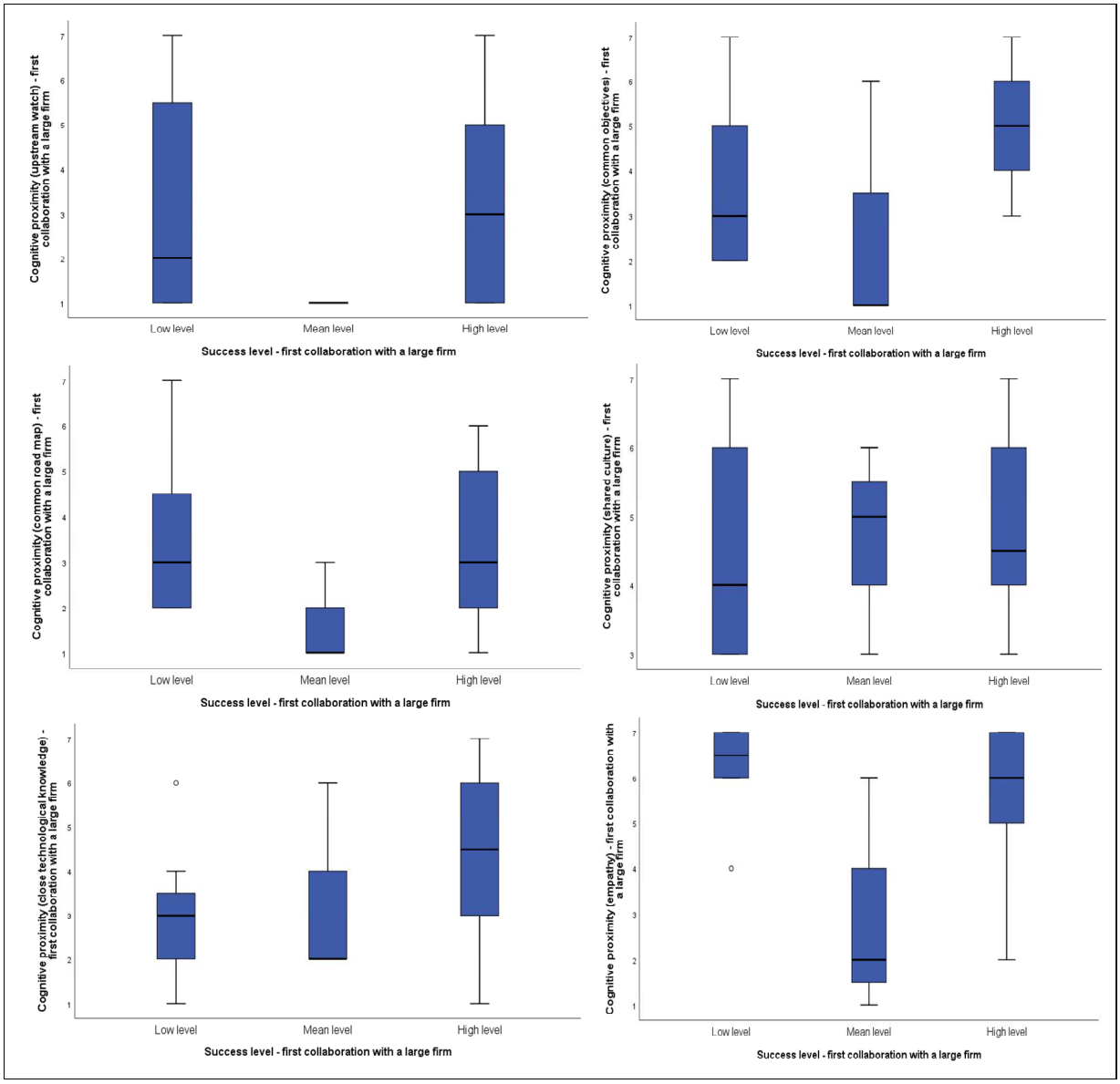


Figure 21 - Collaboration success level and cognitive proximity

Success level and social proximity

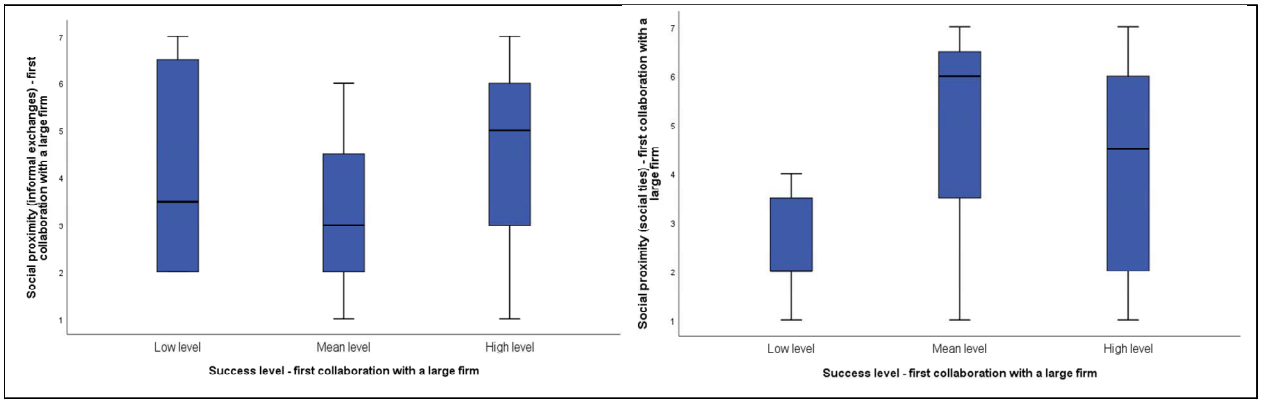


Figure 22 – Collaboration success level and social proximity

In Figure 22, the box-plot shows no relation between informal exchanges and the success level, although data indicates that the largest proportion of startups with a high level of this proximity factor (60%) also have a high level of success. The FET shows no significant relationship.

The box-plot related to social ties shows a relationship with the success level. The bivariate correlation matrix confirms the evidence of a significant positive relationship between the variables (r=0,399, p=0,048) and the FET shows a slight significant relationship.

Conclusions on *success level* and *cognitive and social proximity*:

The following proximity factors were identified as having a potential impact on the success level of startup - large firm collaborations:

- Factor part of cognitive proximity: *Empathy*
- Factor part of social proximity: *Social ties*

The nature of the collaboration: R&D alliance vs Business deal

Thus, other factors in addition to cognitive and social proximity, and not explored here, might play a role in the success level of startup-large firms collaborations. For

example, the nature of the collaboration itself (R&D alliance vs Business deal) as the box-plots below illustrate it:

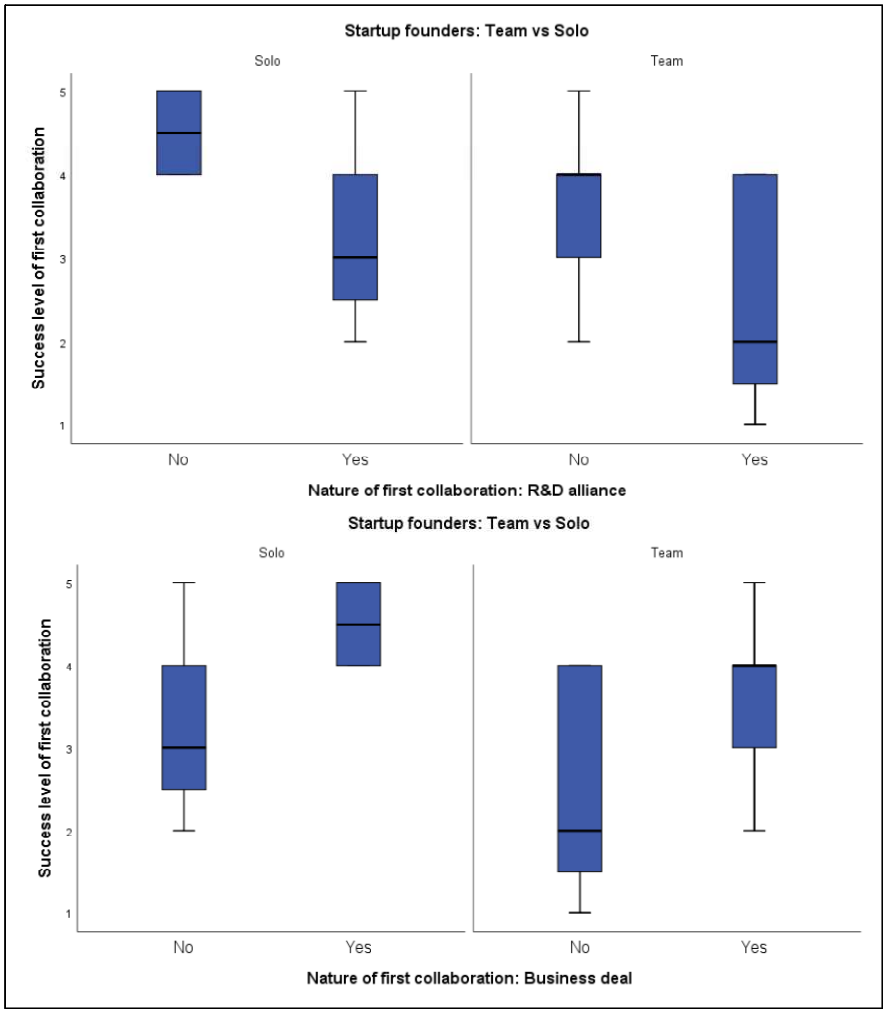


Figure 23 – The success level of startup-large firms collaborations following their nature

There seems to be an evidence that business deal and collaboration success level have a significant positive relationship (r=0,429; p=0,032) and a negative one concerning R&D alliance and collaboration success (r=-0,429; p=0,032). However, the FET significance level could not confirm this.

Reasons given for the collaboration success level

The qualitative explanations of respondents regarding the success level of their first collaboration with a large firm allowed to retrieve the following major impediments to collaboration success:

Table 26 - Major impediments to collaboration success

Impediment to success	**Collaboration nature**	**Verbatim**
Unshared goals and values	R&D alliance	"*The large firm mainly wanted to use a communication lever to show internal developments.*"
	R&D alliance	"*Open Innovation Contest for communication and animation objectives of local teams in large companies, but no product perspectives*."
Problem of innovation culture	R&D alliance	"*There was a problem of innovation culture, the working methods of the large group were too obsolete*."
A need for innovation not clearly defined by the large firm	R&D alliance	"*The initial project was not clear.*"
	Business deal	"*No awareness of the need by the large firm. As a result, it hasn't moved forward.*"
	Business deal	"*Lack in the definition of the company's needs, but also lack of clarity on the nature of our startup's activities*."
	Business deal	"*No validated roadmap, slow and not always coherent decision-making, strategy not clear and not shared*

		enough."
Focus on profitability and no support	R&D alliance	"*The large firm was only focused on the financial gains for it from the operation. There was no technical support either.*"

In contrast, the explanations of respondents regarding the success level of their first collaboration with a large firm allowed to retrieve the following major factors enhancing collaboration success:

Table 27 – Major factors enhancing collaboration success

Reason for success	**Collaboration nature**	**Verbatim**
Shared goals and values	Business deal	"*Importance of feeling, of values common to ours.*"
Fairness of gains	Business deal	"*It was a win-win collaboration."*
Communication and understanding throughout the process	Business deal	"*Continuous understanding of the right direction to take to exchange.*"
	Business deal	"*There was good understanding, good communication and recognition of our work.*"
Technological development for the startup	R&D alliance	"*The firm helped to start the project and develop the technology*."
	R&D alliance	"*A highly technical firm, years ahead of market needs, but thanks to this experience, we have made substantial technical progress.*"

Financial gain for the startup	Business deal	"*We made money.*"
Scaling possibilities	Business deal	"*We got orders for 3 major French cities, but the volume of orders still needs to be increased (scaling up).*"

H5 is thus not validated, collaborations success being fostered by one factor of cognitive proximity (empathy) and one of social proximity (social ties) between large firms and startup founders, the latter being not especially teams.

4.5. Discussion

4.5.1. Resulting framework

The framework resulting from the results of this study is as follows:

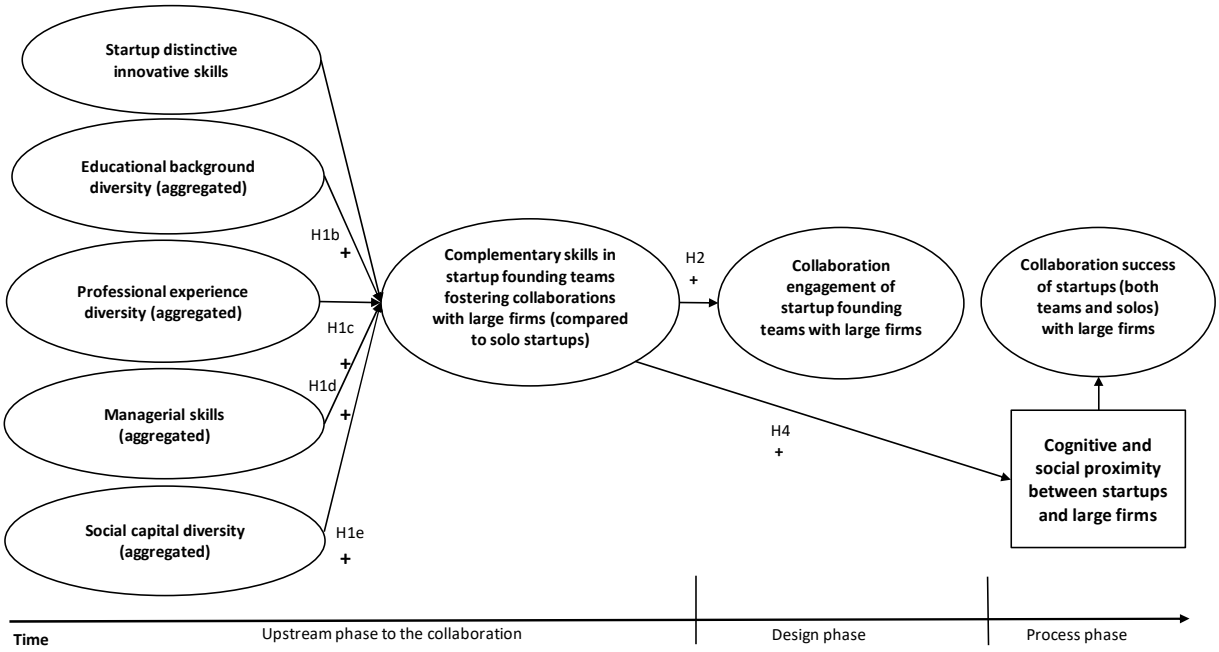


Figure 24 – Resulting framework

The influence of complementarity of skills in startup founding teams on their collaborations with large firms could be shown in the design phase, teams engaging more often than solos in collaborations with large firms. However, a relationship between startup founding teams and the collaboration success could not be retrieved, solos of the sample being more prone to succeed. Several skills specific to startup founding teams are nonetheless positively related to cognitive and social proximity, itself related to the collaboration success level. That means that other contingency factors that are not integrated in the model of this research might have an importance regarding the collaboration success. These results are consistent with the approach that there are many kinds of entrepreneur, no best profile; instead, contingent relationships should be found (Gartner, Shaver, Gatewood, & Katz, 1994) because of the multiplicity of potential "new combinations" (Schumpeter, 1934) "e.g. of goods, methods, markets, supplies, and organizations".

4.5.2. Main results regarding the process view of the nature of startups' knowledge

The following framework presents the main results of this study throughout the collaboration phases.

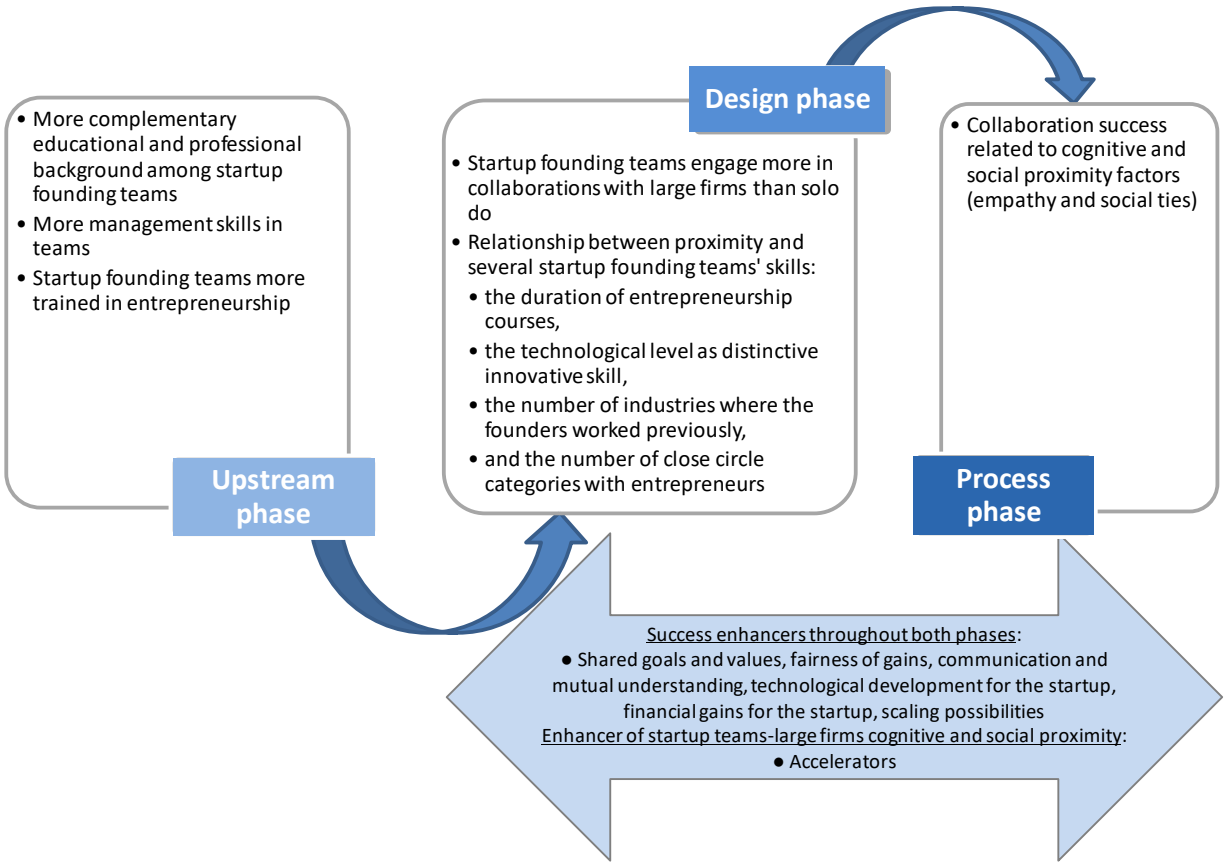


Figure 25 – Processual view of the nature of startups' knowledge related to their capability to collaborate with a large firm (first time)

4.5.3.Theoretical contribution

Critical dimensions for teams to succeed: high-level complementary skills and proximity level

A underlined by Teece (1998), "*Superior technology alone is rarely enough upon which to build a competitive advantage. The winners are the entrepreneurs with the*

cognitive and managerial skills to discern the shape of the play, and then act upon it. Recognizing strategic errors and adjusting accordingly is a critical part of becoming and remaining successful." Technological knowledge of high level is a necessary condition to engage in innovation collaborations with large firms. However being a technology-based startup founding team is not sufficient to succeed in such collaborations. Indeed, the results of the present study showed that the cognitive and social proximity level between the stakeholders is linked to this success. This constitutes a contribution of this study to knowledge on innovation collaborations between asymmetric partners such as startups and large firms. In addition, specific complementary skills owned by startup founding teams are linked to cognitive and social proximity and pertain to the components issued from human and social capital and investigated: distinctive innovative skills, educational background, and professional background. Their importance is in line with existing research work on human and social capital in startup teams (Barney, 1991; Colombo & Grilli, 2005; Jin et al., 2017). This research study adds to knowledge by showing the influence of startup founding teams' know-how in management and entrepreneurship training.

The impact of collaboration nature: R&D alliance vs Business deal

The results shed light on the fact that collaborations based on business deals seem to have much more chances to succeed than the ones based on R&D alliances, but the fact that startups are founding teams or solo founders does not seem to have an influence on it. The issue of collaboration failure in R&D alliances has already been explored in the empirical literature in various contexts (Cheah, Bellavitis, & Muscio, 2020; Lhuillery & Pfister, 2009). The risk assessment of collaboration is a crucial determinant in these collaborations, especially for startups as they do not necessarily have the ability to recover from failure. Since the startups investigated in this study were technology-based, there is thus a potential complexity associated to technology developed or under development by startups, and a risk for the potential partner. This technology complexity is a strength for startups: they often constitute the reason why large firms envisages to have R&D alliances with startups, and they are also of high importance toward potential investors. Indeed, as mentioned by Tech (2018), to

obtain external financing, startups dealing with technology complexity have to show they have a tech-inclined founding team that possesses a relevant background both in terms of technology development skills but also of business competences. Being a complementary technology-based team is not sufficient; the team also needs to demonstrate it. This applies to investors and to large firms too. In addition, to deal with this complexity, startups and large firms need to have a certain closeness of technological knowledge in order to understand each other, be able to interact, and achieve their common objectives in terms of R&D. The common "prior knowledge" (Cohen & Levinthal, 1990) related to the technology being deployed is necessary to facilitate both the innovation development and its implementation. Furthermore, in a recent research work, Cheah, Bellavitis, & Muscio (2020) have shown the importance of the presence of "*higher human network and senior management resources to cope with complex technologies*" in the context of PRI-firm projects. The present research work is consistent with this approach in the specific context of startup – large firm innovation collaborations, especially regarding the network.

4.5.4. Practical and policy implications

A process view of key skills of founding teams following the collaboration phases to anticipate

The contribution of this research is also practical. Indeed, the process view resulting from this study might allow startup founding teams to anticipate some of their decisions and actions. In order to anticipate more, the different issues occurring during collaborations and normally leading to their success, it is crucial that startup teams can identify the skills and specific needs occurring at each phase of the collaboration with a large firm, including the upstream phase. This work contributes to this understanding. It showed that to gain cognitive and social proximity with the large firm, it is essential for startup founding teams to be trained in entrepreneurship with a substantial duration, possess management know-how and to engage with a large firm once they have acquired a high technological level (maturity of their proposal). Upstream to this, startup founding teams should be aware of the importance of

having experiences in several industries and of constituting a large network of contacts.

This work also considers the importance of both hard and soft skills. By showing the crucial importance of soft skills, in addition to hard ones, this research might be of interest for innovation policy to sustain their understanding and efforts dedicated to the development of innovative entrepreneurship throughout all phases of the founding team's project.

4.6. Conclusion and perspectives

The objective of this research study was to explore and understand in which way the human and social capital developed by startup founding teams influences their capability to collaborate with large firms in an open innovation context. Given the small sample size of the study, the results have however to be taken with caution. Moreover, some of the results might be related to a size effect of startups even though this is not the case for all the results: larger quantitative studies could help to solve this key issue.

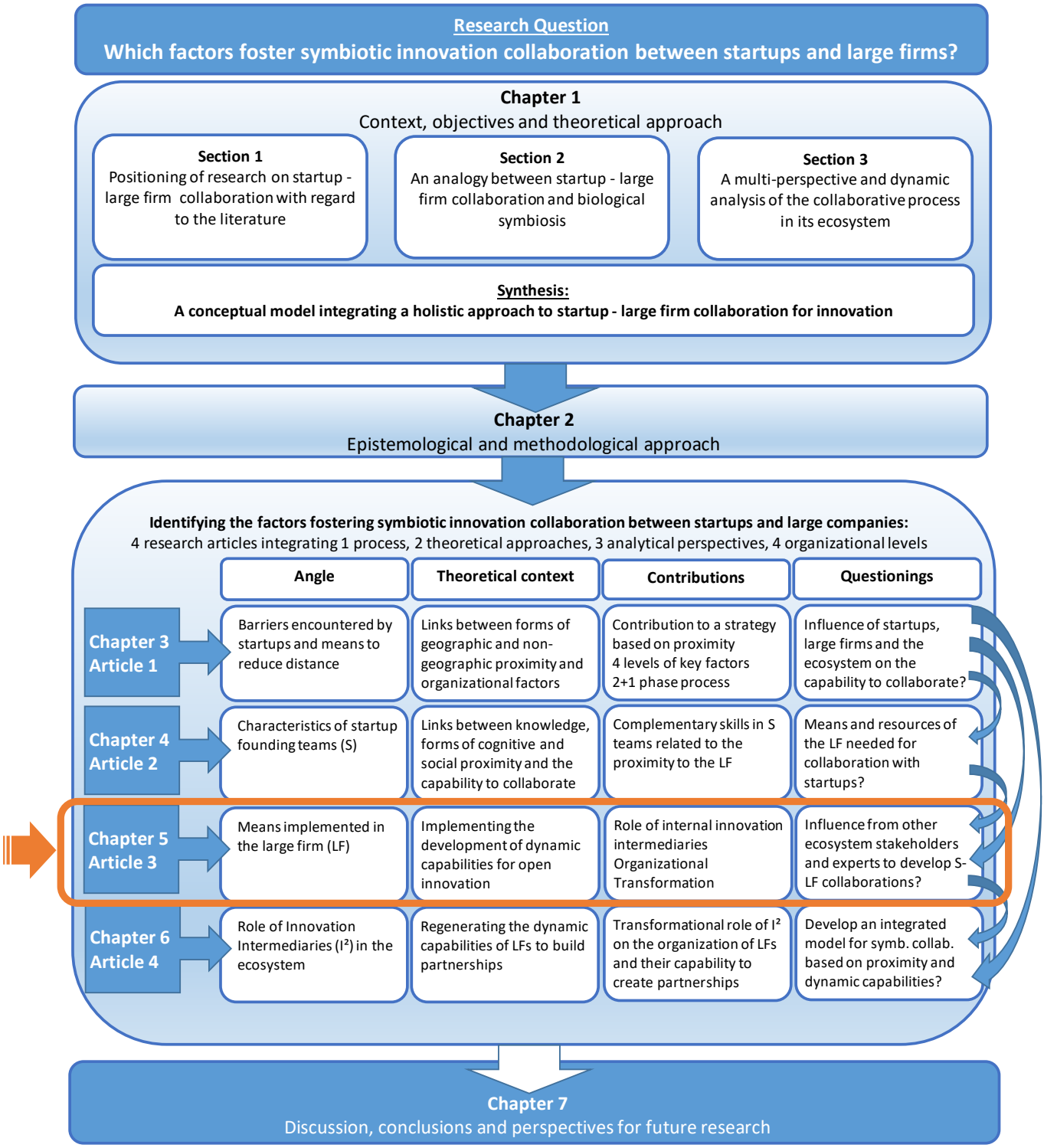
This study showed firstly a propensity of startup founding teams to have more complementary skills and essentially of higher level than solo founders at all levels, namely: educational and professional background, and at a social level, especially regarding network density. The study also indicated a potential advantage of founding teams on solo founders in terms of capability to collaborate with large firms, but only during the design phase of the collaboration. The process phase of collaboration leading to success seems to be more difficult for them. However, considering that future is a result of past decisions and actions, it would be worth that further research explore the links between the decisions taken by startup founding teams during the design phase and their consequences on the process phase, and thus on the collaboration success level too. Issues that arise can be for example: Is risk-taking propensity a characteristic of startup founding teams in comparison to solo ones and that would make them more prone to engage in collaborations with large

firms? Or is this engagement rather due to risk assessment from the large firms side that would be more favorable to founding teams? Multidisciplinary research on the specific decision-making process of startup founding teams would also be interesting to understand better the nature of all contingency factors, both internal and external to startup founding teams and large firms, affecting the innovation collaboration between these startups and large firms. Moreover, as R&D alliances were rarely related to the collaboration success, further research would be needed in this direction to better understand the barriers and levers to the particular type of asymmetric collaborations between startups and large firms. Beyond the crucial cognitive and social proximity, factors associated to the conative dimension (Boldrini & Schieb-Bienfait, 2016), especially for R&D alliance that remains a challenge, should usefully be explored within this context.

From a managerial view, this research should be firstly of interest to startups. Indeed, it showed the various advantages of being a team of founders regarding innovation collaborations with large firms. It also indicated through a process view of collaboration the issues that might occur at each phase and that are worth for startups to anticipate. Regional innovation policies should also be interested in these results in order to put their support especially on the most crucial upstream devices necessary for collaborations, the ones increasing the capability of startup teams to collaborate with large firms and succeed either (or even both) commercially and technologically.

- CHAPTER 5 -

ORGANIZATIONAL IMPACT OF DIGITAL OPEN INNOVATION IN RETAIL BANKS: MANAGING EXTERNAL AND INTERNAL PRESSURE


Research Question
Which factors foster symbiotic innovation collaboration between startups and large firms?
Chapter 1
Context, objectives and theoretical approach
Section 1
Positioning of research on startup - large firm collaboration with regard to the literature
Section 2
An analogy between startup - large firm collaboration and biological symbiosis
Section 3
A multi-perspective and dynamic analysis of the collaborative process in its ecosystem
Synthesis:
A conceptual model integrating a holistic approach to startup - large firm collaboration for innovation
Chapter 2
Epistemological and methodological approach
Identifying the factors fostering symbiotic innovation collaboration between startups and large companies:
4 research articles integrating 1 process, 2 theoretical approaches, 3 analytical perspectives, 4 organizational levels
Angle
Theoretical context
Contributions
Questionings
Chapter 3 Article 1
Barriers encountered by startups and means to reduce distance
Links between forms of geographic and non-geographic proximity and organizational factors
Contribution to a strategy based on proximity 4 levels of key factors 2+1 phase process
Influence of startups, large firms and the ecosystem on the capability to collaborate?
Chapter 4 Article 2
Characteristics of startup founding teams (S)
Links between knowledge, forms of cognitive and social proximity and the capability to collaborate
Complementary skills in S teams related to the proximity to the LF
Means and resources of the LF needed for collaboration with startups?
Chapter 5 Article 3
Means implemented in the large firm (LF)
Implementing the development of dynamic capabilities for open innovation
Role of internal innovation intermediaries Organizational Transformation
Influence from other ecosystem stakeholders and experts to develop S-LF collaborations?
Chapter 6 Article 4
Role of Innovation Intermediaries (I²) in the ecosystem
Regenerating the dynamic capabilities of LFs to build partnerships
Transformational role of I² on the organization of LFs and their capability to create partnerships
Develop an integrated model for symb. collab. based on proximity and dynamic capabilities?
Chapter 7
Discussion, conclusions and perspectives for future research

CHAPTER 5 - Article 3: Organizational impact of digital open innovation in retail banks: Managing external and internal pressure

This article is co-authored with Véronique Schaeffer[19]

This article was published in June 2020 in an international collective book as follows: BERTIN, Clarice, & SCHAEFFER, Véronique (2020). Organizational impact of digital open innovation in retail banks: Managing external and internal pressure, Chapter 11, in Managing Digital Open Innovation, Vol. 5, Book Series Open Innovation: Bridging Theory and Practice, World Scientific Publishing, pp. 297-322, May.

5.0. Extended abstract

Abstract: This article aims to investigate how large organizations, in this case banks, build their dynamic capabilities and deal with corollary rigidities in the era of digital open innovation. Our analysis of two in-depth case studies stresses the challenges that banks face in the era of digitalization. It indicates that banks are transforming themselves deeply in terms of organizational structure, internal processes and interactions, and individual competences; human resistance to change and core rigidities being the most challenging issues to solve. Our results show that people-centered managerial practices -rather than purely technology-centered ones- seem to be highly promising to develop dynamic capabilities within banks. To succeed in developing their innovative capabilities banks have to find the right balance between the external constraints due to the specificity of their activities and the desire and need to innovate in order to satisfy their interconnected clients. To achieve this delicate equilibrium and proceed to the appropriate structural and organizational

[19] An estimation of the personal contribution for this article is available in Appendix 1.

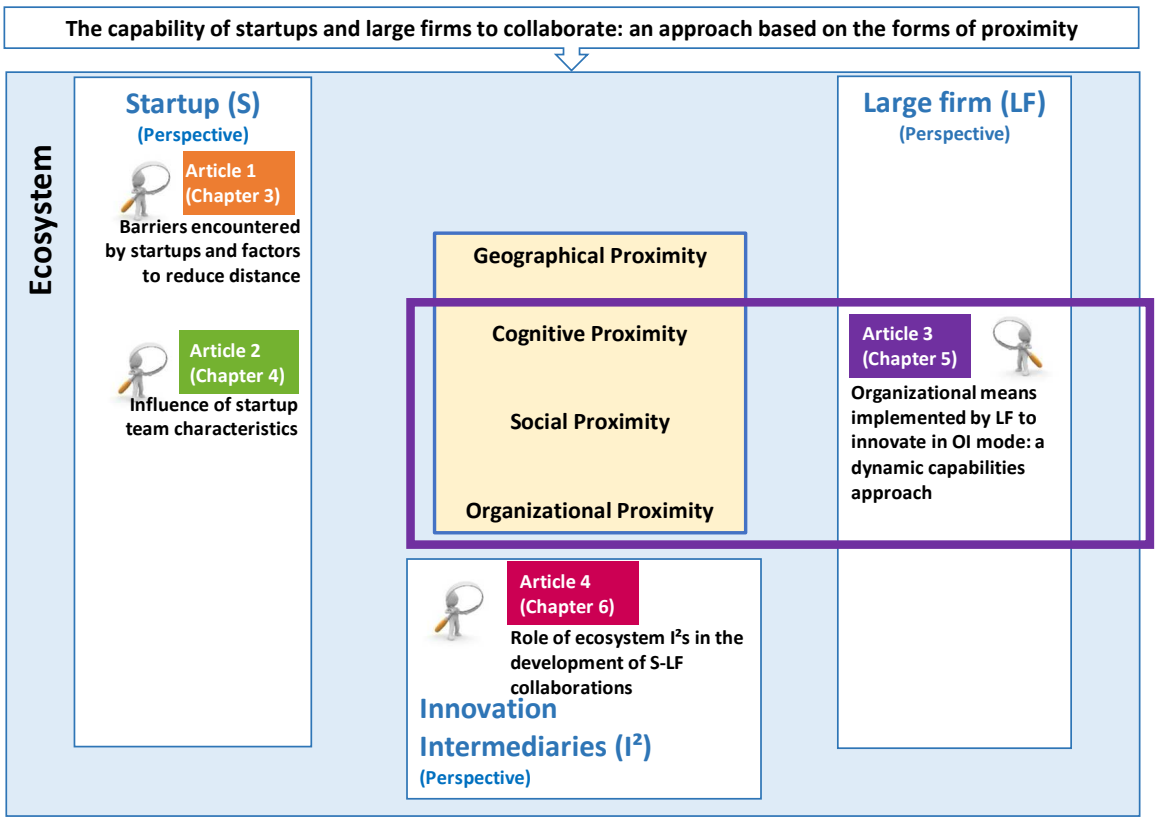
changes, collective mindset from banks' executive management appears certainly as one if not the first determining factor to succeed.

Keywords: Dynamic capabilities, routines, rigidities, retail banking, internal processes, resistance to change, change management, organizational agility, customer-centricity, knowledge exploration, knowledge exploitation, ambidexterity, middle management, financial innovation, empowerment.

Positioning of the article within the thesis

The first article of the thesis had shown the need for adaptation of the large firm upstream to collaborating with startups. The results of the second article showed that factors other than those associated with the startup's skills alone have an influence on its collaboration with large firms. This third article therefore proposes to explore, from the perspective of the large firm this time, the changes made by large organizations, typically highly hierarchical and rooted in the routine of their processes, to open their innovation process to external actors such as startups. The banks were chosen for this reason as well as for the many challenges they face in terms of innovation and opening up of their boundaries. The figure below shows the positioning of the article (purple box) in the conceptual framework of the thesis.

Figure 26 - Positioning of Article 3 in the conceptual framework of the thesis



Legend: S = Startup, LF = Large firm, I² = Innovation Intermediaries, OI = Open Innovation

Key results and originality

The results indicate that large organizations, in this article banks, are undergoing profound transformation at three levels, namely in terms of organizational structure, internal processes and interactions, and individual competencies. The most difficult seems to be the human resistance to change in the face of the introduction of massive digitalization in activities. This internal resistance is reinforced by rigidities specific to the necessarily very strict processes and procedures of the sector, the organizational structure and the decision-making process of banks. It appears from the cases that people-centered practices - involving the creation of communities, informal exchanges between staff members, participative management - seem very promising for developing dynamic capabilities within banks. A purely technical approach does not lead to organizational learning and can only solve problems in the short term. To achieve a balance between the external constraints due to the specificities of their activities and the desire and need to innovate in order to satisfy

their highly interconnected clients, and thus make the appropriate structural and organizational changes, collective intelligence instilled by top management certainly appears to be one of the determining factors, if not the first, for success.

Implications for this doctoral work

This third article highlighted the importance of the human factor in the transformation of large firms to open their innovation process to external actors such as startups. In particular, the collective intelligence instilled by top management facilitates and enables the development of this transformation process. Nevertheless, these changes remain difficult to implement internally and to build and maintain links with the outside world. The first paper of the thesis had shown the key role of innovation intermediaries in startup-large firm collaboration. Are these intermediaries from the ecosystem, as external actors and experts, able to influence the construction of these collaborations by directly acting on large firms' capabilities to collaborate? This is the question, which the fourth and last article of the thesis attempts to answer.

Research valuation

Book chapter in an international collective book

"Organizational impact of digital open innovation in retail banks: Managing external and internal pressure", in *"Managing Digital Open Innovation" Book Series Open Innovation: Bridging Theory and Practice*, World Scientific Publishing, pp. 297-322, June 2020.

Article submission process (2018 to 2019)

26/01/2018 Proposal of an extended abstract for the book chapter: "Organizational impact of digital open innovation in retail banks: Managing external and internal pressure", as part of the special volume on: *"Managing Digital Open Innovation" Book Series "Open Innovation: Bridging Theory and*

Practice", from World Scientific Publishing.

01/02/2018 Proposal accepted

14/09/2018 Submission of the full article

07/05/2019 Request for editorial revisions

27/05/2019 Submission of the revised article

16/12/2019 Request for editorial revisions before publication

17/12/2019 Submission of the revised article

02/06/2020 Publication of the book chapter

Communication in a peer-reviewed conference in 2018

"Organizational impact of digital open innovation in retail banks: Managing external and internal pressure", *Digital Innovation, Entrepreneurship & Financing (DIF) 2018*, AIMS, AEI, Lyon, June 11-12, 2018.

Presentations in research seminars in 2015 and 2016

"Open innovation in retail banking: Organizational perspective of an ecosystem", *ICN Business School Research Seminar*, Nancy, October 6, 2016.

"Crowdsourcing within the French banking sector: Exploring the impact on bank-client relationship", *BETA Laboratory Seminar*, Nancy, June 14, 2016.

"Organizing R&D for efficient crowdsourcing activities", *ICN Business School Research Seminar*, November 2015.

5.1. Introduction

Surfing the wave of the digital age, the banking sector is experiencing huge upheavals leading it to transform itself rapidly (Johannessen & Olsen, 2010; Seidel & Liebertrau, 2015). Today's strategic challenge is to keep current clients and attract new ones by providing them high service quality, and a personalized, intensified relationship including up-to-date e-technologies. This urges banks to become more customer-centric rather than product-centric as they used to be in the past (Auge-Dickhut, Koye, & Liebetrau, 2016; Zinkin, 2014) before the Internet democratization arose. This major challenge pushes retail banks to transform themselves and digitalize their activity processes to innovate permanently and rapidly to gain market shares or at least to avoid losing them (OECD, 2015).

As vertically aligned organizations, traditional retail banks are not organizationally flexible especially as they undergo post-crisis drastic financial and security regulations. They are thus trapped in a straightjacket and encounter therefore tremendous difficulties to innovate as quickly as the market requires it from them. Moreover competition is increasingly intensive within the sector at a global scale and the threat of potential heavy new entrants -namely the GAFA- might become soon strong (Chevelard, Auther, & Maitre, 2015). Competition is also increased by the similarity of services and products that competitors offer to clients (MarketLine, 2015). To add to this complex issue, traditional banks are facing daily an increasingly changing and uncertain environment.

Speeding up innovation and managing consequently organizational changes are a must for banks to offer the service quality required by clients, nay just survive. As they lack agility to innovate and to develop quickly e-services responding to their clients' needs, retail banks open their boundaries by calling more and more on external stakeholders such as Fintechs and innovative startups, clients and even competitors. Indeed, startups are agile and innovation-oriented by nature. Financial technology startups also master *inter alia* web technologies and place the client at the center of their innovation proposals. Moreover to become closer to their clients retail banks solicit them more and more to participate in the innovations they might use (Oliveira & Von Hippel, 2011) and to gather their opinions and ideas. Opening

the firm's boundaries to external stakeholders to innovate is indeed a must for banks willing to perform on a long-term basis (Fasnacht, 2009). But open innovation requires organizational changes (Chesbrough, Vanhaverbeke, & West, 2006; Oumlil & Juiz, 2016; Wagner, 2013) and, especially for banks, an acceleration of these changes (Gianiodis, Ettlie, & Urbina, 2014). If banks must certainly be able to explore new knowledge, find new solutions externally, innovate with external partners, they must be able *at the same time* to exploit their own knowledge, competencies and resources in order to integrate changes and to grow. This ambidexterity requires from firms specific abilities in terms of managerial practices (Fasnacht, 2009). Hence, it relates both on the ability to collaborate with external partners and on the ability to collaborate internally to adapt to changes. Innovation is not just about the development of new market and technological knowledge, it also relies on the implementation of new organizational models (Schlegelmilch, Diamantopoulos, & Kreuz, 2003). The mechanisms by which some firms reconfigure and renew their resources to keep their competitive advantage over time, despite changes in their environment, relies on dynamic capabilities (Ambrosini & Bowman, 2009; Barreto, 2010; O'Reilly & Tushman, 2008; Teece, Pisano, & Shuen, 1997). To our knowledge, exploratory studies on internal and external pressure in retail banks within the framework of digital open innovation is quasi absent from the literature. The ways on how to deal with this pressure too. Therefore, this article aims at investigating this issue by analyzing how banks build their dynamic capabilities and what are the associated rigidities. Beyond the identification of organizational challenges the banking sector is facing, this research work contributes to the literature on dynamic capabilities. This literature has developed rapidly since the seminal work of Teece (2007), but however, there is a lack of empirical studies showing how these capabilities are built, what they look like, how they are actually deployed and how they impact company's resources (Ambrosini & Bowman, 2009).

The second part of this article tackles the theoretical background, namely: the current challenges in the banking sector in liaison with digital innovation, the influence of interconnected clients on a critical key success factor, -the ability of bank operation management-, and the concepts of dynamic capabilities and rigidities associated to the need to find an issue to the internal and external pressure. In a third part, we

present the two case studies and the methodology used to analyze data. The fourth part reports on our results, which are discussed in the fifth part.

5.2. Theoretical background

The literature underlines that the development of digital technologies leads to structural changes in the banking sector (5.2.1) and calls for a deep transformation to renew the competitive advantages of actors (5.2.2). This transformation relies on the ability of banks to develop and activate their dynamic capabilities and to overcome their internal resistance to change (5.2.3).

5.2.1. Challenges in the banking sector associated to digital innovation

Fichman, Dos Santos, & Zheng (2014, p. 330) define digital innovation "as a product, process, or business model that is perceived as new, requires some significant changes on the part of the adopters, and is embodied in or enabled by information technologies". Digital innovation is not just the implementation of a new, easy-to-use software that does not require organizational change. It mainly deals with emerging technologies, which are potential sources of radical innovation.

Digital technologies have and will have a strong impact on economy and employment. They are important driving forces of economy. They lead to important value creation and are associated to many entrepreneurial opportunities. At the same time, they are also a threat for many jobs, which are going to disappear because machines will be able to do them. The process of destructive creation (Block, Fisch, & van Praag, 2017) associated to the acceleration of information technology development requires an adaptation of existing organizations. For Brynjolfsson & Mcafee (2012) this adaptation relies on the adaptation of structures, business models, processes, and human skills: “How can we implement a ‘race with machines’ strategy? The solution is organizational innovation: co-inventing new organizational structures, processes, and business models that leverage ever-advancing technology

and human skills. The stagnation of median wages and polarization of job growth is an opportunity for creative entrepreneurs" (Brynjolfsson & Mcafee, 2012, pp. 6-7).

Digital process innovations result in new operational processes. These transformations are internal to organizations and affect the way to make decisions and to work. They also induce changes in relationships with external partners as they change the way transactions are processed and the nature of interaction with clients. The main questions about digital process innovation relate to change management and to adoption of new technologies by users (Leonard-Barton, 1992).

Digital product innovations deal with products or services that are embodied in information technology devices such as smartphones, enterprise resource planning and connected things, which are existing products transformed by integration of digital technologies. Digital product innovation can consist either of a product incorporating digital technologies or of a set of products and services such as applications whose use is complementary to the one of smartphones. The banking sector is involved in many kinds of product or service innovations such as new services associated to credit cards and to smartphones, new online services.

Business model innovation is a new way of creating and capturing business value, resulting from the use of information technologies. Indeed, the latter are one of the main drivers of business model innovation (Teece, 2010). Hence, firms have to consider digitalization at different stages of the innovation process. They have to make choices on the nature of core technologies, on the importance of focusing on technologies, on the necessary organizational, technical competences, the commercial dimension, and the potential obstacles to overcome.

5.2.2.Interconnected clients and bank operation management ability

Chen, (1999) identified four main critical success factors in the banking industry, namely: the ability of bank operation management, the ability of bank marketing, the ability of developing bank trademarks, and the ability of financial market management. Following the author’s research work, the first factor, “the ability of bank operation management”, proved to be the most important critical success

factors. It deals “with issues related to internal management, i.e. staff politeness and kindness, the management ability of the bank manager, the speed of handling business, the ability of computerization, the ability of asset and liability management, and the ability of internal auditing and control” (Chen, 1999). Two decades later this ability of bank operation management is still crucial even more than ever before. Indeed, this ability is highly impacted by changes due to the increasing digitalization of the banking sector and to the new relationship between banks and their interconnected clients. These major changes require new strategies and skills from managers to ensure the adoption of technological and organizational innovations by users.

Johannessen & Olsen (2010) have already predicted that to create value in a global knowledge economy firms proposing products and services would have to focus on “the newly and interconnected customer” rather than on the old view of firm- and product-centrality. The authors argue that it can be achieved through “individualized immediate feedback, a new organizational logic, and new cooperating structures.” Although this research work did not especially dealt with banks it is particularly valid for them as client satisfaction is becoming more and more centric for this sector. Indeed, as underlined by Solucom & OpinionWay (2014) banks have to reinvent urgently their client relationship and this client centrality is also largely related to the issue of clients’ hyper-connectivity. This latter has namely changed both their behavior and their way of consuming. It is urgent for banks to exploit the digital opportunity to anticipate client needs, value them and reach out to them. This is now possible with an intelligent data use through the big data. Moreover following Rothaermel (2015) “Old-line banking institutions with expensive networks of branches must now offer seamless online banking services. They must make them work between a set of traditional and non-traditional payment services on a mobile platform.”

Today clients are also more and almost better informed than in the past about available banking products and services thanks to internet. They are also able to compare easily competitors’ offers online what means by the way that clients gain knowledge in the banking field, what was not the case before internet

democratization. This implies that they are now demanding to their own bank for high-expert information, namely information that is not already provided online. They are also requiring more online solutions. This needs adaptation and time from banks as “the new dynamic core competency of the banker of the future integrates much more qualifications than in the last century” (Fasnacht, 2009). This situation also has implications on banks’ staff and its management to accompany changes.

In addition to the need for more digitalization, banks also have efforts to engage to gain or maintain clients’ confidence. Indeed, as underlined by MarketLine (2015) “The recent economic crisis has led to an erosion of clients' trust in banks as safe places to deposit savings, and has thus reduced the number of buyers (…). Issues that damage consumer confidence persist.” Banks encounter thus difficulties to attract new clients and to keep the existing ones.

Concerning innovation and development of new business activities, Paniagua & Sapena in Peris-Ortiz & Sahut (2015) argue that “During systemic banking crises most public efforts and resources are devoted to sustaining the financial system. Consequently, less budget and public efforts focus on promoting new business activities.”

5.2.3.Dynamic capabilities and resistance to change

Evolving in a moving context, banks like other firms have to develop dynamic capabilities to trigger the evolution of operational routines and capabilities (Eisenhardt & Martin, 2000; Winter, 2003). Felin, Foss, Heimeriks, & Madsen (2012) building on a definition given by Helfat et al. (2007) define dynamic capabilities as “the capacity of an organization to purposefully create, extend or modify a firm's product or service offerings, processes for generating and/or delivering a product or service, or customer markets” (Felin et al., 2012, p. 1355). Dynamic capabilities are capabilities and routines of a higher order, which allow the evolution of operational capabilities and routines (Collis, 1994; Winter, 2003). In order to identify these routines and capabilities, which are collective constructs, we adopt a micro-foundation approach, based on the characterization of a collective phenomenon by

considering lower level of analysis and the way the components interact at different levels (Felin et al., 2012).

The implementation of new technologies within a firm goes with difficulties that are increased by low transferability level of technologies, organizational complexity related to the extent and scope of technology deployment in the organization, and indivisibility of technology (Leonard-Barton, 1988). Indeed, today's banks are more and more involved in such sensitive situations and have to find ways to deal with them to compete. Although there is an urgent need for French banks to develop digitalization, as underlined by Lebraty & Lobre-Lebraty (2013, p.27), they surprisingly move slowly on the issue of online processing despite the fact that their activities "are perfectly suited to [it]".

Routines and capabilities can be more or less rigid depending on the organizational context (Schreyögg & Kliesch-Eberl, 2007). The most rigid routines rely on knowledge accumulated over time. They are designed very specifically and are considered as optimal way of coordination. In the banking sector, where activities have to be executed in a very reliable, standardized manner, some routines are very rigid. Moreover organization of banks, with a strategic head and a network of commercial agencies, (see Figure 27) contributes to the high level of specification of operational activities, and then to the rigidity of operational routines.

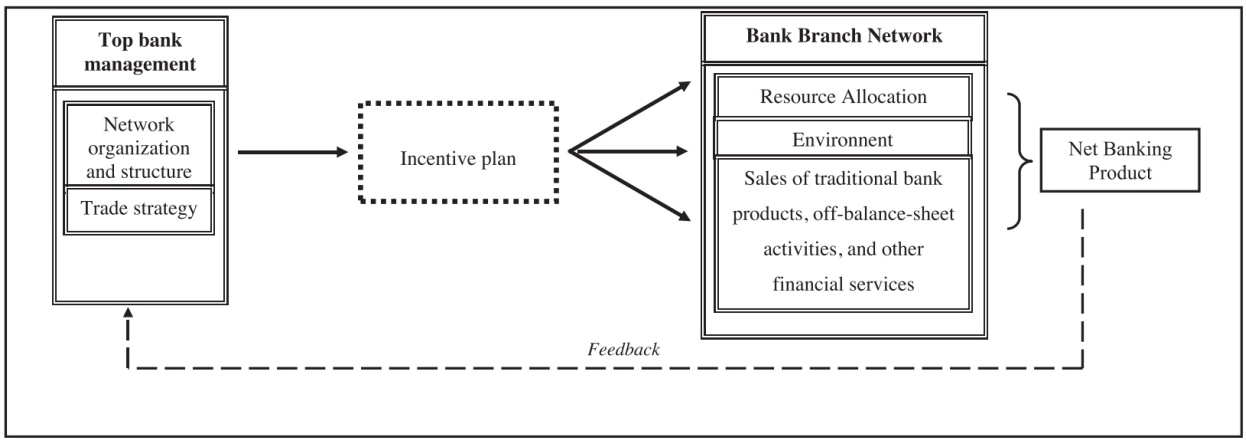


Figure 27 - The decision-making process inside the banking group (source: Deville, Ferrier, & Leleu, 2014)

Banks are highly hierarchical organizations and founded on two main levels: top management that makes strategic decisions, and commercial agencies that can be considered as revenue centers (Deville & al., 2014). Operational units are organizational contexts as such, defined at the top management level that allocates resources, defines products and commercial strategy. Beside rigidities associated to the managerial system, Leonard-Barton (1992) also identifies skills and knowledge base, technical systems, and values and norms -that contribute to shape the organizational culture-, as core rigidities. Norms and values influence the other capabilities and are the more rigid capabilities because they are intangible and collectively built over time.

As noted by Felin & al. (2012), research in the field of management over the past decades contributed to improve our understanding of the concepts of routines and capabilities (Collis, 1994; Helfat et al., 2007; Helfat & Peterhaf, 2009; Nelson & Winter, 1982; Winter, 2003). But there is still a need to explore their micro-level origins in order to understand how they are built and how they evolve over time. Felin & al. identify three micro-levels of routines and capabilities which are nested in each other and are in interaction, namely: (1) individuals which are the actors of the actions carried out and directly affect the performance of organizations, (2) processes and interactions among individuals which contribute to the collective dimension of routines and capabilities, and (3) structures which condition individual and collective actions. Hence, we will consider these three levels to identify the micro-foundations of the dynamic capabilities and then characterize the specific challenges faced by the banking sector to foster the implementation of new capabilities and routines through the building of dynamic capabilities.

5.3. Methodology

This qualitative exploratory study is based on two case studies conducted in two banks we will call Alpha and Beta. We interviewed executives of these banks retrospectively (Huber & Power, 1985). The period of time when the interviews took place, in 2016, was a time when pressure coming from the external environment was

already highly sensitive for the sector. Alpha counts 2.500 people and Beta 2.000 people spread globally. Alpha is located in France, and Beta is in Luxembourg with several subsidiaries worldwide -see details in Table 28-, scope –Alpha is a national bank, acts nationally with a strong presence regionally as Beta acts both at local and international levels. The stage of innovation introduction differs: Alpha started the opening strategy of its frontiers to innovate seven years ago and Beta had just started it at this time.

Table 28 - Presentation of the two case studies (Source: Adapted from Marketline)

	Alpha	**Beta**
Country of origin	France	Luxembourg
Business	Retail banking Insurance Asset management	Retail Corporate and wealth management Treasury and financial markets Group center
Scope / subsidiaries	National, regional	International (Luxembourg, Switzerland, Denmark, the UAE, Belgium, France and Singapore)
Open Innovation introduction	2009	2015
Number of employees	2.500	2.000
Strategic focus	Meet the rising challenges, develop a new relationship with its clients	Innovation and client satisfaction
Threats	Implication of Basel III, Competition, Risk related to online Identity Theft and hacking	Implementation of Basel III, Intense competition, Low interest rates

In 2018, Alpha is involved in external activities to innovate for nine years and Beta for three years.

We analyze the interviews by a process of systematic coding (Figure 28) organized in three steps (Corley & Gioia, 2004). The analysis leads us to identify three main categories of results: the challenges banks face, how they build their dynamic capabilities, and what are the associated rigidities. We adopt a microfoundation approach in order to identify the concrete components of dynamic capabilities. As suggested by Felin et al. (2012) we consider the levels of organization, process and individual. In a second step, we highlight the obstacles encountered by the two banks studied to manage changes at individual and organizational levels, and the crucial role played by digitalization.

5.4. Results

The process of coding leads us to the identification of three main categories of results: the challenges associated to the digitalization of activities (5.4.1), the identification of the concrete components of dynamic capabilities at different levels (5.4.2) and the characterization of the rigidities associated to change in the banking sector (5.4.3).

5.4.1. Effects associated to the digitalization of activities

The digitalization of activities leads to deep changes which affect business models, structures, processes and human skills (Brynjolfsson & Mcafee, 2012). These different challenges clearly appear in the two cases studied which reveal three kinds of challenges related to the digitalization of activities (Table 29): the evolution of products and services, the evolution of internal organization and processes and the evolution of the competitive position with the emergence of new business models. Both banks face the effect of the dematerialization of the services they provided to their clients and the emergence of new competitors with the development of online banks. These evolutions lead to obsolescence of processes structuring the traditional

banking sector activities and the necessity to develop commercial activities, reactivity, specific and high-level services.

"... *Before, the response times were not the same... People made an appointment; the manager knew that the following week he would see the clients... Now, if we don't give an answer right away, it's the competitor who will do it!"* (Bank Beta)

An important challenge associated to this evolution is the renewal of competences and the transition from repetitive activities conducted by employees using strongly structured processes to the development of high-level services.

"*It's really a new job (...) It's like asking a baker to become a bricklayer."* (Bank Alpha)

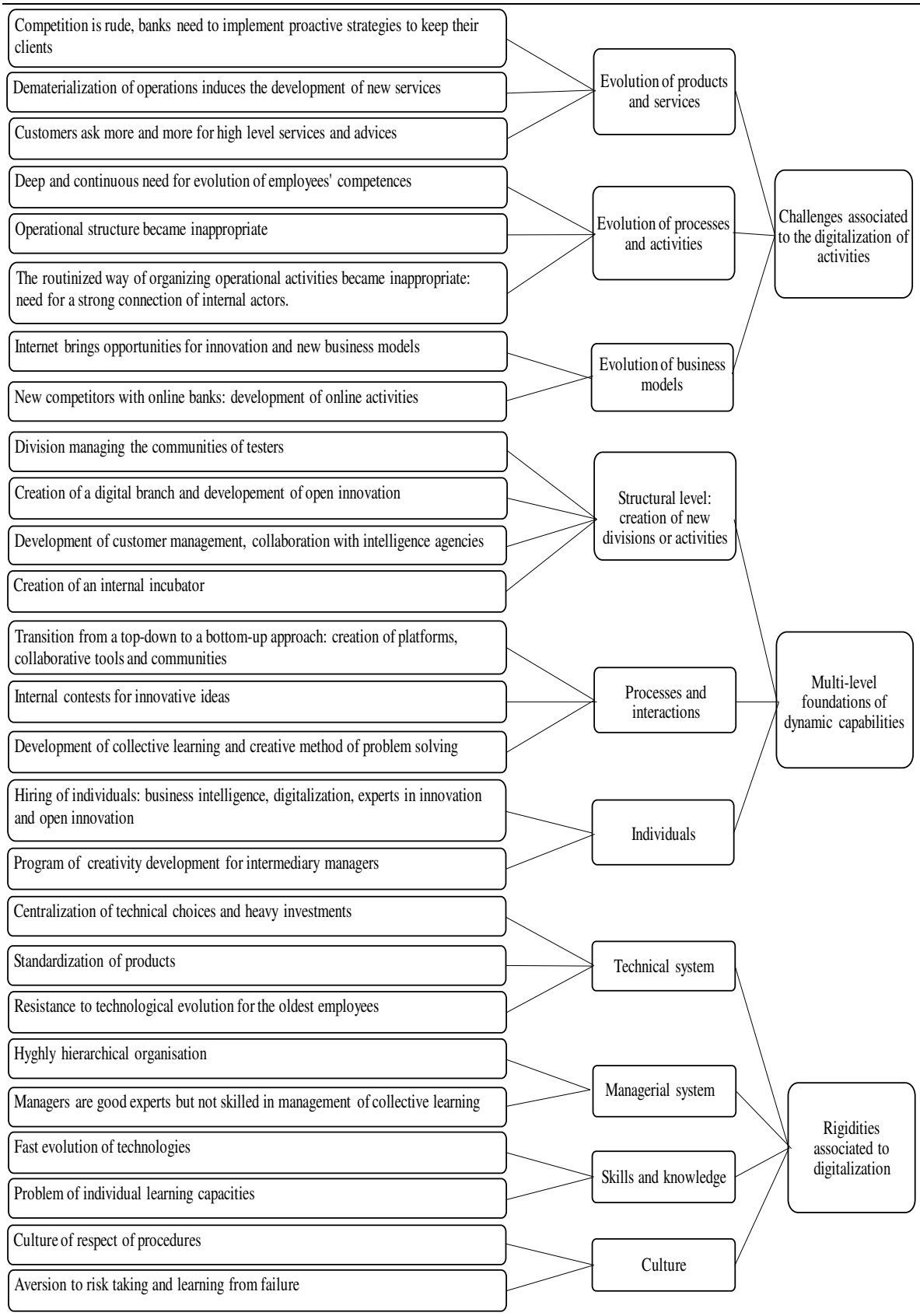


Figure 28 - A three-level codification process of the data collected through interviews

Table 29 - Effects associated to the digitalization of banking activities

Evolution of products and services	• Competition is rude, banks need to implement proactive strategies to keep their clients • Dematerialization of operations induces the development of new services • Customers' behavior has deeply evolved: they ask for high-level services and advices from their bank.
Evolution of processes and activities	• Deep and continuous need for evolution of employees' competences • Operational structure designed to treat material operations became inappropriate • Impact on jobs and on organization • The routinized way of organizing operational activities became inappropriate: need for a strong connection of internal actors
Evolution of business models	• Internet and online innovative apps developed by startups and Fintechs bring opportunities for innovation and new business models • New competitors with online banks and threat of the GAFA: development of online activities

5.4.2. A multi-level approach of the renewal of routines and capabilities

Because of the effects underlined, banks have to renew their competitive advantages and thus to drive an internal evolution. The analysis of the interviews conducted in the two banks leads to the identification of the three kinds of micro-level mechanisms introduced by Felin & al. (2012) that drive change of routines and capabilities. These mechanisms relate to the evolution of the organizational structure of the bank, the evolution of its internal processes and interactions, and the evolution of individual competences (Table 30).

Table 30 - The microfoundations of the renewal of routines and capabilities

Levels	Microfoundations of change
Structural level	• Division managing the communities of testers • Creation of a digital branch • Development of marketing through customer management focus, collaboration with intelligence agencies • Creation of an innovation department • Creation of an internal incubator
Processes and interactions	• Transition from a top-down to a bottom-up approach: creation of platforms, collaborative tools and communities • Internal contests for innovative ideas • Development of collective learning and creative methods of problem-solving
Individuals	• Hiring of individuals: competitive intelligence, digitalization, experts in innovation and open innovation • Program of creativity development for middle managers

The three levels of mechanisms are nested in one another. The change direction that led to their implementation are the willingness to develop innovative capabilities of banks through a better knowledge of market and clients and through an open innovation strategy oriented towards the creation of collaboration with Fintechs.

"The top management will listen to the marketing and the innovation departments or to consulting firms in charge of conducting a technological watch and which make regular customer surveys..." (Bank Alpha)

At the structural level, both banks created new departments and functions in the field of marketing and innovation.

"There is a new department for innovation structured around two teams: a team attached to the Strategy Department which is Strategic Continuity & Market Intelligence and a team which deals with innovation and relationships with Fintechs" (Bank Beta)

"*We have just created a new department that manages user communities. They are also in charge of relationships with startups*". (Bank Alpha)

The willingness to develop relationships with startups appears in both cases, but the strategy is not the same. Bank Alpha created its own accelerator and invested in the capital of incubated startups. Bank Beta chose to develop connections to startups through external incubators that already exist within the entrepreneurial ecosystem built around Fintech.

These structural evolutions are however not sufficient. Indeed, there is also a need to change the internal interactions occurring within the company at the process level. The evolution of processes is driven by the willingness to break the inertia of banking organization and to favor transversal interactions, delegation of responsibility, and initiative especially at the intermediary level of management.

"*The proposals that are made internally go up via management and via a platform that centralizes all the innovation feedback that comes directly from the field."* (Bank Alpha)

"*We are in the process of changing our entire compensation policy to favor collective activities and to promote cross-functionality.*" (Bank Beta)

The evolution of activities and the creation of new functions dedicated to the development of market knowledge require new competences, which are developed both from external sources and from internal sources through programs of competences and creative ability development for middle managers.

"We recruited John, he is an expert! He has extensive experience in the field. Before joining the banking industry, he worked in the industry. He was recruited for his highly innovative approaches... New products... He works closely with the marketing teams." (Bank Beta)

The transition is more difficult to manage for bank Alpha that has a different approach of human resource management, is socially responsible but less flexible.

"*It is complicated to manage this evolution, especially when you are a responsible company that does not make dismissals, that does not make social plans."* (Bank Alpha)

5.4.3.Rigidities associated to digitalization in the banking sector

The deep and wide change introduced in banking activities by the digitalization met internal resistance. It finds its roots in the different elements identified by Leonard-Barton (1992) as core rigidities: the technical system, the managerial system, the skills and knowledge base, and the cultural factors (Table 31).

Table 31 - Rigidities associated to change

Technical systems	• Centralization of technical choices and heavy investments • Standardization of products • Resistance to technological evolution from oldest employees
Managerial systems	• Highly hierarchical organization • Managers are good experts but not skilled in management of collective learning
Skills and knowledge base	• Fast evolution of technologies • Problem of individual learning capacities
Values and norms	• Culture of respect of procedures • Aversion to risk taking and learning from failure

Traditional activities and processes in the banking sector are organized with the aim to secure operations and transactions, and to avoid any risk and error. Consequently, there is a strong centralization and the system of decision is highly hierarchical with different levels of controls. The willingness to develop reactivity, creativity and innovation meets resistance at different levels. The technical system is centrally designed, and each change affects many people in local agencies that are far away from the decision center.

"*The main difficulty is to match IT applications with customer needs. It goes so fast and the amount of investments is so important that we are always a little bit behind... This is the biggest difficulty today... Before, the company used to be ahead of the market, it was proposing something... But now, the clients are ahead of us*..." (Bank Alpha)

The heaviness of the technical system makes the change difficult to manage:

"*Things evolve so fast that the applications installed on your workstation to respond to the client change every day... You have several hundred applications running in your machine, you always have one that is being updated, so you have something changing every day! It really confuses people... When you open your workstation, the path you usually took to find the answer to your client's question... Well, it has changed..."* (Bank Alpha)

This technical difficulty is especially important for bank Alpha that wants to preserve the local agencies and to make them evolve. Bank Beta focuses more on the evolution of resistance to change among middle managers and on the role of banks' organizational culture within the inertia of the system.

"I think the biggest obstacles are daring, learning from mistakes, being resilient. Yes, but you are in a bank! Making mistakes is like being fired right away! (...) We have many managers who are there because they were good experts, but they are not people who have remarkable managerial skills. So necessarily when we say 'let's create the culture of "risk taking", trust...' we have managers -sometimes at a very high level- who believe that a good manager is someone who is feared and directive... There is still a rather heavy historical aspect." (Bank Beta)

At the individual level, the resistance to change relates to the pace of learning which is always slow while the pace of technical change is rapid.

"... For all of us, it is extremely destabilizing and difficult... Some cannot... Agility has limits related to the ability of men and women to accept change, to modify… (...) In fact the complexity comes from the speed of updating applications and the pace of adaptation of the man behind his machine..." (Bank Alpha)

The two banks insist on the difficulties to manage the evolution of competences and behaviors at the operational and management levels. At the operational level the traditional banking operations do not exist anymore and the difficulty is to find a new role to local agencies. Many banks close some of their agencies because it is not just a question of competences but a question of usefulness of the services proposed as

those are now performed online by the clients themselves. Bank Alpha tries to resist to this evolution but faces the problem of the reconversion of the employees who have to develop new competences, completely different from their current ones. At the central level, the challenge is to manage the evolution towards the development of a new culture and a new organization that promote more participative management modes. Bank Beta invests a lot on this evolution and managers who come from other activity sectors in which innovation culture exists drive the change.

5.5. Discussion

These results show the central role of middle management in the evolution of an organization from a non-innovative to an innovative one (5.5.1). They also show how banks manage their transition towards ambidexterity (5.5.2).

5.5.1. The evolution of the role of middle management

The necessity for banks to become more innovative involves a deep evolution of the internal organization built around the respect of procedures and the delegation of responsibility, in a bureaucratic way. This is in line with Miles, Snow, Fjeldstad, Miles, & Lettl, (2010) who show that “hierarchy (…) is not well suited to managing the collaborative process, particularly collaboration that extends beyond the boundaries of the firm.” The necessary change of this hierarchical organization leads the middle management to play a new role. They should not be anymore an intermediary level in the deployment of central decisions, but they also have to promote a culture of innovation and knowledge sharing at the different levels of the organization. The transition from a role of responsible for the respect of procedures to a role of animator of the promotion of knowledge sharing and innovation is not obvious. The transition from a role of responsible for the respect of procedures to a role of animator of the promotion of knowledge sharing and innovation is not obvious and requires specific skills. Bank Beta has created internal communities of managers to promote the culture of knowledge sharing and innovation. The effects associated to the renewal of competences of the middle managers were identified as a big

challenge for the two banks. Bank Beta has invested a lot in the evolution of competences and management skills of middle managers at the central level of the bank, but it faces strong difficulties to renew the competences at the level of commercial agencies, because distance and multi-location make interactions difficult, which are central in these kinds of profile. Multi-location was an asset when banking activities were face-to-face ones. Two strategies can be implemented to deal with this problem: close agencies and invest in the creation of digital services or find other activities where proximity with clients is important, but this last way is not obvious and banks are still looking for solutions to deal with this direction. The comparison of two cases is interesting concerning this issue, because they have adopted different strategies to deal with the proximity dimension. Bank Alpha adopts a strategy of diversification of activities to valorize this asset. On the contrary, bank Beta considers that physical proximity is not central anymore and invests a lot in the development of internal communities in order to develop a culture of innovation.

5.5.2. Banks on the way to ambidexterity

Some specificities of the banking sector reinforce the deepness of organizational rigidities. In their traditional way of working, they have no culture of innovation. The culture of respect of very formal procedures, which is central in the banking sector, involves behaviors that are completely different from behaviors expected in an organization oriented towards innovation and creativity. The culture of respect of procedures leads to the development of many routines in operational activities. The cultural dimension of an organization is the most difficult element to change in an organization because it is the less visible and members of the organization share it unconsciously. Barratt-pugh, Bahn, & Gakere (2013) have underlined the crucial and strategic role of human resource management in change acceleration. They claim a need for human resource to focus on building relational leadership capability and supporting local team activity. A second aspect of banks' specific rigidities is their multi-location organization, with many agencies geographically decentralized and close to clients. This multi-location leads to a phenomenon of bureaucratization and to a culture of reporting (Deville et al., 2014) that contribute to the strong routinizing of activities. Moreover, the technical system, centrally designed and deployed in the

different agencies, contributes to a standardization of activities. Products are also standardized. In this highly hierarchical and centralized organization, operational agencies have no autonomy, and performance goes with the respect of corporate rules.

The conclusion of our research is not that these strong rigidities make banks unable to evolve, to renew their competitive advantages and to compete with online banks. However, the evolution of banks relies on a deep internal transformation that implies strong investments to build new capacities based on new competences. The technical system managed centrally and used in geographically distant agencies is very heavy and supports many operational routines. At each level, new competences and behaviors are required and the learning process mobilizes many resources because the gap to be filled is huge. Sometimes it is too difficult for individuals who used to apply highly routinized operations that are now dematerialized.

Nevertheless, the evolution of banks is not a total revolution. The banking activities still have to be trustable, because circulation of money in an economic system is only possible if everyone trusts the banking system. A strong culture of risk management and control in the banking sector is still important as well as the respect of very precise procedures and verifications, but a part of this operational aspect is now automatized and is also less central than before in organization structuration. Like other organizations, banks have to become ambidextrous. The structural evolution contributes to build this ambidexterity. The creation of specific departments in charge of innovation management and open innovation -with norms of behavior that are not the same as in departments in charge of the current relationships with clients- contributes to this ambidexterity. The diffusion of a culture of innovation at the top management level and the new role of the middle management in a transition from a top-down approach to a bottom up approach are evolutions that contribute to the articulation of exploration and exploitation activities.

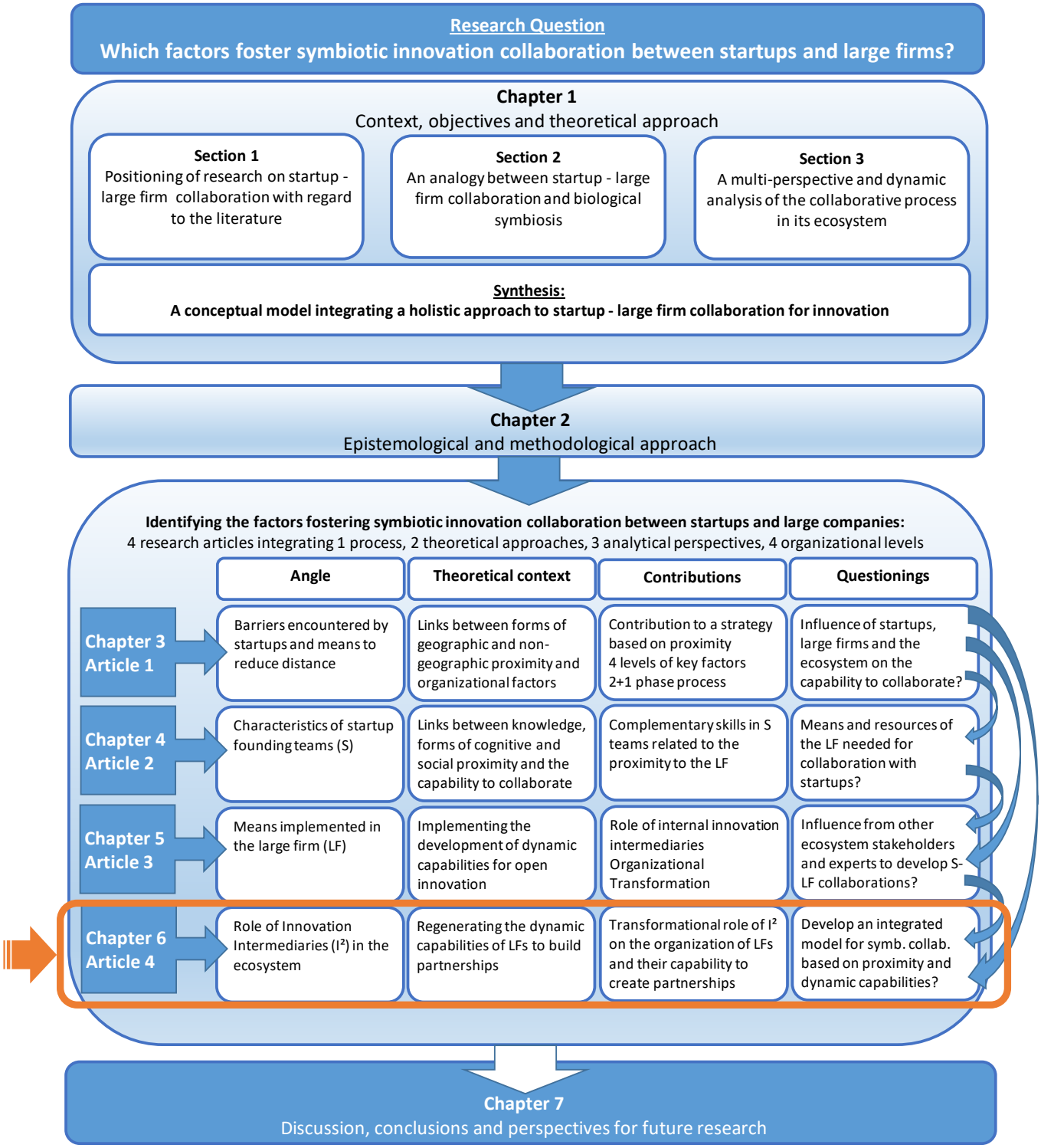
5.6. Conclusions

The aim of this article was to understand how banks build their dynamic capabilities and deal with the associated rigidities in the era of digital open innovation. Through

the two banks' cases we have chosen to study, we show that different approaches are found by banks to cope with the huge changes occurring in their environment and more specifically the ones related to digitalization of their activities. The cases show a growing evolution of products and services, of internal processes and activities and in a global way of banks' business models (Yip & Bocken, 2018). Therefore, banks are trying to develop new, sustainable ways to deal with these evolutions to develop innovative capabilities. Our results indicate that banks are transforming themselves deeply at three levels, namely in terms of organizational structure, internal processes and interactions, and individual competences. What appears to be the most challenging in the cases studied is human resistance to change toward introduction of massive digitalization in banking activities. This internal resistance to change is reinforced by core rigidities proper to the necessarily very strict processes and procedures in the banking sector, to banks' organizational structure and decision-making process too. As daily activities of banks are done by people, banks have to become able to manage both the needed development of their managerial practices and the compliance with the regulatory banking system. This is the paradox banks have to solve. Moreover, it appears through the cases that people-centered practices -involving the creation of communities, the increase of informal exchanges among staff, participatory management- seem to be highly promising to develop dynamic capabilities within banks as people actually learn how to solve problems on the long run. Furthermore bank's staff appears also to be highly important for financial innovation (Martovoy, Mention, & Torkkeli, 2015). A purely technical approach mostly centered on people's use of new digitalized tools –as shown by one of the two cases- does not lead to organizational learning and only allows solving problems on the short term. Thus, to succeed in developing dynamic capabilities, banks have to change deeply the way they function and manage people. They have to find the right balance between the external constraints due to the specificities of their activities and the desire and need to innovate to satisfy their highly interconnected clients. To achieve this delicate equilibrium and proceed to the appropriate structural and organizational changes, awareness and collective mindset from banks' executive management appear certainly as one if not the first determining factor to succeed.

- CHAPTER 6 -

Innovation intermediaries' roles in the development of firms' capability to establish new partnerships with startups: the case of banks in the Luxembourg ecosystem


Research Question
Which factors foster symbiotic innovation collaboration between startups and large firms?
Chapter 1
Context, objectives and theoretical approach
Section 1
Positioning of research on startup - large firm collaboration with regard to the literature
Section 2
An analogy between startup - large firm collaboration and biological symbiosis
Section 3
A multi-perspective and dynamic analysis of the collaborative process in its ecosystem
Synthesis:
A conceptual model integrating a holistic approach to startup - large firm collaboration for innovation
Chapter 2
Epistemological and methodological approach
Identifying the factors fostering symbiotic innovation collaboration between startups and large companies:
4 research articles integrating 1 process, 2 theoretical approaches, 3 analytical perspectives, 4 organizational levels
Angle
Theoretical context
Contributions
Questionings
Chapter 3 Article 1
Barriers encountered by startups and means to reduce distance
Links between forms of geographic and non-geographic proximity and organizational factors
Contribution to a strategy based on proximity 4 levels of key factors 2+1 phase process
Influence of startups, large firms and the ecosystem on the capability to collaborate?
Chapter 4 Article 2
Characteristics of startup founding teams (S)
Links between knowledge, forms of cognitive and social proximity and the capability to collaborate
Complementary skills in S teams related to the proximity to the LF
Means and resources of the LF needed for collaboration with startups?
Chapter 5 Article 3
Means implemented in the large firm (LF)
Implementing the development of dynamic capabilities for open innovation
Role of internal innovation intermediaries Organizational Transformation
Influence from other ecosystem stakeholders and experts to develop S-LF collaborations?
Chapter 6 Article 4
Role of Innovation Intermediaries (I²) in the ecosystem
Regenerating the dynamic capabilities of LFs to build partnerships
Transformational role of I² on the organization of LFs and their capability to create partnerships
Develop an integrated model for symb. collab. based on proximity and dynamic capabilities?
Chapter 7
Discussion, conclusions and perspectives for future research

CHAPTER 6 - Article 4: Innovation intermediaries' roles in the development of firms' capability to establish new partnerships with startups: the case of banks in the Luxembourg ecosystem

This article is co-authored with Véronique Schaeffer[20]

6.0. Extended abstract

Abstract: The objective of this article is to study the roles of innovation intermediaries in regenerating the dynamic capabilities of traditional, highly hierarchical and innovation-challenged organizations. In particular, their roles on the capability to build new collaborations is explored in this article. We focus on the banking sector which is currently facing huge innovation challenges and has to manage the transition from a highly structured business to a strong involvement in the open and changing world of the digital economy. Our approach is qualitative and based on observations and interviews with actors involved in an open innovation ecosystem. We use the dynamic capabilities framework to understand how some of these innovation intermediaries influence the banks' ability to establish new collaborations with fintechs and startups. Our results show the crucial and interdependent roles of innovation intermediaries, both external and internal, in the regeneration of the dynamic capabilities of banks, of which they are valuable resources. They also show that banks are not only adapting to their innovation ecosystem, but that they are also full-fledged players in its co-construction, which makes them complementary to the external innovation intermediaries of the ecosystem. A third result underlines the

[20] An estimation of the personal contribution for this article is available in Appendix 1.

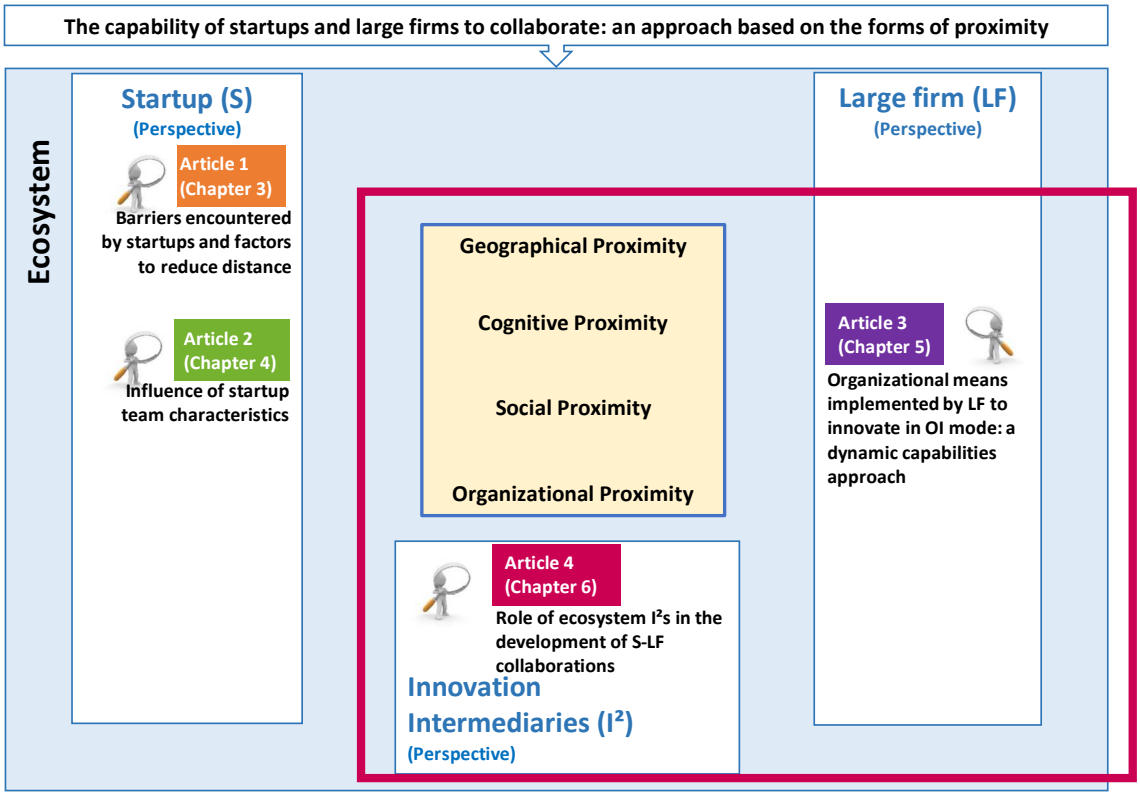
crucial importance of the development of relational capabilities in the dynamics of the entire ecosystem.

Keywords: Innovation intermediaries, Banking sector, Dynamic capabilities, Digital technologies, Open Innovation ecosystem, Accelerators, Digital consultants, Open Innovation corporate club.

Positioning of the article within the thesis

This fourth article represents the third perspective explored on startup-large firm collaboration: that of innovation intermediaries. From the first article of the thesis, they appeared as keystones of this relationship, but also as levers in the indispensable dynamics of the ecosystem in which they evolve. Based on the unique case of an ecosystem, this qualitative study focused on the development of collaborations between banks and fintech or startups, given the challenges that these actors face, in terms of both innovation and collaboration. The figure below shows the positioning of the paper (magenta framework) within the conceptual framework of the thesis.

Figure 29 - Positioning of Article 4 in the conceptual framework of the thesis



Legend: S = Startup, LF = Large firm, I² = Innovation Intermediaries, OI = Open Innovation

Key results and originality

Our results showed the presence of a diversity of intermediaries in the ecosystem with different but also some overlapping roles. This underlines not only their links with the ecosystem actors, but also their interactions with each other, which surely contributes to the smooth, flat coordination of their actions in favour of the ecosystem actors. This research contributes to the knowledge of the different roles of innovation intermediaries in the process of regenerating the dynamic capabilities of large organizations that are strongly challenged by digitalization, digital competition, strict regulation and strong internal routines. Thus, a new role of innovation intermediaries in this context is their capability to transform organizations internally. In this sense, innovation intermediaries can be seen as intangible resources of the organizations that call upon them. We have also drawn attention to the fact that the catalytic role of external innovation intermediaries on the dynamics of the collective ecosystem is only possible if they can meet the appropriate and committed internal actors, i.e. the innovation middle managers deployed by banks, to connect and co-construct with them collaborative solutions including Fintech or startups.

Implications for this doctoral work

This fourth article reinforces the initial results of the first article and provides other, more specific, results on the role of these external actors as intangible resources of organizations from which they are external and independent (without hierarchy). This fourth and last article also shows that the dynamics of the open innovation ecosystem result from a real collective contribution to its development, including innovation intermediaries, firms, startups, Fintech, numerous experts from various fields, and public authorities. This collective intelligence makes the ecosystem for innovation a dynamic and interconnected community.

Research valuation

Communications in peer-reviewed conferences in 2019

"Regenerating dynamic capabilities in innovation ecosystems: the case of the banking sector facing digitization", *EURAM 19 - European Academy of Management Conference*, SIG Innovation, 2019, Lisbon, Portugal, June 26-28, 2019.

"Building dynamic capabilities within an innovation ecosystem: the case of the banking sector", *RADMA - R&D Management Conference*, Ecole Polytechnique et HEC, Paris, June 17-21, 2019.

"Building dynamic capabilities in the digital era: the case of the banking sector", *28ème Conférence de l'AIMS - Association Internationale de Management Stratégique, 2019*, Dakar, Senegal, June 12-14, 2019.

Presentation in a research seminar in 2016

“Open innovation in retail banking: Organizational perspective of an ecosystem”, *ICN Business School Research Seminar*, Nancy, October 6, 2016.

6.1. Introduction

The digital era gives rise to many challenges for incumbents urged to innovate in services (Barrett, Davidson, Prabhu, & Vargo, 2015). The spread of digital technologies over a wide range of economic activities leads to the emergence of plenty of entrepreneurial opportunities. The advent of such generic technologies diffused through a wide range of industries has already occurred in the past with for example the development of advanced materials, biotechnologies or technologies of information and communication after the 1980s (Keenan, 2003; Maine & Garnsey, 2006; Oliver, 1999) which impact many industrial or service activities. However, the impact of digital technologies presents specificities that modify current entrepreneurial and innovation processes (Nambisan, 2017; Nambisan, Lyytinen, Majchrzak, & Song, 2017) and have consequences on the strategic management process, because it causes a perpetual change both in the environment and in the behavior of actors from this environment, increasingly connected. The adaptation to this digitalized widely open context requires the regeneration of strong dynamic capabilities to drive the adaptation of organizations evolving previously in stable environment (Ambrosini, Bowman, & Collier, 2009; Teece, 2018). This paper deals with the challenges associated to the regeneration of such capabilities in traditional industries within their innovation ecosystem.

Based on the existing typology of innovation ecosystem highlighted by Gomes, Facin, Salerno, & Ikenami (2016), the ecosystem we chose to study owns the characteristics of the so called Jam Central Model proposed by Zahra & Nambisan (2012) that the authors define as follows: “a collection of independent entities, such as research centers, collaborating to envision and to develop an innovation in an emergent or radically new field. The term ‘jam’ signifies the improvisational nature of innovation (i.e., the objectives and direction of innovation tend to emerge organically from the collaboration) and the lack of centralized leadership in the ecosystem”. Indeed, the stakeholders involved in this innovation ecosystem are organizationally independent and their collaborations are based on an ad hoc coordination of actors and a diffuse, thus not power-based governance.

We focus on the case of the banking sector that is undergoing a high pressure coming from technological evolution. Indeed, like other industries, this sector is increasingly impacted by the emergence of brand new digital technologies and by new demands coming from their hyper-connected customers. To stay into the race, banks have thus to renew their business model to sustain their competitive advantage on the long run. Teece (2010, p.172) defines a business model as the "design or architecture of the value creation, delivery, and capture mechanisms" of a firm. The components constituting a business model are "the firm's value proposition and market segments, the structure of the value chain required for realizing the value proposition, the mechanisms of value capture that the firm deploys, and how these elements are linked together in an architecture" (Saebi, Lien, & Foss, 2017). The two-way and complex link between technologies and business model choice has been shown by Baden-fuller & Haefliger (2013) and is considered by the authors as having received little attention. Furthermore, business models are closely linked to organizations' dynamic capabilities (Teece, 2018), which are considered by Teece, Pisano, & Shuen (1997) as "the firm's ability to integrate, build, and reconfigure internal and external competences to address rapidly changing environments." Following Teece (2018), "the highest-order capabilities are those on which top management is (or should be) most focused. They are the most relevant for the innovation and selection of business models that address the problems and opportunities the company is endeavoring to solve/exploit." In addition, the current era of collaboration gave rise over the last decade to the expansion of open innovation (Chesbrough, 2003; Chesbrough & Appleyard, 2007; West, Salter, Vanhaverbeke, & Chesbrough, 2014). This open mode of collaboration to innovate has become a must for banks (Fasnacht, 2009). It can also be considered as a means to accelerate organizational change following Gianiodis, Ettlie, & Urbina (2014) who claim for a better understanding of organizational changes to help firms to develop this transition and the associated capabilities in order to capture value. The changes linked to a turbulent environment and the fact that the processes may be internal or external to the firm lead us to focus especially on regenerative dynamic capabilities as defined by Ambrosini et al. (2009). In their near environment, their open innovation ecosystem, innovation intermediaries play a crucial role for the stakeholders they serve. Bertin (2019) showed that intermediaries represent the

keystone of the collaboration between startups and large firms by allowing the construction and then the progress of the project thanks to their regular exchanges with the partners, their understanding and knowledge of the partners and the ecosystem network. According to (Howells, 2006), the field of research on intermediaries is quite fragmented, with a lack of studies focusing on the holistic role of intermediaries in the firms' innovation process. Furthermore, (Agogué, Yström, & Le Masson, 2013) argue "that the industries studied are limited, although several argue that an important function for the intermediary is to establish connections between industries." (Randhawa, Wilden, & Gudergan, 2018) invite "to investigate the 'open service innovation capabilities', focusing on the capabilities by clients as opposed to the intermediary". The variety of roles of innovation intermediaries has not been studied yet following the perspective of their influence on banks capabilities within an open innovation ecosystem.

In line with these calls, this paper aims to investigate the various roles of external innovation intermediaries in the ability of banks to build new partnerships with fintech and startups within the open innovation ecosystem of Luxembourg. We use the framework of dynamic capabilities as a process to explore these roles and highlight their influence in the regeneration of higher-order capabilities of traditional industries, which need to develop them to cope with the exponential increase of digital technologies. This paper contributes to knowledge in the field of strategic management by showing how traditional, highly structured organizations such as banks can regenerate their higher-order dynamic capabilities by being strongly engaged in their open innovation ecosystem and by being connected to a variety of actors from their ecosystem, including innovation intermediaries.

6.2. Literature review

6.2.1. New needs resulting from digitalization of business activities

The diffusion of digital technologies results in a deep transformation of innovation activities and entrepreneurial ecosystems affecting many traditional industries

outside information and communication sector. Social media enables open strategy by increasing two properties that are essential to this strategy: inclusiveness and transparency (Baptista, Wilson, Galliers, & Bynghall, 2017). This influence comes from the open, participative nature of social media (Huang, Baptista, & Newell, 2015). Hence, digitalization is a driving factor pushing organizations to more openness, externally but also internally. Beside this effect where organizations are users of digital innovations, digital technologies provoke a deep modification of current entrepreneurial and innovation processes (Nambisan, 2017; Nambisan et al., 2017) and have consequences on the strategic management process, because it causes a perpetual change both in the environment and in the behavior of actors from this environment.

The first major change to be considered is the disappearance of boundaries structuring the entrepreneurial and innovation outcomes and processes. Boundaries between industries and markets evolve in a fluid and continuous process. The concepts of spatial boundaries and location loose of relevance because of the dematerialization of business activities. Business models are in a perpetual redefinition and the boundaries between different stages of the entrepreneurial and innovation process are fuzzier (Ries, 2011). The second major change is the increasingly distributed nature of the innovation process (Bogers & West, 2012). It leads to collective innovation processes that involve many actors having different goals and behaviors. New constraints, threats and new opportunities arise from this.

We chose to focus on the case of the banking sector as it is a good example of a mature sector anchored in laws, in regulatory authorities and where large organizations behave as central actors. Digitalization and open innovation have changed the traditional business model of banks and provoked the entrance of many new actors within the ecosystem of banks. Indeed, the new digitalized, openness context urges banks to find new ways, namely new sustainable business models, to cope with the huge changes occurring in their environment. These new ways are closely linked to the development of their innovation capacity, to their openness level to external actors from the ecosystem, and to their capability to manage internal and external actors and knowledge (Bertin & Schaeffer, 2020).

Digitalization has changed the whole banking landscape and ecosystems: market itself and competition game rules, banking activities and internal processes including the new role of bankers. Indeed, the huge potential in terms of new services offered by digital technologies gave birth to new needs from hyper-connected customers, and therefore to a need from banks to transform their activities to be able to bring the appropriate value added requested by their customers. Furthermore, competition in the banking sector is scarce because of online banking developed by some traditional competitors, but mostly by non-traditional ones such as insurance companies or other organizations. The latter are not known from the start for their banking activities, but they decided to develop this service offering for their existing customers. These new, numerous players can divert customers from their usual bank. In addition, the threat of potential new big entrants -the GAFAM- in banking activities is growing. Hence, for banks, digitalization can be considered both as a threat and as an opportunity. The worst threat is to disappear if unable to compete by digitalizing existing and new activities. From another perspective, digitalization is also an opportunity for banks to improve their own activities and processes and to restructure them by finding new business models based on digital technologies, and that will allow them both to create and to capture value.

Hence, traditional banks are in upheaval today and just beginning to renew their business models to be able to compete on the long run. Core rigidities (Leonard-Barton, 1992) are especially strong in this industry because of the nature of activities that leads to a culture of control of risks resulting in a strong control of activities and processes (Deville, Ferrier, & Leleu, 2014). As shown by Martovoy, Mention, & Torkkeli (2015) and Bertin & Schaeffer (2020), bank’s staff appears to be highly important for financial innovation. Therefore, their inclusion in the whole process of business transformation –namely the development of sensing, seizing and reconfiguring capabilities- is necessary, nay mandatory. The challenge for today’s banks is thus to become more proactive than reactive. To do so, they need to stay very tuned to their environment and explore new knowledge spaces by opening their frontiers and becoming involved actors of their innovation and ecosystem. Banks also need to accelerate the change process to be able to compete efficiently. Once the

right business model designed, banks then need to reconfigure their resources and capabilities in accordance with the open strategy they have developed.

In this moving, open environment where new business opportunities emerge, organizations have to regenerate their dynamic capabilities (Ambrosini et al., 2009) to be able to sense and to seize the business opportunities and to manage the reconfiguration of their resources that goes with the implementation of new business models. The regeneration of dynamic capabilities is particularly challenging for organizations which were on stable markets, did not develop dynamic capabilities over time and do not possess internal competences in advanced digital technologies.

6.2.2. Dynamic capabilities in the digital competition race

Digitalization of business activities at a global scale gives rise to a fierce competition between an ever-increasing number of players. Digitalization democratization also leads to an acceleration of the need for organizations to change and innovate. These huge, constant changes from the environment urge organizations to adapt themselves permanently to be able to keep their competitive advantage. This implies the necessity to design a new business model allowing organizations to create and capture value (Teece, 2018), and not just to adopt new digital tools. Hence, organizations need to develop dynamic capabilities in order to foster this wealth creation and capture (Teece et al., 1997). Dynamic capabilities enable organizations to identify and seize business opportunities through the continuous realignment of tangible and intangible assets (Teece, 2007). These capabilities are of higher-order as they come above ordinary, operational capabilities (Teece, 2018; Winter, 2003). These higher-order strategic capabilities are directly linked to the competitive advantage of organizations, and to their ability to sustain it. Following Teece et al. (1997), “to be strategic, a capability must be honed to a user need (so there is a source of revenues), unique (so that the products/services produced can be priced without too much regard to competition) and difficult to replicate (so profits will not be competed away).” The framework of dynamic capabilities consists of the sensing, seizing, and transforming, what will allow an organization to design and then implement its new business model (Teece, 2018). The links between these three

dimensions of dynamic capabilities and digitalization of activities are emphasized hereafter.

Sensing capabilities

The development of digital technologies can lead to threats, but also to the emergence of many new business opportunities, which can conduct organizations to enter new fields of business. The identification and shaping of opportunities is a constant effort of exploration “across technologies and markets, both ‘local’ and ‘distant’” (March and Simon, 1958; Nelson and Winter, 1982 in Teece (2009, p.9)).” It relates to “a scanning, creation, learning, and interpretive activity. Investment in research and related activities is usually a necessary complement to this activity” (Teece, 2009, p.9). For an organization the difficulties associated to the detection and the integration of new fields of business are multiple and call on the development of environmental scanning (Robinson & Simmons, 2018) and foresight activities (Heger & Rohrbeck, 2012), beside the external focus of the organization directed by the current activities which are not oriented towards the detection of the emergence of new fields. Foresight activities are developed by some organizations to increase their ability to identify early new fields of business, which are sensing activities necessary to make strategic decisions that engage the trajectory of the organization on a long-term perspective (Heger & Rohrbeck, 2012).

A peripheral vision is necessary to detect early opportunities and threats which are outside the current focus of the organization (Day & Schoemaker, 2004). Robinson & Simmons (2018) show that scanning is not an individual activity within organizations, but that the ability to engage the organization as a whole to gather information about the evolution of the environment is a key element in environmental scanning activities. Beside strategy teams that use personal and professional networks to gather information, employees who have personal networks and personal relations with customers are also precious sources of information. The authors also show the importance of external sources of information such as industry associations, industrial and market intelligence reports, personal networks and customers. These external information sources complement internal and organized ones.

At the intra-organizational level, the new role of middle managers in firms has been emphasized, beyond their traditional role of being part of a firm's control system (Floyd & Wooldridge, 1994). Three decades ago Wooldridge and Floyd (1990, p.240) have already highlighted that middle managers have to be involved in strategy to improve strategic decision making, and that context and organizational structures and human resource policy have thus to be "articulated (…) [to] encourage middle managers to think strategically." This role is even more crucial in times of redefinition of the organization's strategy, and within a context of openness to external actors. If opening-up their frontiers to external actors is a must in an open strategy context, organizations also have to open up inside their own boundaries by widening the potential contributors to strategic decisions and thus involving other echelons in the strategic decision making process, such as middle managers (Baptista et al., 2017). Therefore as highlighted by several scholars (Birkinshaw, 2017; Hautz, Seidl, & Whittington, 2017), open strategy as a necessary, collective process goes with both transparency and inclusion. For banks, where strategies are based on data confidentiality, nay secrecy, and where competition is especially strong, openness is a difficult challenge. To cope with the problem of being an easy-to-be-copied first-mover and of protection against imitation, Rivkin (2000) suggests organizations should opt for a complex strategy with tacit processes where competitive advantage is hidden and thus difficult to be recognized and thus analyzed by external actors.

Seizing capabilities

Based on sensing of an opportunity, the organization must then offer the adequate products, services or processes (Teece, 2007). Seizing capabilities includes the design of business models built to create value for the customer and to capture this value (Teece, 2018). Teece underlines there is no consensual definition of business model and suggests that "a business model defines how the enterprise creates and delivers value to customers, and then converts payments received to profit" ; he adds that "in essence, a business model embodies nothing less than the organizational and financial 'architecture' of a business" (Teece, 2010). Seizing capabilities also include protection of tangible and intangible (human resources) capital, an attractive

incentive policy for employees, together with “strong relationships [that] must also be forged externally with suppliers, complementors, and customers” (Teece, 2011).

Banks are traditionally hierarchical organizations (Deville et al., 2014), where employees follow highly standardized processes and strict banking regulations that are mandatory constraints. Designing new business models in this context is difficult because of the underlying challenges in terms of organizational and cultural changes. Indeed, highly hierarchical organizations develop highly routinized processes and procedures over time. These routines, although necessary to coordination and operational activities, can become rigidities (Leonard-Barton, 1992). Moreover, digitalization of banking activities can be a reinforcement factor of some core rigidities because of people’s potential resistance to change. Therefore, motivation of people and an adopted incentive system are crucial to lead this change to success.

Initial drawbacks of banks have also to be taken into account in their change management process. Indeed, the fact that traditional banks are not innovative by nature and have therefore no innovation culture implies that they have to learn from other actors from their innovation ecosystem to innovate and cope with digital technologies. In terms of collaboration, they are more used to transactional partnerships than to relational ones; they have to learn it too, within the ecosystem, and thus develop relational capabilities (Helfat et al., 2007). Infusing the appropriate innovation culture within the organization is essential for banks to perform in the digital competition race. That means human beings are at the center of banks transformation processes, much more than implementation of technologies as such.

Reconfiguring capabilities

Reconfiguring capabilities are about threats management and transforming the organization (Teece, 2007). They lead to the sustainability of competitive advantage over time: “A key to sustained profitable growth is the ability to recombine and to reconfigure assets and organizational structures as the enterprise grows, and as markets and technologies change, as they surely will” (Teece, 2007). That means organizations must reconfigure even in times of growth with the purpose to maintain their advantage over competitors and despite changes in their environment. The

managerial system, skills and knowledge base, technical systems, and values and norms (foundation of the organizational culture) are sources of rigidities that inhibit the evolution and the reconfiguration of the organization. The most important sources of rigidity is the organizational culture, because it is collectively shared, built over time, intangible and it is made of norms and values that drive unconsciously behaviors of organization members (Greenwood & Suddaby, 2006; Leonard-Barton, 1992). The reconfiguring capabilities rely on the ability of the organization to learn and to overcome core rigidities that inhibit the ability to implement new business models. Organizations have to promote learning and therefore deploy incentive systems to motivate employees to learn and share information and knowledge, to explore new ones too (Teece, 2007).

6.2.3. Innovation intermediaries and the regeneration of organizations' dynamic capabilities

De Silva, Howells, & Meyer (2018) define innovation intermediaries as "organizations that provide a supportive role for collaboration between two or more parties during various stages of the innovation process". Stewart & Hyysalo (2008) highlight that "Two crucial features of the environment that innovation intermediaries engage with are: (1) the unpredictability of technological change, market organization and user uptake and (2) an absence of existing linkages between potential users and suppliers that need to be created in order or innovation to occur and be sustained." This unpredictability is strongly present for the banking sector and there was traditionally no dedicated existing linkers helping banks to connect to key stakeholders to innovate in an open innovation mode. Furthermore, following Kivimaa, Boon, Hyysalo, & Klerkx (2019) "intermediaries are found to bridge between actors involved in situations where direct interaction is difficult due to high transaction costs (e.g. locating a suitable partner to collaborate with, disincentives to collaborate) or communication problems resulting from differences in culture, interests, and capacity to absorb or exchange knowledge." These differences materialize the cognitive distance existing between stakeholders and that have to be managed by them by searching for more proximity so that they can interact and collaborate (Bertin, 2019). They also reflect the organizational difficulties encountered by banks in managing the

internal and the external and thus the process of open innovation as a whole in a context of increasing digitalization (Bertin & Schaeffer, 2020). Beyond the roles of brokering or networking traditionally associated to innovation intermediaries, Agogué et al. (2013) highlighted their exploring role, describing them as “architect which designs prerequisites and offers leadership in the process of joint exploration and creation of knowledge”, making thus intermediaries active in this process. The next section presents our research study on the various roles of intermediaries on banks’ capability to build new partnerships to innovate in a given ecosystem.

6.3. Methodology

We adopted a case study approach to explore the foundations of a complex organizational phenomenon. This case study has an instrumental value, in the sense that the intention of the research is not to describe all aspects of the case and then mobilize a set of theories to explain the situations observed. This case is used as a field of observation to study the influence of innovation intermediaries on the regeneration of strategic dynamic capabilities in a mature firm having evolved in a stable context and facing the need to adapt to a fast-moving environment in the digital era. This phenomenon could have been studied in other contexts with similar characteristics (Stake, 1998).

We choose the single case study of the ecosystem of Luxembourg because it shows a series of changes in coherence with the existing theories on business model innovation and open innovation presented in the previous part of this article. It expanded these last years to develop the adaptability and capability to innovate of local organizations, among which banks, and to foster entrepreneurship through the support of startups and fintech via incubators and accelerators. Several specific characteristics of the Luxembourger ecosystem led us to choose it as field of study. Indeed, firstly Luxembourg is clearly focused on technology and innovation, and digitalization is a priority for the Luxembourger government. Secondly, Luxembourg has built a growing startup and fintech ecosystem. Thirdly, as a gateway to European markets, communication is facilitated inside the ecosystem itself, but also with the

outside because of the generalized use of the English language, what makes Luxembourg naturally prone to open innovation. Finally, stakeholders from the ecosystem are geographically close to each other because of the country size, which allows to reduce distances between people. Many data such as reports, videos and press releases are publicly available to present these aspects of the development and activities of this ecosystem.

We also conducted interviews to collect data from a diversity of stakeholders involved in the phenomena studied (Table 32), in order to gather information necessary for our understanding of the regeneration of dynamic capabilities and that cannot be observed from the outside. The aim of these interviews was to collect descriptions of the world in which respondents are involved in the phenomenon studied and to share their interpretation of the meaning of this phenomenon (King, 2004; Kvale, 1983). Then, the aim of the first series of interviews internal to banks was to understand through interviewees' description the challenges and changes introduced to adapt the banking system in the digital era, but also to collect their perception of the difficulties associated to this transition. The second series of interviews was dedicated to the various roles of external innovation intermediaries in the ecosystem as a whole and more specifically in the capability of banks to build new partnerships with startups and fintech. According to Kvale (1983), the researcher should not impose an overly rigid structure in the conduct of the interview but should favor exchange, in order to perceive the interviewee's point of view. We conducted 12 semi-structured interviews in order to bring out in the discussion an understanding of the mechanisms at stake in the evolution of banks' and intermediaries' organization. Their duration was from 30 to 90 minutes.

Table 32 – Interviewees

Codes	**Interviewees**	**Functions**	**Type**
DC	Digital consulting agency	Country Head Luxembourg	Intermediary
CC	Open innovation corporate club	Corporate Innovation Manager	Intermediary

SA-BK	Startup Accelerator of Bank2	Director of the accelerator	Intermediary
SA-HUB	Startup Accelerator (abroad) deployed by Bank2	Chief Executive Officer	Intermediary
FA	Fintech Accelerator	Head of Partnerships and Ecosystem	Intermediary
CO-CEO	Community working space (building and organization)	Chief Executive Officer	Policy and financial support
SI-CEO	Incubator	Chief Executive Officer	Actor from the OI ecosystem
BK1-HRM	Bank1	Human Resources Manager	Bank
BK1-INN	Bank1	Head of Innovation	Bank
BK1-STR	Bank1	Head of Strategy	Bank
BK2	Bank2	Former Director in bank2	Bank
BK3	Bank3	Former Director in bank3	Bank

We asked questions to banks representatives about the new challenges for banks in the digital era, their open innovation strategy, the internal change supporting the evolution of the activities of the bank, the difficulties associated to these changes and the role of actors from the ecosystem in the transformation of banks. We then asked to innovation intermediaries about their activities, about their roles in direction to firms, especially banks having integrated in their strategy the building of new partnerships with startups and fintech. The interviews have been recorded and transcribed into text.

We conducted a qualitative analysis of these data through a three-steps process leading to identify first-order, second order and third order codes (Gioia, Corley, & Hamilton, 2012) which describe the main aspects of our theoretical findings. Data coding was undertaken means NVIVO software.

6.4. Results

The analysis of the interviews by a process of systematic coding organized in three steps leads to identify two main categories of results, namely the focus shift on the innovation ecosystem due to the threats and strategic challenges faced by banks in the digital era, and the involvement of innovation intermediaries in the regeneration of banks' dynamic capabilities.

6.4.1. Threats, strategic challenges and focus shift on the innovation ecosystem

The digitalization of activities leads to deep changes which affect business models, structures, processes and human skills (Brynjolfsson & Mcafee, 2012). The cases of Banks studied clearly show the strategic challenges associated to the diffusion of digital technologies in the banking sector. There are external challenges associated to the evolution of the market of banking products and services that threats the traditional banking activities and that also constitutes opportunities for new businesses. The evolution of the banking sector leads to redesign the organization of banks operational activities and to implement technological innovation associated to digital technologies.

The dematerialization of banking activities, the emergence of new competitors with the development of online banks and the rapid pace of innovation in the financial sector with the development of a dynamic entrepreneurial ecosystem around financial technologies provoke an important restructuration of the processes structuring the traditional banking sector activities and the necessity to develop commercial activities, reactivity, specific and high-level services. An important challenge associated to this evolution is the renewal of employee's competences to use new tools, to understand new product and to develop the ability to assist customers when using the new services.

The deep evolution of operational activities has to be driven by the implementation of new strategies integrating the deep changes of the technological environment and its internal and external consequences. Beyond the ability to drive the evolution of

operational capabilities through the activation of second-order capabilities, banks have to develop higher-order capabilities, as defined by Teece (2018) and Teece et al. (1997) to be able to sense new opportunities, to seize them and to implement new, adaptive business models in a fast-moving environment.

Table 33 – Major threats for banks identified and their challenges to innovate in collaboration with startups or fintech

Dimension	Item	Verbatim
Externally: Threats from the environment	Impact of digitalisation on activities	*"We see that fewer and fewer clients are going to our agencies."* (BK1-HRM) *"You see these neo-banks popping up all over the place... Today, if we want to continue to exist, it is absolutely necessary that we are able to bring this differentiation in the quality of service that we offer to our clients and this added value..."* (BK2-CEO) *"In 2014 the group became aware of the digital challenges it would have to face. And it was with this in mind that they set up the first accelerator." (SA-HUB)*
	Risk taking issue toward brand new technologies	*"And then suffer setbacks with technologies that are not yet mature... They [banks] don't take risks... And so it's not installed yet."* (DC) *"By definition, financial institutions manage risk. So they prefer to use a mature solution that has already been implemented, that has experience, that is no longer in the startup phase and so on, rather than a solution that is not yet implemented, that does not yet have clients."* (DC) *"There are solutions that are very innovative but that*

		are not going to be adopted because they have not proven themselves." (DC)
	Very stringent banking regulation	*"We absolutely cannot afford to collaborate with companies that do not follow the strictest regulatory rules that apply locally in Luxembourg. We set the bar relatively high in terms of regulation for the protection of our clients."* (BK1-INN) *"And you know that in Europe, regulation for fintech is much more drastic in general, except perhaps in Estonia, than it can be for example in Great-Britain."* (BK1-INN) *"Banks still have an extremely difficult burden because our legacy systems are ultra-heavy and force us to follow very strict procedures."* (BK3) *"Artificial intelligence, we don't necessarily know about it. It could be black boxes. And the regulator hates black boxes..."* (DC) *"The players involved in innovation must be able to develop fine-tuning systems in the same way as traditional systems so that the regulator is effectively reassured about what the technology can do. (...) Fintechs or startups must set up control or audit systems that can reassure the regulator."* (DC) *"Luxembourg is making great efforts to regulate certain activities related to the blockchain. This is not the case in all countries."* (DC)
	Acceleration of time	*"There is a shortening of the time line in relation to the response time and the complexity of the responses."*

		(BK1-HRM) *"So before, if there was a problem to solve, he had six months to answer! So now it's... now, so if we don't bring an answer it's the competitor who will do it!"* (BK1-HRM) *"The project can be delayed, it costs more than expected because there is no expertise within the institution to implement the technology."* (DC)
<u>Internally</u>: Challenges to overcome in order to collaborate with fintech and startups	Cultural differences between banks and fintech / startups	*"I think the approach in terms of data management is radically different between a bank and most startups. So I would say that today this is one of the biggest obstacles."* (BK1-INN) *"We have entered a new century, a new area, and if we want to continue to exist, we must accept to train and to adapt."* (BK2) *"These are already two worlds that cannot talk to each other much and are beginning to tame each other. I think it's changed a lot in the last five years."* (BK3) *"The problem is the discrepancy between the bank and fintech, where the startup does not have the same way of working, the same profile or the same people as in the bank. So we have to find ways to work together."* (DC) *"And also on the fintech side there were also small things in relation to the financial institutions... which was indeed a cultural and managerial difference to be able to get closer to the financial institutions."* (DC)
	Technological	*"[Co-developing with startups or Fintechs], I'd like to*

	knowledge	*tell you that it's primarily a cultural problem, but quite honestly, the case that we see the most, it's more problematic, it's clearly more to do with technology."* (BK1-INN) *"We must not only accept, but also be able to handle all these new technologies."* (BK2) *"Then there is the issue of digital culture and knowledge about these technologies more generally within the bank's business lines. (…)There's a barrier from traditional IT that is not necessarily familiar with these new technologies."* (DC) *"Another hindrance, and we see it every day, is the lack of knowledge regarding the benefits of technology, Fintech, and what it can really bring to jobs and problems."* (DC)
	Human and financial resources, and size effect	*"Today in a bank you have about 60% of the employees who are directly or indirectly involved in compliance issues. 20 to 30 % are on all that IT... can you imagine what remains for the client? And somehow I don't know how to manage that."* (BK3) *"Large financial institutions, even if the risk culture is there as it is in any financial institution, they still have a stronger backbone and can afford to move to technologies that are not fully mature."* (DC)

6.4.2. Involvement of innovation intermediaries in the regeneration of banks' dynamic capabilities

Sensing

Intermediaries' activities designed to sense the environment innovation opportunities (see Table 34) for their ecosystem's stakeholders are mainly based on technological opportunity exploration within the ecosystem but also worldwide, on environmental opportunity exploration, on network building including all key-stakeholders from the ecosystem, and on the creation of a single information gateway for corporates. Thus, intermediaries base their actions on what exists in the ecosystem and what better could exist given the innovation opportunities arising around the world that might be retrieved. The whole device is supported by a local public strategy willing to develop the appropriate means and infrastructure -namely common premises for several accelerators and incubators in Luxembourg- to support innovation efforts of the ecosystem's stakeholders. The strategic impulse of the Chamber of Commerce and the support from the City of Luxembourg and other major private partners are thus determining in the deployment of the organizational structure dedicated to the community of intermediaries studied. From the specific viewpoint of a partnership between banks and fintech and/or startups, sensing activities undertaken by intermediaries help them understand their environment better and above all quickly, and to potentially access innovative technologies. The single gateway allows a concentration of highly qualified information on innovation opportunities at the same place for everyone. This community process provides time saving, relevant, quality information to corporates, startups and fintech.

Innovation intermediaries' role in sensing activities is to provide quickly high-quality information on innovation opportunities, and for some of them (digital consultant, and fintech accelerator) knowledge related to emergent technologies.

Table 34 - Sensing activities

The result table below shows intermediaries' roles in searching for innovation opportunities and key-stakeholders in the local open innovation ecosystem and abroad.

The codes indicated in the last five columns of the following table allow to identify intermediaries and are presented in table 1.

Intermediary roles upstream to potential partnerships	**Verbatim**	**DC**	**CC**	**SA Bk**	**SA hub**	**FA**
Technological opportunity exploration						
Worldwide watch on startup or fintech projects and technological solutions to be deployed in banks	*"We're actually going to go to fintech and startups to feed our fintech and startup bases. So it's actually doing some watch. For example, this afternoon I'm going to meet an actor who works in the blockchain. So that's how we maintain our knowledge of the ecosystem."* (DC) *"Now one of the roles to be played is indeed to do quality and qualified sourcing to be able to find the right projects for large groups that are highly solicited by startups but do not necessarily have the skills or the internal organization to identify the good quality project that will respond to their problems."* (SA-BK) *"So our mission is not to bring fintechs to Luxembourg but to find the best fintechs around the world and make sure that they work with the players in the financial center."* (FA)	X		X		X

	"Typically if I need a solution for a local bank I will ask my partners around the world: Give me the best solutions in your geographical area. So I'm going to have 20 solutions that are among the best in the world. And we'll sort out the ones that make the most sense for the place." (FA)					
Sourcing of solutions to specific problems encountered by banks: intermediary as solution provider	*"We are also coordinators or quasi leaders on certain innovation projects. Typically, certain problems in the sector will be tackled if the technology does not exist. We'll see which technology providers we could coordinate to find a new solution that we could put on the market."(FA)*					X
Environmental opportunity exploration						
Exploration of new needs and opportunities through market, business and regulatory intelligence	*"We actually have our internal watch structure… We have a regulatory watch and a business watch. This effectively allows us to be more relevant in our knowledge of the business lines in addition to our various missions in the development of the business lines. With both we are quite relevant in our proposals."* (DC) *"Here, I have five shareholders, so as I was saying. Almost all of them have more or less one person in charge of innovation and who is connected with*	X			X	X

	the world of startups to see what is being done in terms of evolution, and with these people, we basically compare the observations we make on the market, Technological developments. In fact, we have meetings that are organized every two months to discuss these issues... starting with a business problem and then finding solutions that respond to it via everyone's networks." (SA-Hub) *"There is a lot of watching, a lot of collaboration and understanding of needs."* (FA)					
Network building of potential partners and experts in the ecosystem						
Network building of partners in the ecosystem (firms, startups, fintech, public and private experts in various fields)	*"If you meet a startup and it's a big hit with what the company has been able to express in a workshop, the Club makes the connection with the other one right away. But it's quite punctual. If we don't have a request for innovation predefined by the company, it's as we go along according to the meetings we have."* (CC) *"I am in a logic of construction, i.e. on the one hand looking for partners and on the other hand startups before really going to identify experts who will be able to support us in a logic of accompaniment. (…) Universities... I've*		X		X	

	worked with some of them in my previous positions. I know just about who to activate, and when." (SA-Hub)					
Information centralization for corporate partners						
Creation of a single gateway for corporates of the ecosystem to access other ecosystem's stakeholders	*"So obviously there are companies that also go directly through the partners. When they are part of the club, the idea was precisely that there should be a single gateway that would facilitate contact according to the business lines and expertise required."* (CC)		X			
Infrastructure and time-saving services offered to the community						
Startups' and fintech's community work offices and equipment to meet with potential partners, services to external partners Facilitation of Fintech on-boarding which is mandatory for them to approach banks but time-consuming	*"We have aggregated the different common processes of banks across Europe and we are going to have a kind of label for our fintechs. If our fintechs correspond to the criteria, once they meet the document, we do an audit, one of our partners does an audit, and another one takes care of the technical part. Once this label is done, they will be much more quickly on-boarded by our banking partners because there are people who have already checked and validated that it works, that from a security point of view it's safe. These are also other initiatives that we want to launch so that innovation is not only found but is also very easily integrated. So instead of filling out 20 catalogues,*			X	X	X

	they fill out one catalogue and it's deployed in 20 banks." (FA)					

Seizing

Intermediaries' role in banks sensing activities (see Table 35) consists first in establishing connections between stakeholders. To that purpose, they activate their networks, and organize events where the whole ecosystem, including banks, fintech and startups, is invited to join. Secondly, they help banks in parallel to analyze their needs in terms of technological innovation (on one hand for their clients, and on the other hand for their staff), making corporates work together on a trust and goodwill basis in order to expand banks innovation directors' knowledge regarding their own stakes and needs. Sharing being at the core of intermediaries activities, they co-construct their activities agenda with their corporate partners among which banks. Thirdly, intermediaries accompany banks by selecting risk-wise technological solutions, nay by providing and/or coordinating them. When necessary, they also involve the whole open innovation ecosystem regarding solutions, such as users, schools, universities, various experts.

Innovation intermediaries help thus banks sensing concrete, appropriate solutions to their needs, taking also into account their specific constraints.

Table 35 - Seizing

The result table below shows intermediaries' roles from the meeting and needs definition to the decision on the effective engagement of stakeholders in the partnership project

Intermediary roles in the partnership	**Verbatim**	**DC**	**CC**	**SA bk**	**SA hub**	**FA**

design stage						
Expert network activation						
Sharing and opening of their whole expert network to the project's stakeholders (fintech, startup, banks)	*"If there are computer coding needs, we call upon the expertise of E who is our partner. If there are marketing needs, we call on coaches from S who is a partner of our accelerator. If there are needs in terms of SEO, communication on the internet, it is the agency L. If there are other needs in terms of tax or accounting, it's our accounting firm. So there again, we are there to respond to personalized needs. Our goal is to allow everyone to make up for time or skills they don't have."* (SA-BK) *"So we connect the fintechs with potential clients, with investors, with technology partners, with research centres, we try to find them employees according to their needs."* (FA)			X		X
Banks needs and stakes analysis						
Understands the needs and propose the best alternatives regarding banks business model	*"Our role is really to help our clients solve their problems, whether they are business model issues, operational efficiency issues or regulatory issues, and how to reduce regulatory costs. So our role is really*	X	X			

renewal needs and/or operational and regulatory effectiveness needs	*to offer our clients the best solution to solve these different issues."* (DC) *"The need must be vital to the company, otherwise there is no call for innovation. We must also make sure that the need is precise but not too much. We focus on the problem and not on the solution, otherwise we are 100% sure that we will never find what we are looking for. In some calls, we had predefined a problem and at the end of the process the company decided to work with a startup that had nothing to do with the initial problem."* (CC)					
Connects banks needs and technology (business model renewal, searching for added value proposal) and translates new technology specificities and advantages in terms of added value	*"So we really go to the heart of the jobs to break down the needs and psychologies of the jobs and then describe how this or that technology can solve problems. This is highly appreciated by clients who have heard about such and such a technology but who don't necessarily see what it can do for them in their business. (...) So obviously our Finlab allows us to train internally, to watch, etc., and then to propose missions to our clients around this new technology."* (DC)	X				
Co-construction of intermediaries' activities with the partners						

Involvement of the partners in the activities of intermediaries (workshops, experience sharing, learning expeditions, etc.) based on their innovation issues managed with agility	*"For example, the subject of innovation challenges has been addressed internally. In this case, an innovation manager will lead the session in front of the others to share with the participants what he has been able to do internally, how he has implemented things, what his difficulties have been. So the principle is really the sharing of experience. (...) Innovation directors meet regularly to discuss their problems. Depending on the subject, it is either the innovation directors or other managers interested in the subject who are chosen. (...) Innovation directors vote to set the agenda."* (CC) *"So I'm constantly looking for new partners and I'm also in charge of the animation of the current partners. Then we animate with them, we co-construct with them the activities of the accelerator."* (SA-BK)		X	X		
Connecting banks and fintech and startups through events						
Connecting banks and startup or Fintech through the organization of a wide range of	*"So the club was created 3 years ago to facilitate exchanges between Luxembourg companies and the startup ecosystem. It was brand new and so we could see that companies*		X	X	X	X

events open to the ecosystem's stakeholders	*were going to see the different players one by one, saying 'here I have this problem, I would like to meet this or that startup', but there was no gateway for these companies. So that's why the club was created."* (CC) *"We really want to have this role of facilitator of innovation and connecting startups and large groups... and we are now seeing that the operating methods we have with corporates are changing. So I think that there is now a good apprehension within large companies that they will have to rely on younger projects, startups to be able to innovate internally."* (SA-BK) *"Our objective is also to make sure that startups are regularly present on our premises and at our events, as well as the partners and corporates we work with to ensure that we can facilitate this connection between startups and corporates."* (SA-Hub) *"We're trying to be a facilitator, trying to get people to meet each other. Here every month, we have a fintech Friday. So we all have drinks together, the members, our partners. We meet 100, 140 people. We have*					

	a drink and that's when things happen. The informal part is very important." (FA)					
Fostering trust-based corporate coopetition						
Facilitation of issues and environment understanding through best practice exchanges among usually competing firms (ethical charter as precondition)	*"For example, today many banks and insurance companies are recruiting enormously around the customer experience, the user experience. When you put the experts from each UX company around a table, there are stars in their eyes because they are not used to talking to each other. So I think that the Club has a great mission to put people in touch, not only with startups, but also between companies on cross-functional positions. There are exchanges of best practices: 'What platform do you use? What tools? What expert did you call on?' There are really nice exchanges, it's great."* (CC)		X			
Involvement of the whole open innovation ecosystem toward solutions						
Involvement of all actors from the open innovation ecosystem regarding solutions (solution testing by users, solicitation of	*"There are absolutely no limits on collaboration and as soon as there is a need to go and test with students or other clients, we call on other public or private actors. It is the very definition of open innovation to solicit a diversity of actors, universities, students, actors of innovation. In the*		X	X	X	

universities and schools, enhancement of corporate coopetition, common events organized, innovation calls open to the whole ecosystem)	*house we try to get everyone to collaborate. If there is a specific subject, we will redirect to the right people."* (CC) *"So, schools, public educational institutions, of course, are called upon, insofar as there are the required safeguards, of course, in terms of intellectual property, security... So we are more like facilitators in putting people in touch with these structures if the companies have not already done so beforehand."* (SA-BK) *"What we are used to doing in terms of good practice is to regularly invite each other to our events, to participate in initiatives that are carried out by each other in a spirit of goodwill. For example, we organized a competition to reward the best collaborations between startups and corporations. And in this context, I passed on the information to all the accelerator and incubators so that they could relay it internally. Because the idea is really to bring the ecosystem to life and not to focus solely on the Hub project."* (SA-Hub)					
Selection of risk-wise appropriate solutions to banks problems						

Selection of startups and fintech solutions in line with banks and firms problems, risk awareness and security for banks	*"From public data we're trying to score the fintechs. So we have a score based on a certain number of data and criteria that we choose that we think are relevant, which means that when a client has a specific request, we can quite easily propose a list of 4 or 5 fintechs that correspond to his needs. This also allows us to see what is being done in the industry, etc."* (DC) *"Calls for innovation are tailor-made services. So we propose different steps up to the organization of an expert selection committee that will help the company to choose the best collaboration."* (CC) *"We select startups on 3 very simple criteria: a legal entity of any kind, with at least two partners, and an innovative project that has been confronted to the market."* (SA-BK) *"What we need are solutions that exist, that may already have one or two clients, that may already have an investment that proves that someone believes in their project and that they won't be dead in 6 months. So there is less risk for our financial partners."* (FA)	X	X	X		X

Transforming

Regarding transforming activities of banks (see Table 36), innovation intermediaries are less present than in the sensing and seizing activities. Indeed, once the partnership with a fintech or a startup has been established, intermediaries withdraw, because they want to remain neutral. However, they are a precious help for banks in the internal diffusion of technology and in the support of the collaboration by providing them the appropriate new helpful experts (startup-corporate collaboration expert, and innovation expert). Intermediaries also deploy efforts in favor of the diffusion of innovation culture in banks. Regarding this last point, corporates attending events organized by innovation intermediaries can be themselves considered as internal intermediaries since they will diffuse the innovation culture within their banks, which means what they have learnt through the external innovation intermediaries' actions. This can however be possible only if there is a strong strategic intent by the bank together with a proactivity materialized by an operational follow-up by banks. The transforming capability is also highly facilitated among banks, which have deployed structural, financial and human resources at regional level, namely startup accelerators.

Table 36 - Transforming

The result table below shows intermediaries' roles in terms of experience enhancement of partnership building to reconfigure organizational assets and structure in order to achieve the common objectives of partners

Intermediary roles in the partnership process phase	**Verbatim**	**DC**	**CC**	**SA bk**	**SA hub**	**FA**
Diffusion of technology in banks						
Supports banks in the use of new technologies by setting up use	*"Our consultants help banks to use technology by setting up use cases. (...) Skills are our internal database. So here it's simply listing among our*	X				

cases, provide to banks their trained and skilled experts in emergent technologies and tools: transfer of technological knowledge	*consultants who has been certified for this or that tool, who is competent to operate a bot... So that's our entire internal database of skills on technologies."* (DC)					
Support to the startup-firm collaboration, technology and innovation						
Once the partnership designed, the intermediary withdraw from it but provides experts in collaboration, technology and innovation consulting to the partners	*"When we work with a client, we give them knowledge about fintech, help them structure a partnership and then we withdraw. We are not part of the relationship that will be established between the bank and fintech. We want to remain independent, because when we give advice, well, there's no conflict of interest, there's no conflict of interest... we remain totally independent."* (DC) *"Then when the startup-corporate relationship is "industrialized", we no longer have a role. In this case, we call on other experts in the fields of startup-corporate collaboration and innovation. For the moment, we have rather gone to the point of organizing committees and then the company and the startup make their*	X	X			

	experience together and we see how it evolves." (CC)					
Enabling culture evolution in banks						
Importance of cultural efforts from banks to maintain the collaboration: Internal intermediaries connected to external intermediaries appear as promising disseminators of culture evolution in banks	*"It's about using innovative tools internally and then using them at our clients' sites. These are often collaborative, group work tools. So we use them internally and then we can deploy them to our clients."* (DC) *"But in the member companies of the club we have a minimum of 50 employees to make it interesting. Otherwise all the activities that we are going to tackle, they won't be able to replicate and adapt them internally if they don't have enough employees to apply the methods. (...) So the idea is to awaken interest, to get people's minds to come up with methodologies and concepts so that the innovation director can then use them internally."* (CC) *"Another difficulty is to be open and to accept to integrate innovations that have not been developed within the banks but outside. (...) We show that it is above all a question of culture... So as I am responsible for our partners, we have innovation*	X	X			X

	breakfasts almost every month and I take them to different industries. So we go to the aerospace industry, medicine, food, transportation, automotive, to show them how others innovate in those industries. And it's all about innovation culture." (FA)					

Table 37 - Overview of the results on the roles of innovation intermediaries in banks' ability to build new partnerships with fintech and startups

Dynamic capabilities	Intermediary roles in the bank - fintech / startup partnership building	Digital consulting agency (DC)	Corporate club (CC)	Bank's startup accelerator (SA-BK)	International startup accelerator (SA-HUB)	Fintech Accelerator (FT)
Sensing activities	Technological opportunity exploration	X		X		X
	Environmental opportunity exploration	X			X	X
	Network building of potential partners and experts in the ecosystem		X		X	
	Information centralization for corporate partners		X			
	Infrastructure and time-saving services offered to the community			X	X	X
Seizing activities	Expert network activation			X		X
	Banks needs and stakes analysis	X	X			
	Co-construction of intermediaries' activities with the partners		X	X		

	Connecting banks and fintech and startups through events		X	X	X	X
	Fostering trust-based corporate coopetition		X			
	Involvement of the whole open innovation ecosystem toward solutions		X	X	X	
	Selection of risk-wise appropriate solutions to banks problems	X	X	X		X
Transforming activities	Diffusion of technology in banks	X				
	Support to the startup-firm collaboration, technology and innovation	X	X			
	Enabling culture evolution in banks	X	X			X

6.5. Discussion

The digital era brings new opportunities of business and a main challenge for mature firms having evolved for many decades in stable environments requiring a strong control of operational activities is to develop strong higher-order dynamic capabilities to design and implement new business models. Our results highlight the different roles played by innovation intermediaries from the ecosystem in the renewal of banks' dynamic capabilities, their impact as catalysts on the ecosystem's dynamics, and the challenges associated to the elaboration of a strategy in an open innovation ecosystem for banks, including the necessity to renew the competences of top managers and middle managers.

6.5.1. The enabling role of innovation intermediaries on banks' dynamic capabilities

Our results show firstly that innovation intermediaries compensate for a lack of connection between stakeholders, in this case banks and Fintechs or startups, who do not know each other a priori. They also help reducing the uncertainty level -and thus the associated reluctance to engage- for stakeholders willing to collaborate for innovation purposes. Indeed, by creating connections between potential partners, innovation intermediaries foster their mutual understanding, necessary to collaborate. Some intermediaries also provide technology translation to banks that means knowledge on what a given new technology can bring to business lines on one hand, and to banks' clients on the other hand. The above results reinforce thus the conclusions of Stewart & Hyysalo (2008). Furthermore, in the extension of the research work of Kivimaa et al. (2019), our study indicates that innovation intermediaries bridge between originally distant, asymmetric partners. Moreover, their role as "architects" (Agogué et al., 2013) is crucial for several dimensions of partnerships between banks and Fintech or startups, and especially the renewal of dynamic capabilities of banks, namely:

- *Sensing activities: searching for newness and generating a "stock" of potential solution providers*. Their own local and global networks allow innovation intermediaries to explore technological opportunities, to constitute a large network of expert Fintech and startups beyond the ecosystem itself, at a worldwide scale. Innovation intermediaries help banks to know their environment and their own ecosystem better and to detect quickly potential existing solutions for them. Through sensing activities, they use thus their exploration and relational skills.

- *Seizing activities: initiating interactions between matching actors and helping to select the right solution with a risk-consciousness*. To strike possible partnerships between banks and Fintech or startups, the innovation intermediaries activate their expert network. Through this stage, they demonstrate their own expertise in understanding and translating new technology, and strong networking, organization, and relational skills.

- *Reconfiguring activities: helping to develop internal innovation culture in banks*. The role of innovation intermediaries is at this stage no more focused on the partnership, but on the smooth implementation of the solution internally. They might foster the diffusion of technology and go on providing helpful external experts from their network if needed. At this stage, innovation intermediaries use their soft and relational skills to help adopting the innovative solution chosen.

Two categories of innovation intermediaries were encountered in the ecosystem explored and emerged from our results: content linkers (content being knowledge and/or information) and network linkers (networks being based on their own knowledge of the local innovation ecosystem's actor competencies). A third category can also be added: content-network linkers. The linkers who assume this double role are highly valuable in the sense that these double competencies give them the ability to have a holistic view of each particular technological problem they face and to find easier potential ways to solve it. In our study, it was notably the case of a consultant specialized in digital management.

6.5.2. Internal innovation intermediaries as crucial linkers between internal and external

As underlined in the previous point, relational capabilities of innovation intermediaries appeared as crucial at all three stages of dynamic capabilities renewal. However, the persons in charge of innovation in banks, who are often middle managers, must possess these relational capabilities too. Indeed, if external innovation intermediaries play a crucial role of catalysts of innovation partnerships in their ecosystem, relationships between banks and Fintech or startups can only occur if banks deploy the right internal innovation intermediary, the one who will be able to connect, interact with Fintech or startups, and then diffuse back the innovation culture within banks. Thus, innovation intermediaries from the ecosystem can only have an impact as catalyst if the right banks' internal innovation intermediaries are deployed. Furthermore, these relationships between internal and external intermediaries allow both mutual understanding and co-construction of innovative solutions. They thus help to move forward to a potential partnership.

Hence, to accompany the huge changes in banks and align operations with the new open strategy, internal linkers are also crucial, both internally and externally. This is in line with the research work of Ben Mahmoud Jouini & Charue-Duboc (2018, p.83), who emphasize in the context of customer-supplier relationships "*the need for an organizational actor with access to both technical experts and company management who take strategic decisions in areas of innovation and development and thus contribute to the instruction of these decisions*". Firstly, these internal intermediaries participate in developing the new innovation culture by fostering internal innovative initiatives, bring their own ideas to improve internal processes and make them evolve, help their teams to understand the impact of the digital changes occurring, and thus also help to decrease resistance to change. An essential condition to educate staff to a new, innovation culture is to adapt the human resource policy consequently: human resource management based on trust, on a higher level of autonomy of staff and a fluid, more informal communication among people are essential. Secondly, the internal innovation intermediaries link the organization to its local innovation ecosystem and thus to external innovation intermediaries and potential innovation partners. This role is crucial for organizations searching for solutions to innovate as these intermediaries allow them to access new knowledge spaces, to gather new, strategic information from their local environment, to access potential future partners, and to other networks able to contribute to their growth and digitalization process development. Another crucial role of these intermediaries is to improve absorptive capacity of new knowledge related to digital innovation.

Hence, beside the crucial need for banks to connect to their ecosystem through external innovation intermediaries, the development of strong dynamic capabilities in a fast-moving environment requires the deployment of an internal collective intelligence based on a less hierarchical and top-down process of decision, in an open strategy mode. Banks have to enhance internal creativity among the whole staff in order to develop an innovation culture. The role of middle managers has then to be completely different. They must be involved in ‘sensing activities’ and play the roles of linkers between strategic level and operational level, coaches for their own teams, contributors to internal improvements and innovative solutions, and also linkers between the internal and the external: the bank and the ecosystem’s actors (external

innovation intermediaries). This leads to necessary changes in human resource management, such as the deployment of an incentive policy dedicated to motivating people to create and to share their innovative ideas.

6.6. Conclusion

The objective of this research paper was to explore the various roles of external innovation intermediaries in the ability of banks to build new partnerships with Fintech and startups within the open innovation ecosystem of Luxembourg. We investigated this issue through the lens of dynamic capabilities that banks need to regenerate. Our results showed a diversity of intermediaries possessing different roles, but also overlapping ones, indicating not only their connections to the ecosystem's actors, but also their interactions with each other, what surely participates in the smooth flat coordination of their actions in favor of this ecosystem's actors. The different roles found are in line with the literature, and particularly the research work of Agogué et al. (2013). Our research contributes to knowledge on the different roles of innovation intermediaries in the regeneration process of dynamic capabilities of large organizations that are hugely challenged by digitalization, hard competition, strict regulation and strong internal routines. Thus, a new role of innovation intermediaries in this context is their ability to transform organizations internally through their various soft and hard skills, and the experts and solution providers they find for them. In that sense, innovation intermediaries can be considered as intangible resources of organizations that call on them.

This research should be of interested to banks and to innovation policy makers. Indeed, it contributes to a better understanding of external innovation intermediaries within the specific framework of the banking sector in open innovation context, which is not enough investigated by researchers. We also drew attention to the point that external innovation intermediaries' catalysts role on the collective ecosystem's dynamics is only possible if they can meet the appropriate and engaged actors, i.e. the middle managers in innovation deployed by banks, to connect to and potentially co-construct with them partnership solutions including Fintech or startups. Our

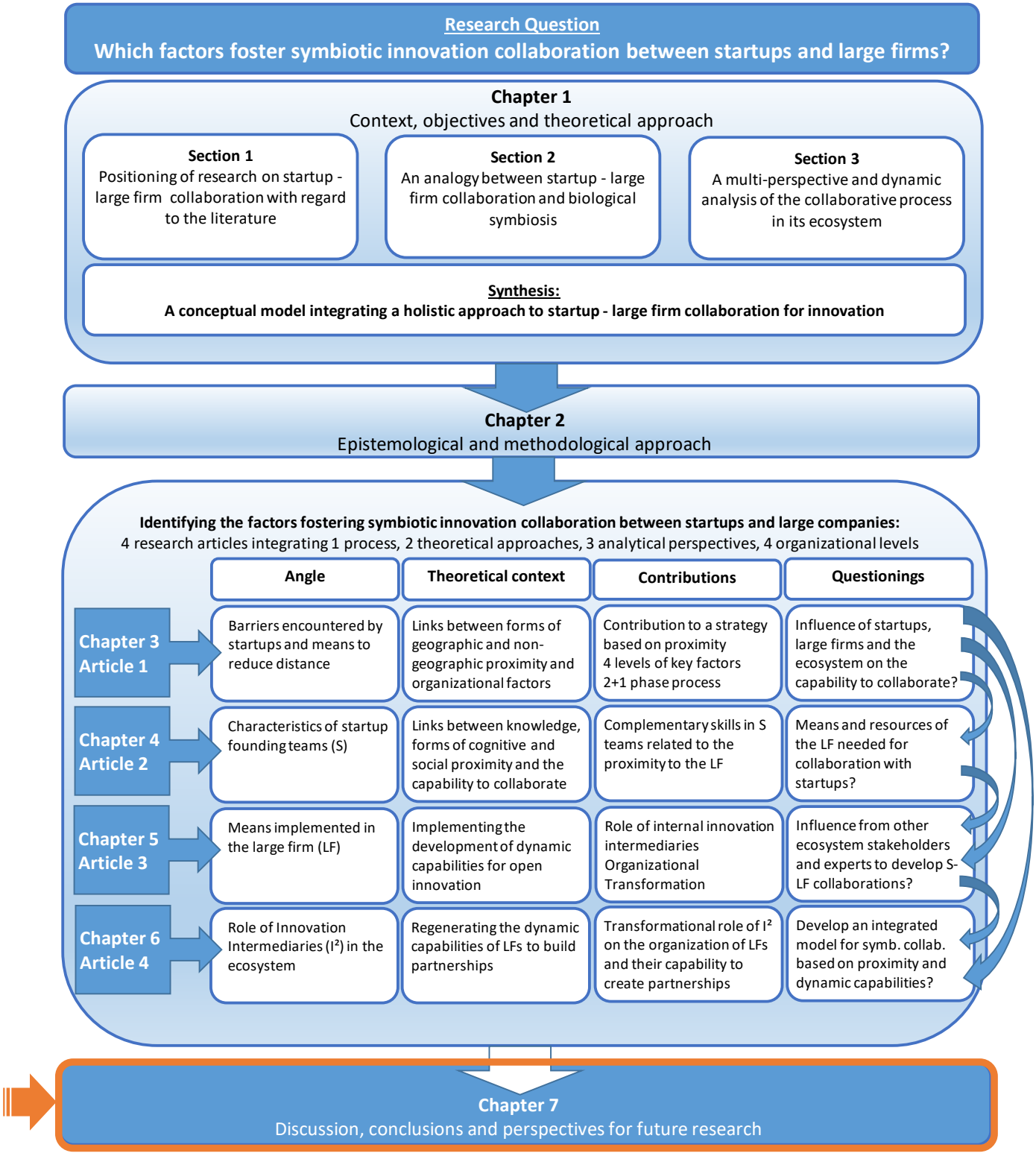
research is also of interest to the latter since it allow them understand better the ecosystem's supporting intermediaries and also the constraints occurring for the banking sector while looking for innovative solutions. To achieve this ecosystem's dynamics, public authorities should also pay attention to disseminating more information on the different actors, for example in the form of an online map, to all stakeholders so that they know who they can interact with for their innovation and business needs. Finally, the open innovation ecosystem dynamics results from a real *collective contribution* to its development, including intermediaries, organizations, startups, Fintech, experts from various fields, and public authorities. This collective intelligence makes the innovation ecosystem a dynamic interconnected community.

- CHAPTER 7 -

Discussion, conclusions and research perspectives

"*Together we stand, divided we fall.*"

Pink Floyd, *Hey You*, in The Wall, 1979


Research Question
Which factors foster symbiotic innovation collaboration between startups and large firms?
Chapter 1
Context, objectives and theoretical approach
Section 1
Positioning of research on startup - large firm collaboration with regard to the literature
Section 2
An analogy between startup - large firm collaboration and biological symbiosis
Section 3
A multi-perspective and dynamic analysis of the collaborative process in its ecosystem
Synthesis:
A conceptual model integrating a holistic approach to startup - large firm collaboration for innovation
Chapter 2
Epistemological and methodological approach
Identifying the factors fostering symbiotic innovation collaboration between startups and large companies:
4 research articles integrating 1 process, 2 theoretical approaches, 3 analytical perspectives, 4 organizational levels
Angle
Theoretical context
Contributions
Questionings
Chapter 3 Article 1
Barriers encountered by startups and means to reduce distance
Links between forms of geographic and non-geographic proximity and organizational factors
Contribution to a strategy based on proximity
4 levels of key factors
2+1 phase process
Influence of startups, large firms and the ecosystem on the capability to collaborate?
Chapter 4 Article 2
Characteristics of startup founding teams (S)
Links between knowledge, forms of cognitive and social proximity and the capability to collaborate
Complementary skills in S teams related to the proximity to the LF
Means and resources of the LF needed for collaboration with startups?
Chapter 5 Article 3
Means implemented in the large firm (LF)
Implementing the development of dynamic capabilities for open innovation
Role of internal innovation intermediaries
Organizational Transformation
Influence from other ecosystem stakeholders and experts to develop S-LF collaborations?
Chapter 6 Article 4
Role of Innovation Intermediaries (I²) in the ecosystem
Regenerating the dynamic capabilities of LFs to build partnerships
Transformational role of I² on the organization of LFs and their capability to create partnerships
Develop an integrated model for symb. collab. based on proximity and dynamic capabilities?
Chapter 7
Discussion, conclusions and perspectives for future research

CHAPTER 7 - Discussion, conclusions and research perspectives

7.1. Main results of the research program

This section presents the main findings of the thesis that emerged from the four research papers (Chapters 3 to 6). A visual synthesis of these results is proposed for each of the three perspectives studied (startups, large firms, innovation intermediaries). A discussion ensues on the transversal dimensions of these results that support the thesis. Finally, an integrated and holistic model for symbiotic collaboration between startups and large firms is proposed.

7.1.1. Synthesis of main results

This thesis focuses on the factors fostering symbiotic collaborations between startups and large firms, asymmetrical partners, in an open innovation ecosystem. The objective was to bring out the organizational and ecosystem factors underlying startup-large firm collaborations based on an organizational and financial independence of the actors and thus a certain form of organic coordination, as can be the innovation process in this context. The aim was therefore to show how actors that are both organizationally and financially independent, without any hierarchical links, and in addition asymmetric, manage to organize themselves in a context of open innovation to collaborate. The thesis defended is, on the one hand, that these driving factors of collaboration to innovate are similar to those present in symbiotic relationships in nature, and on the other hand, that they can be (co-)built if they are lacking to one or the other of the actors by a voluntary adaptation of the actor(s), not based on hierarchy but on trust, exploration and organizational agility. This covers a variety of organizational and managerial dimensions, from the open innovation strategy to its implementation.

The main findings present the factors that emerged throughout the research program across the four papers. They are organized according to their level of analysis (intra-

organizational, inter-organizational, ecosystem), their perspective (startup, large firm, innovation intermediaries in the ecosystem) and the 2+1 phases of collaboration identified (Upstream phase, Collaboration Design phase, Collaboration Process phase), thus providing a holistic view of the phenomenon studied.

7.1.2. Synthesis of the results according to the three perspectives studied

This part proposes a first synthesis of the design of the thesis from the research question to the defended thesis. The three perspectives studied (startup, large firm, intermediaries) then give rise to three summaries of the results presented in the form of diagrams, then a table of questions arising from the results and specifically dedicated to startups. These synthesis elements show the connections made between the perspectives, the chronology of the collaboration and the organizational levels. These connections will be presented in the first point of the discussion section.

Table 38 - Design of the thesis

Research Question of the Research Program
"What factors foster symbiotic collaborations between startups and large firms in open innovation ecosystems?"
Research sub-questions
• Article 1, Chapter 3: What are the organizational factors that foster proximity (cognitive, social, organizational, and geographical) between startups and large firms and their capability to collaborate in an open innovation context? • Article 2, Chapter 4: To what extent does the human and social capital developed by startup founding teams influence their capability to collaborate with large firms throughout the innovation collaboration project? • Article 3, Chapter 5: How do large, mature firms open up their innovation process to collaborate with startups by developing their dynamic capabilities while reducing their own internal rigidities? • Article 4, Chapter 6: What are the roles of intermediaries within an open

innovation ecosystem in the regeneration of dynamic capabilities (especially to develop new collaborations with startups) of traditional, highly hierarchical organizations?
Theoretical framework activated
Theory of geographical and non-geographical (cognitive, social, organizational) proximity and of the regeneration of dynamic capabilities.
Main results
• Identification of the factors fostering symbiotic collaborations between startups and large firms, according to three perspectives (startup, large firm, intermediaries), according to the 2+1 phases of collaboration (Upstream, Design, Process) and four organizational levels: intra-organizational of the startup, intra-organizational of the large firm, inter-organizational, and ecosystemic. • Identification of adaptation means to increase the actors' capability to collaborate according to the 2+1 phases of collaboration. • Analogy with biological symbiosis reconsidering the notion of ecosystem.
Defended thesis
The driving factors of symbiotic collaboration can be (co-)constructed if they are lacking to one or the other of the actors by a voluntarist adaptation of the actor(s), although this type of collaboration is not based on hierarchy but on trust, exploration and organizational agility. These factors are similar to those present in symbiotic relationships of mutualist type in natural ecosystems.

Three synthesis figures are proposed below to visualize the results in more detail according to each of the perspectives taken into consideration:

- **Figure 30** presents the factors of symbiotic collaboration following the 2+1 phases of collaboration, the organizational levels, and the large firm perspective. The transversal results show the sometimes heavy organizational changes that large firms must make during the Upstream phase to increase their capability to

collaborate with startups, which can be facilitated by interactions with intermediaries in the ecosystem. They also show the questions that the startup should ask itself before committing to a collaboration with a large firm, in order to optimize its geographical and non-geographical proximity with it and thus maximize the chances of success (see Table 40 - To engage or not to engage? A questioning grid for startups).

- **Figure 31** presents the factors of symbiotic collaboration following the 2+1 phases of collaboration, the organizational levels and the startup perspective. The transversal results underline the importance, in addition to technological mastery, of several cognitive and social skills of the startuppers, in particular empathy, the capability to establish social links with large firm actors, and the building of a network (in the Upstream phase).
- **Figure 32** presents the factors of symbiotic collaboration following the 2+1 phases of collaboration, the organizational levels and the perspective of innovation intermediaries. The transversal results indicate their crucial role, on the one hand in developing startup-large firm collaborations, and on the other hand in developing the capability of large firms to collaborate with startups.

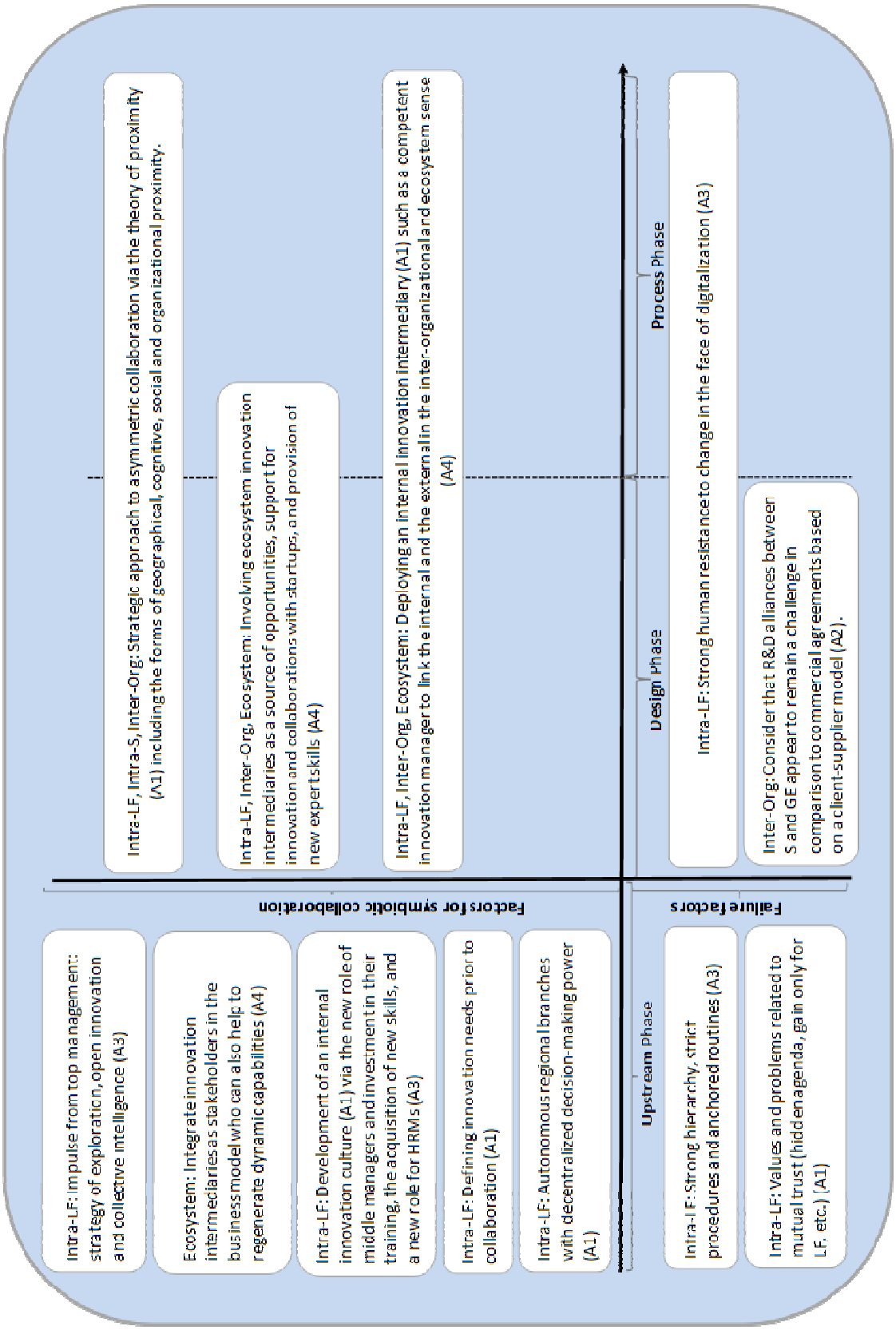


Figure 30 - Factors of Symbiotic Collaboration following the 2+1 Phases of Collaboration, the Organizational Levels and the Large Firm Perspective

Figure 31 - Factors of Symbiotic Collaboration following the 2+1 Phases of Collaboration, the Organizational Levels and the Startup Perspective

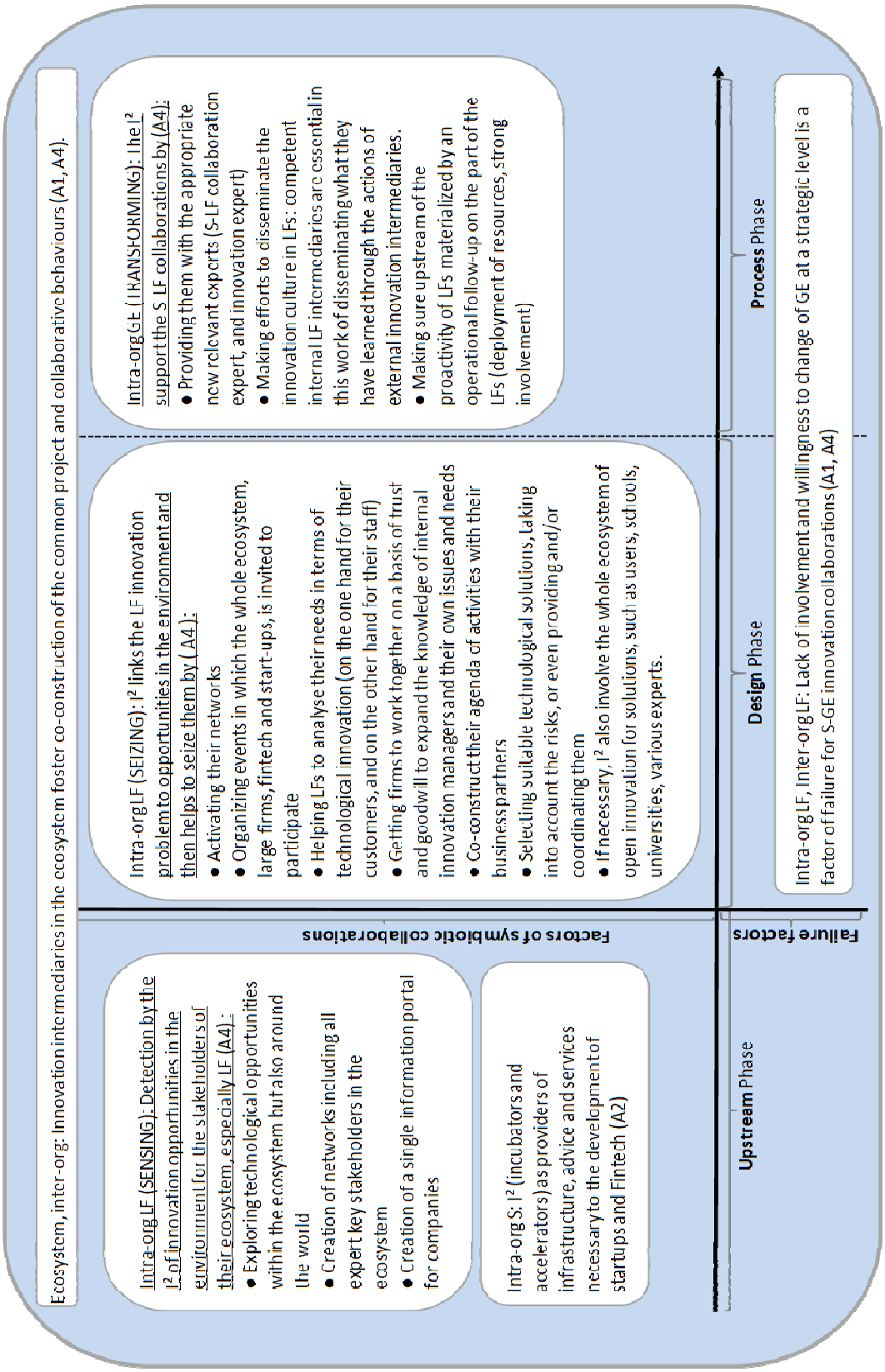


Figure 32 - Factors of Symbiotic Collaboration following the 2+1 Phases of Collaboration, the Organizational Levels and the Intermediaries Perspective

7.2. Discussion

This section discusses the transversal results of this research program, beyond the specific contribution of each of the articles. The following transversal results have emerged from this work:

- The relevance of a holistic, process-based and dynamic approach of startup - large firm collaboration to foster their capability to collaborate to innovate
- The capability to collaborate is fostered by the upstream deployment of collective intelligence from large firms and by the complementary nature of the startup founding teams
- Internal and external innovation intermediaries, essential resources for startup - large firm collaborations and ecosystem dynamics
- Results in the light of biological symbiosis: towards a complementarity of actors and their contribution to the ecosystem community

Prior to the discussion of these results, a synthesis is proposed below, which links the results, the points discussed and the associated theoretical background.

Table 39 - Synthesis of the transversal results of the thesis

#	Transversal results	Points discussed	Theoretical background
1	**The relevance of a holistic, process-based and dynamic approach of startup - large firm collaboration to foster their capability to collaborate to innovate**	• An empirical integration of the different forms of proximity for a holistic vision of startup - large firm collaboration • The relevance of a process-oriented vision of asymmetrical collaborations	Literature on the theory of proximity and on collaboration

2	**The capability to collaborate is fostered by the upstream deployment of collective intelligence from large firms and by the complementary nature of the startup founding teams.**	• The need for dynamic organizational adaptation in large firms, based on collective intelligence • The complementary nature of startup founding teams and the social and cognitive skills of startups foster their capability to collaborate with large firms	Literature on the dynamic capabilities, and social and human capital of startup teams
3	**Internal and external innovation intermediaries, essential resources for startup - large firm collaborations and ecosystem dynamics**	• The capability of external intermediaries to contribute to the organizational transformation of large firms. • The interdependence between internal, external intermediaries and the community	Literature on innovation intermediaries and on dynamic capabilities
4	**Results in the light of biological symbiosis: towards a complementarity of actors and their contribution to the ecosystem community**	• Complementarity as a value of dynamic and virtuous ecosystems • The contribution of stakeholders to the ecosystem community	Literature on symbiosis and cooperation

7.2.1. The relevance of a holistic, process-based and dynamic approach of startup - large firm collaboration to foster their capability to collaborate to innovate

Articles 1 and 2 of the thesis are based on the theoretical framework of the flat typology of forms of proximity proposed by Boschma (2005), from the Dutch School of Proximity, and the work of researchers from the French School of Proximity (Bouba-Olga & Grossetti, 2008; Kirat & Lung, 1999; Pecqueur & Zimmermann, 2002; Talbot, 2009; Torre & Rallet, 2005; Torre & Wallet, 2014). The first transversal result of the thesis showed the relevance of a holistic, process-oriented and dynamic approach of asymmetrical startup - large firm collaboration to foster their capability to collaborate for innovation. The following points show to what extent this first transversal result of the thesis represents a theoretical contribution to the proximity framework (first point) and to the literature on collaboration (second point).

7.2.1.1. An empirical integration of the different forms of proximity for a holistic vision of startup - large firm collaboration

Bouba-Olga & Grossetti (2008, p. 17, freely translated) point out that "*the typologies [of forms of proximity] produced so far [are] part of an overall progression towards a clarification of notions and their operationalization. (...) It will certainly be necessary to go further [by confronting] our categories with various fields.*" The first transversal result of the thesis contributes to a better understanding of the factors fostering the operationalization of forms of geographical, cognitive, social and organizational proximity in the context of asymmetrical collaborations between startups and large firms. Indeed, the thesis concretely links the forms of proximity (geographical, cognitive, social, organizational) and the organizational factors that foster them, contributing on the one hand to empirically integrate the theory of proximity to the question of collaboration between asymmetrical actors in the context of open innovation, and on the other hand to show that this approach allows a relevant and structured holistic vision of collaboration. Boschma (2005) has shown the complementarity and substitutability of different forms of proximity, geographical and non-geographical, and Hansen (2015) their substitutability and overlap. This transversal result of the thesis also shows that, taken individually, each of the forms of proximity studied (geographical, cognitive, social, organizational) is necessary but

not sufficient for collaboration, because of their interdependencies, and that it is therefore relevant to consider them all together to approach in its entirety a complex problem such as that of startup - large firm collaboration.

The holistic approach provided by the theory of proximity, for example, has highlighted the importance of the startup's ambidexterity in fostering its capability to collaborate, ambidexterity being defined as the simultaneous pursuit of exploitation and exploration (Raisch, Birkinshaw, 2008) and appearing as a necessity to link the internal and the external (Lichtenthaler, Lichtenthaler, 2009). Through this approach, the thesis also helps to show the potential of the theory of proximity to allow the emergence of problems and solutions not considered at the outset of the research, by highlighting the effects induced by the absence of certain forms of proximity or by a too weak proximity, and this more at the intra-organizational level of the large firm. Regarding this point, Rangus and Slavec (2017), for example, have shown that decentralization has a positive and significant influence on a firm's innovation performance. The thesis sheds additional light on this work by linking decentralization, startup - large firm collaboration and forms of proximity: geographical proximity facilitates social and cognitive proximity when the regional branch is relatively autonomous and power is decentralized, which has a positive impact on the quality of collaboration.

Finally, innovation intermediaries have already been the object of various studies showing their influence on the speed of diffusion and adoption of new products and services (Hägerstrand, 1952; Rogers, 1962; Howells, 2006), on their contribution in terms of transformation of ideas and knowledge to be transferred (Hargadon, Sutton, 1997), on the absorptive capacity Kokshagina et al. (2017), and on trust building (Gómez et al., 2016). While confirming these elements of the literature, the first transversal result of the thesis also shows the effects in terms of proximity of these intermediaries of innovation, who make the link between the internal and the external: they facilitate at the same time the social, cognitive and organizational proximity between the startup, the large firm and also the actors of the ecosystem. This makes the intermediary the keystone of these asymmetrical collaborations.

Thus, the thesis sheds light on the operational and holistic dimension of the theory of proximity, and shows its interest in the holistic understanding of complex

organizational phenomena such as asymmetrical collaborations between startups and large firms in the context of open innovation.

This approach also gave rise to the development of the questioning grid below, based on the forms of proximity studied.

Table 40 - To engage or not to engage? A questioning grid for startuppers

	1	2	3	4	5	6	7
We did a watch on the large firm before collaborating with it.							
The needs of the large firm were clearly defined from the start, before imagining our collaboration.							
We have established (or plan to establish) a common roadmap							
We always understand each other very easily							
My startup adapts to the reality of the large firm and shows a certain empathy towards it.							
We have close technological knowledge							
We have complementary technological skills							
Our interactions are mainly face-to-face							
We have established strong social ties, sometimes friendly, with one or more people from this large firm.							
A person or team with innovation expertise put my startup in touch with the actors of the large firm. (This intermediary is either internal to the large firm or external to it: it can come from the ecosystem).							
My startup is (or should a priori be) relatively autonomous in carrying out the various activities related to the collaborative project with the large firm.							
This large firm has a local or regional branch that is autonomous in its decision making, with which my startup interacts directly.							
This large firm is very accessible throughout the collaboration process.							
The exchange of information and knowledge with this large firm is easy and straightforward.							

We can easily get to this large firm, which is geographically close to our startup (in km/travel time).							
We interact with this large firm via asynchronous online tools (such as email and/or platform).							
We interact with this large firm via synchronous online tools (such as instant messaging or web conferencing: Slack or Skype, for example).							

Considering the importance of the stakes and the particular relationship to time of the startup, the objective of this questioning grid, which represents one of the transversal products of this thesis, is to help the startup in its decision making process to engage in a collaboration with a large firm. The aim is to evaluate each of the points of the grid according to the startuppers' level of agreement (from "1 - Totally disagree" to "7 - Totally agree"). The more answers positioned to the right (close to 7), the more promising the collaboration appears in terms of interactions, geographical and non-geographical proximity and therefore mutual understanding.

This tool is not predictive; it is intended to feed the personal reflections of startuppers who need to engage in a collaboration with a large firm. It can be used during the Upstream phase or at the beginning of the Design phase of the collaboration.

7.2.1.2. The relevance of a process-oriented vision of asymmetrical collaborations

When autonomous actors collaborate, they engage in an interactive process (Wood & Gray, 1991, p. 146), which implies an organization over time as well as potential changes. Ring and van de Ven (1992, p. 495) show that "*levels of risk in deals and reliance on trust between parties can and will change over time, and with these changes parties will alter their choices in governance structures and accompanying safe-guards*". Moreover, according to Hogenhuis & al. (2016), work on asymmetric relationships has so far ignored the obstacles encountered by startups and large firms at different stages of the innovation process. The first transversal result of the thesis highlights the phases of collaboration as well as the interest of structuring the

work on collaborations on a temporal axis. For example, since the differences resulting from the asymmetry between partners require a great attention from the startup in the selection of the large firm (Das & He, 2006), it is crucial for the startup to identify possible sticking points and the verifications to be carried out at the time of partner selection. Furthermore, this result also shows the importance of a phase outside the collaboration itself: the phase named here *upstream phase*. It proves to be crucial in the adaptation of the partners. Thus, from the first article, the collaboration project was structured in two main phases plus one (Bertin, 2019, p. 145):

- Phase 1: the *Design phase*, which refers to "*the set of elements enabling engagement in the collaborative project, from the meeting to the decision for effective engagement by stakeholders*."
- Phase 2: the *Process phase*, which represents "*the joint work on the project, the collaboration itself, the interactions, potential adjustments and ad hoc means implemented to achieve the objective sought by the partners*."

But beyond the collaboration project itself, another phase, expanding the only time frame of the collaboration, was crucial to its success (Articles 1, 2, 3 and 4):

- The *Upstream phase*, which "*concerns any factor existing before the beginning of the relationship.*"

Hence the designation of "2+1 phases" of collaboration.

The 2+1 phases highlighted in this thesis have been essential to capture the dynamic, evolving nature of collaboration. This breakdown has allowed to understand and structure the underlying determinants of the interactional process between the two partners, without however occulting the finality of success of the collaborative project. In this sense, this result of the thesis contributes to the literature on collaboration. This work also responds to the call of Hogenhuis et al (2016) cited above, as well as that of Usman & Vanhaverbeke (2017) for more work including the startup perspective on collaboration with large firms, as this startup perspective is rarely studied.

Figure 33 represents in the form of a multidimensional cube the elements integrated in the proposed holistic and process-oriented vision (chronology).

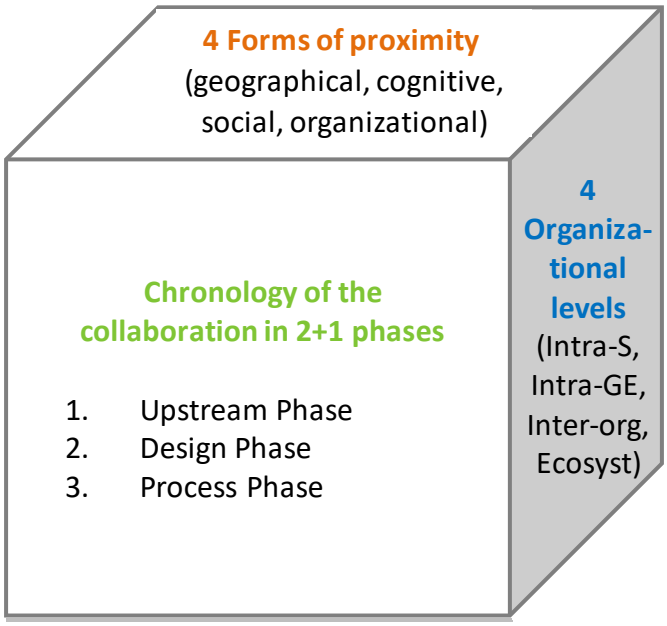


Figure 33 – The Multidimensional Cube: A Holistic and Process-based Vision of Collaboration

7.2.2. The capability to collaborate is fostered by the upstream deployment of collective intelligence from large firms and by the complementary nature of the startup founding teams

The Upstream phase has emerged (article 1) associated with the startup's ability to anticipate and adapt, albeit to a lesser extent, and with that of the large firm in particular. In this respect, this phase is particularly essential in a context of asymmetrical partnership where the actors have to adapt to each other to maximize the chances of success of their collaboration. Article 3 and Article 4 investigated the factors specific to this phase for the large firm. To do so, the thesis relied on a second theoretical framework: the dynamic capabilities framework (Teece, 2018;

Teece et al., 1997). Moreover, article 1 also showed that certain capabilities of the startup were able to increase the cognitive and social proximity to the large firm. A more in-depth investigation of these first results was carried out on the basis of a quantitative study (Article 2), comparing the influence of the human and social capital of startup founding teams vs. solo founders on their capability to collaborate with large firms. The second transversal result of the thesis shows on the one hand the contribution to the dynamic capabilities framework, and on the other hand the contribution to the literature on teams. The following points present these contributions.

7.2.2.1. The need for dynamic organizational adaptation in large firms, based on collective intelligence

Because of its size, which makes it a difficult structure to handle, and its history, its past strategic orientation, which makes it dependent on a given trajectory that influences its capacity to adapt its business model (Saebi et al., 2017), the adaptation work during the Upstream phase can be relatively heavy for the large firm. This is confirmed by the second transversal result, especially since the demands of an uncertain environment and the need to adopt an open innovation strategy push the large firm to become ambidextrous (Lichtenthaler & Lichtenthaler, 2009). In order to understand how large firms manage to increase their capability to collaborate with startups, alone or with the help of innovation intermediaries, the theory of dynamic capabilities as originally developed by Teece et al. (1997) has been mobilized, as this framework is particularly well suited to strategic issues involving a renewal of the business model (Teece, 2018). This work contributes to the theory of dynamic capabilities by responding to the call of Teece (2018, p. 48): "*Studies that provide a better understanding of business model innovation, implementation, and change will shed light on important aspects of dynamic capabilities*". Indeed, the results highlight the adoption of a collective intelligence approach instilled by top management for the successful development of dynamic capabilities in a context of evolution of the business model in open innovation mode: internally, where all the employees of the company are concerned, thus confirming the work of Martovoy et al. (2015) and Barratt-pugh et al. (2013), and externally by strengthening links with intermediaries in the ecosystem, but also with other potential stakeholders. This approach also

contributes to the evolution towards a culture of innovation in large firms, which is often the thorniest point when implementing major organizational changes, such as decentralization, associated with performance (Rangus & Slavec, 2017): the results showed that the development of dynamic capabilities to collaborate with startups is accompanied by a shift towards a decentralization of the power of the large firm via autonomous regional branches in terms of decision-making. In a context of opening up the innovation process, this calls into question the hyper-hierarchical structure of the organization, which would imply introducing fewer hierarchical strata and adopting coordination based more on the autonomy of actors, and therefore on trust, than on control. In the particular context of startup - large firm collaboration, this result confirms the work of Miles et al. (2010, p. 100) :

> "*Hierarchy, however, is not well suited to managing the collaborative process, particularly collaboration that extends beyond the boundaries of the firm.*"

7.2.2.2. The complementary nature of startup founding teams and the social and cognitive skills of startups foster their capability to collaborate with large firms

The literature on founding teams tends to focus on their performance (Boss et al., 2018; Jin et al., 2017; Spender et al., 2017). The second transversal result of the thesis contributes to this literature by shedding light on another, more relational dimension: the capability of teams to collaborate. Indeed, this thesis is based on a relational and non-transactional approach of collaboration, the transactional one being more extensively explored in the literature (Dyer & Singh, 1998; Hill & Birkinshaw, 2014; Yoon & Hughes, 2016). The relational approach focuses on the modalities of interaction between startups and large firms, the conditions that bring them closer together to interact. In order to explore the links between teams and their capability to collaborate with large firms, the literature on the human and social capital of teams has been mobilized, their importance in the collaborative and entrepreneurial process having been highlighted (Marvel et al., 2014; Nooteboom, 2000). This work contributes to this literature by highlighting two key factors of startup founding teams, which are related to their capability to collaborate with large firms:

the first is of a social nature, the social ties forged between one or more members of the startup and one or more stakeholders in the large firm; the second is of a cognitive nature, a certain empathy towards the large firm. This second transversal result also contributes to the literature on teams by showing that founding teams of startups seem better equipped than solo startups to cope with the requirements of the Design phase of collaboration with a large firm. Their higher complementarity than solos in terms of training and career paths allows them to engage in more partnerships than solos during the Design phase. However, this result should be tempered, as this complementarity does not seem to have a direct influence on the success of the collaboration as such (Process phase). The results thus contribute to the literature on teams by also showing that other factors (internal and/or external to the team) should be considered during the Process phase in order to better understand which other factors hinder or foster it. Indeed, there is a plethora of contingency factors. Following the example of Gartner et al. (1994, p. 8), this thesis suggests that we should investigate more in the direction of contingent relationships rather than with a view to finding a single model that does not exist:

> "*Yet, it should also be noted that the heading for this section did not suggest that all entrepreneurs are unique or that every entrepreneurial situation is such a one-of-a-kind event that no similarities among entrepreneurs exist. Instead, we suggest the need for mid-range theories (e.g., Pinder & Moore, 1979) that reflect contingent relationships rather than offering a "One Best Way" type of model*."

7.2.3. Internal and external innovation intermediaries, essential resources for startup - large firm collaborations and ecosystem dynamics

Article 1 highlighted the key role of innovation intermediaries in the smooth running of startup - large firm collaboration. The perspective of these intermediaries (individuals from incubators, accelerators, open innovation club for companies and digital management consulting agency) was studied in Article 4. The third transversal result lies in the highlighting of a new role of innovation intermediaries: that of constituting external resources for firms, thus contributing to the literature on intermediaries. This

result also contributes to the literature on dynamic capabilities by showing the capacity of external intermediaries to contribute to the organizational transformation of large firms, as well as the crucial role in this process of combining internal and external intermediaries of innovation. These elements are discussed in the following points.

7.2.3.1. The capability of external intermediaries to contribute to the organizational transformation of large firms

Innovation intermediaries have been the object of many studies that have brought to light their different roles, in particular their role as brokers (Hargadon & Sutton, 1997; Howells, 2006; Mina et al., 2014), networkers, architects of collective exploration and knowledge creation (Agogué et al., 2013), or trust builders (Gómez et al., 2016). Despite the extensive literature, definitions of some roles sometimes overlap, such as those of boundary spanners, gatekeepers, and knowledge brokers (Haas, 2015). This third transversal result of the thesis contributes to the literature on innovation intermediaries by bringing out a new role: that of intangible external resources of the firm. Indeed, the results showed the strong contribution of innovation intermediaries at each stage of the regeneration of dynamic capabilities (sensing, seizing, transforming) of the large organizations explored to develop new collaborations with startups. They detect opportunities for solutions, support the large firm in defining its technological innovation problem, then help it to seize opportunities within the ecosystem, and even far beyond it, by activating their networks of startups and experts of all kinds capable of providing appropriate solutions, as well as other stakeholders in the ecosystem potentially useful to its development (users, universities, schools, etc.). The results show that the co-creation capabilities of innovation intermediaries with firms (Randhawa et al., 2018) are essential for the development of collaborations between startups and large firms. Dynamic capabilities aim at changing the existing resource base (Teece, 2007). This third transversal result contributes to this theoretical framework by highlighting the capability of innovation intermediaries, as intangible external resources, to co-develop the large firm's capabilities to open up to the outside world, especially to startups and thus participate in the transformation of their business model. This perspective on the influence of intermediaries' skills on collaboration has made it possible to reveal the

intangible and yet essential effects of these skills, since they increase the necessary proximity between actors.

7.2.3.2. The interdependence between internal, external intermediaries and the community

Kokshagina et al (2017) showed that the innovation intermediary facilitates absorptive capability. This third transversal result contributes to dynamic capabilities by also showing the crucial role of the combination of internal and external intermediaries of innovation in the transformation of firms (third and last stage of the development of dynamic capabilities). This implies that without internal intermediaries, the actions carried out by external intermediaries may prove to be fruitless in terms of implementation of the chosen technological solution. Internal intermediaries are in fact essential anchor points for disseminating the culture of innovation within the company and for ensuring the indispensable link between the external and the internal to collaborate. The results also highlight the impact of an open innovation strategy on middle managers of large firms who see their role evolve and become more open to the outside world than in the past. This point confirms the work of Das & He (2006, p. 136) :

> *"The separation of middle managers from the top management in large established firms makes it crucial to involve middle managers in the negotiation stage and, thereafter, the operation of alliances. Whether the established firm can take measures to make its middle managers accessible for its entrepreneurial partner should be a vital criterion that a startup firm should emphasize in selecting its alliance partner."*

This result helps to show that the open innovation strategy of large firms aiming to collaborate with startups implies a transformation of the business internally, adequate training and a change of mindset, of culture, as external actors, the intermediaries of innovation, have become essential stakeholders for the firm. The internal innovation intermediaries, who act as a link between the internal and the external, are in this sense also providers of an increase in the level of cognitive, social and organizational proximity, these three forms of proximity being crucial for the success of the startup - large firm collaboration (Article 1).

7.2.4. Results in the light of biological symbiosis: towards a complementarity of actors and their contribution to the ecosystem community

The results of the thesis brought out the factors fostering symbiotic collaboration to innovate between "symbiont" organizations (startups and large firms including internal intermediaries), supported by external intermediaries as 'representatives' of the community (“biocoenosis”) of the ecosystem. Articles 1, 2, 3 and 4 approached from three different perspectives the factors fostering the rapprochement of the two symbionts (the startup and the large firm) that are asymmetrical but complementary. This part presents more particularly the interest of the analogy of this relationship with the mutualist (win-win) type of symbiosis by placing it in the context and needs of today's society.

7.2.4.1. Complementarity as a value of dynamic and virtuous ecosystems

A symbiotic collaboration implies an interdependence whose ultimate goal (beyond the collaboration project as such) is to make both stakeholders (startup and large firm) grow or simply ensure their survival, and no longer foster one to the detriment of the other according to a competitive mode of operation. This type of symbiotic relationship makes all the more sense for startups and large firms as they are different and therefore potentially complementary. Basing relationships more on this complementarity makes it possible to generate symbiotic collaborations more naturally, since complementarity always implies reciprocity (Brandenburger & Nalebuff, 1996), a principle underlying mutualist symbiosis and underpinning a long-term vision:

> “*Complements are always reciprocal. Just as auto insurance complements new cars, new cars complement auto insurance*.”

The interest of symbiotic collaborations for stakeholders is to join forces to win each one because they are together. For initially competing actors, this means rethinking sometimes deeply their competitive relationships to make them evolve towards cooperative relationships (collaborating while being competitors) as in Brandenburger & Nalebuff (1996):

> "*Creating value that you can capture is the central theme in Co-opetition. The best way to do this will obviously be different for different businesses. But one strategy that Co-opetition emphasizes is working with what we term "complementors." A complementor is the opposite of a competitor. It's someone who makes your products and services more, rather than less, valuable.*"

These same authors specify: "*a good theory gives people the tools to discover what is best for them.*"

For the actors, this implies an effort to seek complementarity, union and combination of their resources in order to become stronger together and ultimately (over)live better than they would have done if they had been alone.This also implies ensuring that the complementarity exists at different levels: technological, in terms of objectives, values, and a common base of knowledge, as shown in the articles of the thesis. Thus, the theory of proximity mobilized makes a real sense in this search for complementarity, particularly prior to the engagement of stakeholders in any collaboration. In this sense, proximity appears as a promising theoretical framework for the emergence of mutual symbiotic collaborations between startups and large firms, and even beyond as presented in the following point.

7.2.4.2. The contribution of stakeholders to the ecosystem community

In addition to the symbiotic collaboration that benefits the dyad, i.e. each of the two symbionts, it is also their potential contribution in terms of economic, societal and ecological benefits to their ecosystem that guided the orientation of this thesis towards a biological analogy. In the face of the profound changes taking place at many levels in our societies, this question of the contribution of actors, including companies, to the community (in the biocenosis sense, and not in the sense of the literature on communities of practice) of their ecosystem comes back recurrently to the forefront of the scene.

This thesis has shown the virtuous interdependence links between symbionts (startups and large firms) and their ecosystem (through innovation intermediaries, representatives of the biocenosis). Since the ecosystem, in particular the community (biocenosis), participates in "feeding" the symbionts so that they (over)live, the

symbionts should logically feed the ecosystem in return, at least if they want to see their (over)life perpetuated in the long term. This is what happens in the case of the ecosystem under study (Article 4). Thus the symbiotic relationship extends far beyond the dyad, also encompasses the community and thus contributes to the development of the collective of the ecosystem. This research, while relying on the structuring theoretical framework of proximity, shows the interest for economic actors to rethink their relationship to their ecosystem, by drawing more inspiration from natural ecosystems, and to integrate this dimension into their development strategy and even their business model, as the results mobilizing the dynamic capabilities framework have shown. Figure 34 presents a synthesis of the transversal results of the thesis in the form of an integrated and holistic model for symbiotic collaboration between startups and large firms mobilizing the theory of proximity and dynamic capabilities.

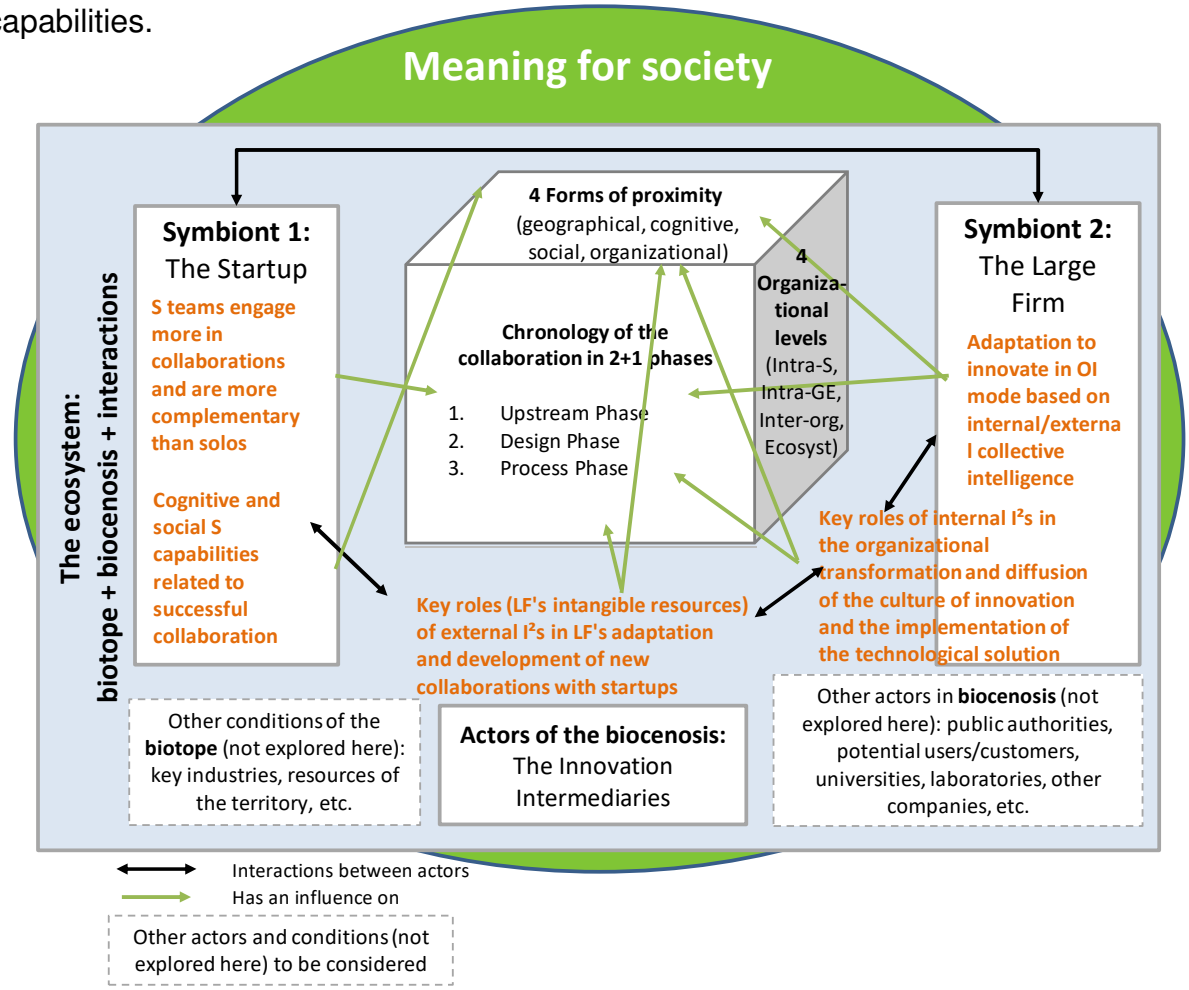


Figure 34 - Proposal of an integrated and holistic model for symbiotic collaboration between startups and large firms using the theory of proximity and dynamic capabilities

7.3. Conclusions of the research program

This part presents the theoretical and managerial contributions of this research program, then the limits and perspectives of future research, and finally the research project planned after this thesis.

7.3.1. Theoretical contribution

Contributions of a theoretical nature concern the following areas of the literature: open innovation, entrepreneurship, and ecosystems. These contributions are presented below.

7.3.1.1. Contribution to the Open Innovation Literature

This thesis focuses on the symbiotic collaboration between startups and large firms in the context of open innovation. Within this framework, the exploration of the research object was carried out at different levels, thus responding to the calls from Chesbrough & Bogers (2014) and of Bogers et al. (2017): the intra-organizational level (that of the startup and that of the large firm), the inter-organizational level and the ecosystem level. The thesis thus helps to show how the protagonists organize themselves, with the help of their ecosystem community, in open innovation mode to increase their capability to collaborate. The association of these different levels with the theory of proximity has proved fruitful in that collaboration has been studied in a holistic way, in time and in geographical and non-geographical space. Therefore, the same research object, evolving in an open innovation context, was studied in the most systemic way possible within the framework of this thesis, and allowed to highlight the organizational factors favoring symbiotic collaboration in open innovation mode, but also the interdependence links between the different elements studied (levels, actors, factors). This work sheds additional light on these interdependencies in the open innovation literature, especially in asymmetrical collaborations where actors are independent at the organizational and financial levels.

Moreover, in this precise framework, this thesis also contributes to the development of open innovation strategies: as underlined by Chesbrough et al. (2006, p. 231), "*central to an Open Innovation strategy is to maintain diverse types of ties to a*

diverse set of institutions." The Proximity Theory framework has been particularly successful in highlighting the elements of an open innovation strategy structured around factors that specify the nature and diversity of forms of proximity in startup-large firm collaboration, while crossing them with different organizational levels. This holistic framework focusing on geographical and non-geographical proximity enriches the reflection on open innovation strategies with asymmetric partners, but could be used *a fortiori* for more symmetrical collaborations. From this point of view, this thesis contributes to making more transparent the phenomenon of open innovation strategy as suggested by Hautz et al. (2017), follows the footsteps of Lichtenthaler (2011) who suggests that open innovation is not a managerial fad, but rather a sustainable trend, as well as the ones of Felin & Zenger (2020) who advocate an orientation of the open innovation strategy focused on the problem of the enterprise and not on its environment as a whole:

> "*Thus we argue that the commonly-used funnel or filtering metaphor of open innovation -where the firm seeks to be more and more open to the environment- is misleading and problematic. Instead, openness should be conceived of as a directed activity: an activity directed by the theories, hypotheses and problems of the firm. To use a metaphor, rather than increase the aperture, lens size, breadth and overall capacity to be open to and absorb external factors (information, ideas, products, solutions), we argue that the best outcomes from openness emerge from a more targeted search- or flashlight approach.*"

Finally, this work contributes to a better understanding of the links between open innovation and the dynamic capabilities framework (Teece, 2020). Dynamic capabilities enable a process-based approach to asymmetrical emerging collaboration, from the exploration of the environment at large to the implementation of the solution adopted to solve the innovation problem. This work has allowed to show on the one hand the interest of a time-based vision of the open innovation process in a context of asymmetrical collaboration, and on the other hand that the organization seeking to regenerate its own dynamic capabilities does not necessarily achieve this transformation alone and can rely on innovation intermediaries to lead this transformation. This work thus helps to show that by becoming more open, by developing an open innovation strategy, the organization benefits from a positive

internal effect induced by external resources (in this case, innovation intermediaries) from its ecosystem that contribute to the regeneration of its dynamic capabilities.

7.3.1.2. Contribution to the Entrepreneurship Literature

In this thesis work, the startupper plays a central role, the startup perspective being almost absent in the literature on their collaboration with large firms (Usman & Vanhaverbeke, 2017). In addition, the objective was to better understand the impact of team resources on their capability to collaborate with large firms -and ultimately on the success of their collaborations-, an issue that is absent from the literature. The link between diversity within management teams and their performance has already been the subject of numerous studies (Abatecola & Cristofaro, 2018; Bjornali et al., 2016; Boss et al., 2018; Guo et al., 2018; Li, 2014; Vanaelst et al., 2006; West III, 2007), but no research in the specific context of the thesis was found. This work contributes to the field of entrepreneurship, in particular to knowledge on the influence of the complementary nature of knowledge-based resources (human and social capital) of startup founding teams on their capability to collaborate with large firms. Furthermore, this work has also contributed to responding to the call from Marvel et al. (2014) who emphasized the importance of human capital throughout the entrepreneurial process and called for more research on the interactive role played by human capital in relationships. This work complements the work of Hogenhuis et al. (2016), showing that startups formed by teams of founders have significantly higher management know-how than solo founders. This research examines both human and social capital and takes a process-based view of collaboration, and also responds to the recent call from Clough et al. (2019) for a process-based perspective on the mobilization of entrepreneurial resources, beyond the direct link between these resources and the final outcome. The work proposed in this thesis integrates the 2+1 phases (*Upstream, Design, Process*) of collaboration between startups and large firms, thus highlighting the specificities of each of the 2+1 phases of collaboration, in the form of process.

The contribution of this work also lies in the quantitative combination of the human and social capital of startup founding teams, their capability to collaborate with large firms, and the theory of proximity, based on the findings of the first paper (Bertin, 2019). The various forms of proximity have notably been measured quantitatively,

which also contributes to the existing literature on capability to collaborate, which is more based on qualitative methods.

7.3.1.3. Contribution to the Ecosystem Literature

This thesis contributes to the literature on ecosystems, particularly those with characteristics that foster open innovation. By proposing a biological analogy, a question emerges as to the necessity of the many types of ecosystems present in the literature. Might not the ecosystem in the biological sense of environment (biotope) and community (biocenosis) be the most suitable? Indeed, the use of the characterization of a biological ecosystem, which is at the origin of the notion of ecosystem used in the literature in management, shows that the terms innovation, business or entrepreneurial which are associated with ecosystems lead to an approach which restricts the perspectives on the object under study. Thus, the literature distinguishes between business ecosystems and innovation ecosystems, the former focusing on value capture and the latter on value creation. However, a biological ecosystem approach shows that a holistic (as opposed to reductionist) vision can allow the emergence of key contingency factors of various natures, thus enriching the exploration of the object under study. The various terminological restrictions present in the literature on ecosystems could lead to not taking into account certain contingency factors, whereas the simple notion of "ecosystem" can include any characteristic of this ecosystem without excluding others, and thus contribute to a more holistic view of the phenomenon under study. This thesis has certainly mentioned the terminology of open innovation ecosystem, in order to understand the research context. However, this terminological issue emerged throughout the course of this research. According to this thesis, the biological analogy contributes to the reflection on the very notion of ecosystem and, above all, on the real necessity for the creation and use of a multitude of ecosystem types. All the more so, as Scaringella & Radziwon (2018) point out, this diversity of terms leads to competition between streams of literature on different ecosystems, preventing progress in the literature on ecosystems as a whole.

The contribution on the notion of ecosystem includes that on the literature on innovation intermediaries, which are part of the ecosystem community (biocenosis). The results of the thesis confirm the existing work on the broker, networker and

architect roles of these intermediaries (Agogué et al., 2013) and also make a contribution with respect to these roles, innovation intermediaries having emerged as intangible resources of the large firm accompanying the latter in the development of its dynamic capability to create new collaborations with startups.

7.3.2. Managerial contribution

At a managerial level, the outcomes of this research program are likely to be of interest to the main stakeholders, i.e. startups, large firms, incubators, accelerators, competitiveness clusters, open innovation clubs, consultants, as well as public authorities that support innovation, in particular the *Grand Est* Region, which financed this thesis. The managerial contribution of this thesis may allow them to better understand the factors of divergence and most importantly of convergence of the symbiotic collaboration between startups and large firms, and thus participate in its success, as well as in the dynamics of the ecosystem of which they are part.

7.3.2.1. Contribution for startups

The primary objective of the thesis in terms of contribution was to provide solutions for startups facing difficulties to collaborate with large firms. The contribution of this thesis for startups covers different dimensions. The first one relates to a structured knowledge of the points of divergence with large firms and potential convergence solutions. The first paper of the thesis (Bertin, 2019) allowed to combine these elements for a better understanding of this type of asymmetrical collaboration through the call to the theory of geographical and non-geographical proximity, and a process-based vision of 2+1 phases collaboration (Upstream, Design, Process). The thesis shows the importance of the Upstream phase of the collaboration, and in particular of the decisive choice regarding the large firm to collaborate with. The strategic watch is a means to be privileged before any engagement in this type of collaboration, because it can allow to retain the most adequate firm a priori, because closest to the startup at the cognitive, social, organizational and geographical levels, the one which is also the best prepared for this type of collaboration, in particular through the achieved deployment of an open innovation strategy. The Design phase of the collaboration (from the meeting to the contractual engagement) will confirm or invalidate this level of proximity. As such, the questions (see Table 40) associated

with the level of proximity with the large firm and proposed through the second article can be an aid to decision making for startups to engage (or not) in a collaboration with such or such large firm.

Another contribution of the thesis concerns the composition of the startup. The second paper showed a high complementarity of startup founding teams, as well as a link between this complementarity of the teams' skills and their proximity to large firms. This proximity of the teams concerned the skills associated with the high level of the following factors: duration of entrepreneurial training, level of technological skills, number of firms where the founders had previously worked, number of close contacts in the entourage with entrepreneurial activities, number of contacts on social networks, support from an accelerator. It thus seems wise to create a startup as a team in order to combine the skills necessary for its growth and its proximity to large firms. Apart from an obvious high level of technological skills (*hard skills*), *soft skills* are needed to collaborate with a large firm, including interpersonal skills, communication skills, empathy and patience. In contrast, a more natural proximity to SMEs, where agility is closer to that of startups, was encountered in the cases studied. Depending on their situation and the degree of urgency to commercialize their product, for example, startups may have an interest in also or initially targeting SMEs with which relations are more symmetrical, and therefore the overall proximity level is higher. This is an interesting option for startups, especially because of the speed of decision making within SMEs, compared to the often slow decision making of large firms as they are usually centralized in the capital city.

This thesis also showed the interest for startups to connect to their local and regional ecosystem, including incubators and accelerators. Indeed, the resources of startups being limited, the skills and the network of experts brought by these structures can allow startups to grow faster and to be closer to the needs of the actors of their ecosystem (users, customers). This research work has shown that solo startups are more likely to be found in incubators and team-based startups in accelerators. This suggests that teams would reach a more advanced stage of maturity of their product than solos. However, this result remains to be nuanced because of the accelerator selection criteria of startups, which may include the criterion of being formed by several founders.

7.3.2.2. Contribution for firms, large and SMEs

The contribution dedicated to enterprises is addressed in priority to large firms but also SMEs, which have not yet opened their boundaries and, therefore, have not yet developed an open innovation strategy. The results of this research may enable them to perceive the benefits in terms of innovation that such an approach represents both for the firm and for its local and regional ecosystem. It may also be useful for them to better understand and apprehend on the one hand the obstacles inherent to collaboration with startups, and on the other hand, the factors conducive to the success of harmonious, symbiotic collaborations with startups, oriented towards mutual benefit. The process-based (chronological) vision adopted in this thesis will also allow structuring and organizing the potential organizational changes to be made according to the phase of the collaboration concerned, as these changes may be more complex and longer for a large firm than for an SME, due to its size, which makes it a more difficult structure to change. From this point of view, the results showed a more natural cognitive proximity between startups and SMEs, with fewer differences between them, which is an advantage and a definite time-saver for SMEs and startups when developing collaborations.

For large firms that have already deployed an open innovation strategy that includes collaborations with startups, this research can be a useful complement, particularly in case of difficulties when collaborating with startups. This contribution may enable them to better understand the reasons behind certain points of divergence. Ultimately, it can also lead to a better mutual understanding between large firms and startups, bringing out their initial differences and how the necessary rapprochement can be done to reduce them in order to collaborate effectively and innovate.

The first observation that emerged from the first article of the thesis is the need for large firms to anticipate their collaboration with startups. Like the open innovation strategy, to which it is linked, this type of asymmetrical collaboration cannot be improvised. Thus, the so-called Upstream phase of collaboration is crucial: this thesis suggests that large firms should base their strategic thinking on open innovation and collaboration with startups on the theory of proximity. This thesis proposes in the first article (Bertin, 2019) a reading grid of the forms of proximity necessary to bring startups and companies closer together. This directly operational grid allows on the

one hand to understand the importance of geographical and non-geographical proximity in collaboration, as well as a holistic vision of it, and to set up the appropriate organizational arrangements that will promote it and ultimately increase its chances of success for the benefit of both stakeholders. The major points of change identified are first and foremost cultural: the dissemination of a culture of innovation internally is essential, as is the deployment of collective intelligence instilled by top management (Bertin & Schaeffer, 2020). From this point of view, the thesis showed the substantial contribution of the deployment by the large firm of one or more competent people internally, on the one hand to make the link between the firm and its ecosystem (including startups), and on the other hand to spread the culture of innovation and promote the implementation of the chosen solution within the firm. From a structural point of view, a decentralization of activities to the regions via branches autonomous in their decision-making is also very favorable to collaborations with startups, which, by their nature requiring rapid growth, need rapid decision-making and geographical proximity to interact and move forward in the common collaborative project. From an organizational point of view, services organized in silos are unfavorable to collaboration and a holistic view of it. Therefore, this thesis invites the large firm to organize itself in a more transversal way where all or part of the services of the firm participate in the collaborative project with the startup. This also implies a flatter hierarchical structure, with fewer hierarchical strata, less based on control and more on horizontal coordination in agile mode, in order to encourage transversality, information and knowledge sharing, initiative taking, creativity and collective innovation and to foster the involvement of all staff members. In this sense, the strong involvement of the human resources departments in the process of moving towards a culture of innovation appears to be a factor favoring the implementation of change.

Another contribution of the thesis towards firms planning to collaborate with startups concerns the indispensable connection to innovation intermediaries in the local and regional ecosystem to develop new collaborations with startups, including: incubators, accelerators, competitiveness clusters, open innovation clubs, and consultants specialized in digital management. These external actors can be present from the understanding of the business problem to the implementation of a technological solution provided by one or more startups. They also support the firm in

the organizational changes associated with its open innovation strategy, thanks in particular to their interactions with the indispensable *internal* innovation intermediaries deployed by the firm. Moreover, the involvement of firms in their local ecosystem, which "feeds" them by sharing their expertise with stakeholders (the community of this ecosystem), such as startups, is favorable to the dynamics of this ecosystem. This virtuous circle based on reciprocity contributes to its dynamism and sustainability, which in turn benefits the community.

7.3.2.3. Contribution to innovation support structures within the ecosystem

Although the thesis does not focus on these innovation intermediaries, their importance in the development of symbiotic collaborations between startups and large firms led to their inclusion as indispensable stakeholders in the development of this relationship. This research confirms the crucial contribution to their local and regional ecosystem of incubators, accelerators, open innovation clubs, competitiveness clusters, digital management consultants, and public authorities. The first article (Bertin, 2019) showed the key role of the innovation intermediary in startup-large firm collaboration, which helps to increase their cognitive, social and organizational proximity, which have proven to be essential forms of proximity for the success of this type of asymmetrical collaboration. The third article (Bertin & Schaeffer, 2020) showed the transforming potential of innovation intermediaries on the large firm at each stage of the regeneration of their dynamic capabilities (*Sensing, Seizing, Transforming*). Thus, within the dynamic ecosystem explored, incubators and accelerators are more at the service of the actors of the local ecosystem (the community) as a whole than at the service of startups alone. This mindset generates a large amount of interactions with a variety of stakeholders and experts, which benefits the entire ecosystem. This thesis has highlighted the fact that skilled innovation intermediaries, in addition to being brokers, networkers and architects (Agogué et al., 2013) of collaboration, are intangible expert resources for large firms.

7.3.2.4. Contribution to innovation policies of local and regional ecosystems

Finally, as this thesis contributes to a better understanding of the factors fostering symbiotic collaboration between startups and large firms, it is of interest for policies

supporting innovation within local and regional ecosystems. An originality of the thesis lies in the holistic vision of this collaboration, which has led to the study of different fruitful perspectives in terms of results.

Firstly, collaboration between these asymmetric actors is not sufficient on its own. It is an integral part of the community of the ecosystem, in which the actors evolve. This community has the ability, through its coordinated actions in a relatively organic way (without any established hierarchy), to support this type of collaboration in order to lead it to success. Public authorities, together with innovation intermediaries, are an integral part of this community. The ecosystem studied in this thesis (Article 4) has shown that collaboration between the actors of this community around a common goal of developing entrepreneurship and innovation within the ecosystem is essential. Therefore, communication and geographical and non-geographical proximity between these stakeholders are also crucial.

This thesis suggests a collective collaboration between all stakeholders of the ecosystem community aiming at developing innovation (local and regional political actors, incubators, accelerators, competitiveness clusters, experts in digital management, as well as representatives of startups and firms). Defining common objectives to foster innovation and entrepreneurship for a given ecosystem, with its contingency factors, its own reality, would be the first point. The second point would be to invest in the mechanisms that contribute to the dynamics of innovation collaborations. Regional support to startups in their collaborative projects with large firms or SMEs would be relevant, particularly during the Upstream and Design phases of the collaboration, which require time and resources that startups inherently lack. This research has shown, for example, in the Upstream phase, the positive influence of entrepreneurial training courses of significant duration. Likewise, training on strategic watch, whether they do it themselves or have it done, could be very useful, if not indispensable, for startuppers in their choice of a large firm. Although this thesis did not focus on SMEs, exchanges with startups showed that collaboration between startups and SMEs was more natural than between startups and large firms, as they are closer to each other by nature. The exploration by public authorities of funding actions in favor of startup-SME collaborations could be fruitful for the rapid development of innovations within the ecosystem, all the more so given the fact that

SMEs are the largest providers of employment in France: about 4 million SMEs, i.e. 99.9% of firms, 6.3 million employees, 43% of the added value.[21]

In order to define the different axes having an impact on collaborations to innovate within a given ecosystem, the thesis invites public authorities to feed their reflections with the help of the reading grid related to the forms of cognitive, social, organizational and geographical proximity, which have a real impact on the quality and success of collaboration and also present the interest of a holistic vision of it.

Finally, it appears that better communication and diffusion of information to the entire ecosystem community would be a driving force for innovation collaborations. Exchanges with a substantial number of startups have revealed a desire to centralize at the local and regional level the information related to the ecosystem actors and experts likely to accompany or support them. The simple knowledge of these potential resources specific to the local ecosystem, whether human, technical, material or financial, would allow, in particular startups, to save precious time and to make choices that are more informed because based on reliable and relevant information. The deployment of an interactive digital platform would seem very useful in this respect.

7.4. Limits, perspectives and future research project

This section presents the limits of this research work and suggests perspectives for future research. The final point of this work presents the research program whose development is envisaged further to this thesis.

7.4.1. Limits and perspectives for future research

The starting point of this thesis was the study of collaboration for innovation of the startup-large firm dyad. As the research progressed, other stakeholders from the local ecosystem community, essential to the success of this asymmetrical collaboration, were added and their perspectives were explored. It would seem

[21] https://www.economie.gouv.fr/cedef/chiffres-cles-des-pme

relevant to broaden this perspective through future research, i.e. to study local ecosystems and characterize their contingency factors. This would make it possible to link these contingency factors to the needs of stakeholders, in order to identify their positive or negative effect on the design and process of collaborations. This would shed additional light both from a theoretical and practical point of view, particularly with regard to the decision-making of public authorities that finance the innovation devices of their ecosystem.

The diversity of the cases studied in this thesis allowed us to consider a wide variety of factors that hinder or foster asymmetrical collaboration. The associated limitation is the lack of study on the duration of a specific case of startup-large firm collaboration. Longitudinal studies would be interesting to highlight the contingency factors specific to a given situation. Another relevant axis in terms of future research would be longitudinal studies including cases of failed collaborations, which is lacking in the literature (Tucci et al., 2016, p. 286) :

> "*Our current open innovation [OI] research is unbalanced, in that we have many, many more examples of "success" than "failure". The failure cases are critical to defining the limits of OI, and to revealing latent conditions that may thwart the effective use of OI in certain situations. Failure cases may also sharpen our definition of OI by examining where it does not work well*."

Likewise, given the impact of the preparation of the large firm during the Upstream phase on the quality of collaboration, longitudinal studies could be carried out from the decision to adopt an open innovation strategy and to collaborate with startups up to the real collaboration (*Design* and *Process* phases). This would make it possible to refine further, on a time-based axis, the factors driving the transformation of large firms in this collaborative approach.

The quantitative study of this thesis (Article 2) had an exploratory aim. Hence, the number of startups studied (31) represents a limit for generalizing the results. Future quantitative studies on the key variables that emerged from this work, involving a substantial sample of startups, would confirm or refute these initial results. Variables to be studied would include the influence of social ties between the startup and the large firm or the influence of the startup's empathy towards the large firm on the

success of the collaboration. Such research could focus on a single case studied in depth based on the different perspectives of stakeholders. Finally, it would be interesting to pursue work on the nature of the link between the duration of entrepreneurship training of startup founding teams and their level of proximity to large firms. Here again, longitudinal studies from the idea of the birth of the startup to its rise in terms of turnover would be very enlightening.

7.4.2. Future Research Project

Complementarity of resources and skills is the driving force fostering the emergence of collaboration. On the one hand, the complementarity of resources between startups and large firms is at the very origin of their common will to collaborate in order to innovate, and on the other hand, the complementarity of skills within the founding teams of startups has proven to facilitate proximity with the large firm. The second strength noted among the actors is adaptability, particularly on the side of the large firm, which has been led to question its existing business model in order to adopt a global strategy of open innovation. Finally, the third strength, the competent support provided to partners by the community (innovation intermediaries in particular) of the local and regional ecosystem proved to be essential to the development of these collaborations.

The results of the thesis have led to the consideration of a continuation of this research program. The envisaged future research project will focus on the adaptation of the community, in the broadest sense (biocenosis), of the local and regional ecosystem to increase the capability of economic actors to collaborate in an open innovation mode and in a context of sustainability. The framework developed in the thesis based on the theory of proximity will serve as a model for this new project. The first part of this research program will first of all focus on the structured analysis of the set of contingency factors of a local ecosystem, on the one end influencing open innovation (value creation *and* capture) from the perspective of cognitive, social, organizational and geographical proximity, and on the other hand contributing to giving meaning to collective action. This program will be in line with the United Nations Agenda 2030 on Sustainable Development Goals, and in particular with the "SDG #17" dedicated to collaboration, "partnerships for the goals":

> "*The seventeenth and final goal promotes effective partnerships between governments, private sector and civil society that are necessary to achieve the Sustainable Development Goals (SDGs) at the global, regional, national and local levels. These partnerships must be inclusive, built on shared principles and values, and place people and the planet at the center of their concerns*."[22]

Moreover,

> *"Due to the COVID-19 pandemic, the global economy is projected to contract sharply, by 3 per cent, in 2020, experiencing its worst recession since the Great Depression.*
>
> *Strong international cooperation is needed now more than ever to ensure that countries have the means to recover from the pandemic, build back better and achieve the Sustainable Development Goals."*[23]

Based on these elements related to ecosystem contingency factors, the second part of the project will be considered. This will explore the links between local and regional ecosystem contingency factors that foster the proximity between startups and SMEs and their symbiotic collaboration to innovate.

Continuing this work on collaboration between startups and SMEs would seem to be relevant for several reasons. Indeed, as mentioned above, SMEs provide most of the jobs in France. Helping to support them in their innovation efforts would make it possible to participate on the one hand in the acceleration of their innovations and thus in their business continuity, nay survival, and on the other hand in increasing their hiring capability. Moreover, in the current pandemic context, it is more than ever necessary to combine all possible forces in the direction of employment and innovation. Startups being a source of innovation, their association with SMEs appears to be very fruitful, especially as these actors are relatively symmetrical and therefore close from a cognitive and organizational point of view. The problem will no longer lie in the asymmetry of the relationship, as was the case between startups and large firms, but in the lack of resources, particularly time, and in the rapid matching of

[22] https://www.agenda-2030.fr/odd/odd17-partenariats-pour-la-realisation-des-objectifs-56, Source consulted 31/07/20 (adapted transation)
[23] https://www.un.org/sustainabledevelopment/globalpartnerships/, Source consulted 31/07/20

their innovations with sustainable development goals. This component will draw on the literature on open innovation strategies of SMEs (Anderson et al., 2014; Brunswicker & Ehrenmann, 2013; Brunswicker & Vanhaverbeke, 2015; Leckel et al., 2020; Lee et al., 2010; Usman et al., 2018; van de Vrande et al., 2009).

The first episode of the pandemic highlighted the useful, necessary jobs and the others. This experience lived by the whole humanity invites us to rethink even more than in the past the meaning given to all our actions, both as individuals and as economic actors. Despite the tragedy it represents, this pandemic could be considered positively for the future as a "catalyst for change". (Mention et al., 2020). This envisaged new research program is part of this quest for value creation for the collective, and aims to participate in rethinking the contribution of human beings to the local ecosystem that supports them, to the living, to nature, of which they are an integral part. In the perspective of this stimulating new research work, which will integrate multidisciplinary approaches, the literature on symbiotic economy, associated with a major structural change of the current mode of production, will be called upon (García-Olivares & Solé, 2015, p. 41):

> "*Given the obvious structural and world-view differences between the old and the new system, this plausible and needed economic evolution should be considered as a structural change in the present mode of production, that we can call growth capitalism, in order to turn into what could be called Symbiotic Economy*."

This research program will thus be in line with the research work carried out in favor of an innovation conducted according to the sustainable development goals and a rapprochement of the human being with his/her natural ecosystem, his/her ecological environment (Kiron et al., 2013; Kivimaa et al., 2019; Shrivastava, 2015; Shrivastava et al., 2020; Shrivastava & Berger, 2010; Wasieleski, David M. Waddock & Shrivastava, 2020; Wasieleski & Weber, 2020), and integrating individuals as *acting* stakeholders, individually *and* collectively, *in* and *for* their local and regional ecosystem.

- CHAPTER 8 -

Résumé de la thèse

CHAPTER 8 - Résumé de la thèse

Introduction générale

Contexte du programme de recherche

Face à la complexité du macro-environnement, mais également de leur méso-environnement, les grandes entreprises doivent explorer de nouveaux espaces de connaissances, externes, pour innover plus rapidement et mieux que leurs concurrents. Il existe aujourd'hui de nombreux échecs de grands groupes qui n'ont pas réussi à dégager un avantage concurrentiel sur leur marché :

> « *En juillet 2016, Yahoo! est racheté pour moins de 5 milliards de dollars par Verizon, opérateur de téléphonie mobile. Il y a douze ans, ce pionnier du Web valait 43 milliards de dollars. Pourquoi une telle dégringolade ? "Yahoo! a été un portail de news, un moteur de recherche, un service d'e-mails, une société de Bourse, sans jamais devenir le meilleur sur aucun de ces marchés", analyse Frédéric Fréry, professeur de stratégie à l'ESCP Europe*. »[24]

Face à ce contexte, les grandes entreprises se tournent de plus en plus vers l'innovation ouverte, afin d'intégrer dans leur processus d'innovation des acteurs externes variés en vue de dégager ou de maintenir un avantage concurrentiel. Les startups, en tant que ressources précieuses pour le développement d'innovations, mais également pour leur orientation résolument centrée sur le client et inscrite dans leur business model (Sarrazin, 2017), font partie de ces acteurs externes. Leur agilité leur permet de réagir rapidement et de proposer des solutions innovantes recherchées par les grandes entreprises pour répondre à la demande de leur marché et leur permettre de conserver leur avantage concurrentiel ou simplement survivre (Chesbrough, 2003; Spender, Corvello, Grimaldi, & Rippa, 2017). Les startups, de leur côté, rechercheront la collaboration avec de grandes entreprises pour diverses

raisons, dont : un besoin de ressources financières ou matérielles, de connaissances externes complémentaires (ressources techniques), de reconnaissance et de légitimité vis-à-vis des clients ciblés dans l'optique d'une commercialisation rapide et surtout d'un passage à l'échelle (*scaling up*). Cela marque une première différence fondamentale entre startups et grandes entreprises : leur business model, celui des startups étant fondé sur sa « scalabilité » (*scalability*) comme mentionné par Blank & Dorf (2012), ce qui n'est pas le cas de celui des grandes entreprises.

La collaboration entre startups et grandes entreprises apparaît *a priori* comme naturelle : chacune recherchant ce que l'autre possède, la collaboration intégrant cette complémentarité pourrait sembler évidente. Si elle peut l'être d'un point de vue rationnel et externe, elle n'est cependant pas encore naturelle dans les faits, comme en témoigne Jean-Pierre Bouchez dans son excellent ouvrage paru tout récemment (Bouchez, 2020, p. 234) :

> *« Un état des lieux des pratiques montre que si la collaboration entre ces deux mondes comporte des facteurs encourageants, il n'en reste pas moins qu'un certain nombre d'améliorations restent encore à concrétiser* ».

L'équilibre de la collaboration n'est donc pas si simple à trouver. Réussir à concilier les intérêts de ces « deux mondes » aux réalités bien différentes afin de les faire se rapprocher et collaborer pour innover ensemble autour d'un objectif commun est un véritable challenge. Au-delà de ces réalités bien différentes, d'autres dimensions peuvent intervenir et freiner, voire faire échouer, la collaboration entre ces acteurs. Par exemple, la crainte de la grande entreprise de voir en la startup un potentiel futur concurrent sérieux. Bien que cette crainte soit toutefois à nuancer car moins présente ces dernières années, de l'avis collégial des startups et intermédiaires de l'innovation interrogés sur le sujet, elle reste tout de même latente. Côté startup, la crainte qui apparaît comme la plus importante est celle d'un « *hold-up des droits de propriété intellectuelle* »[25]. On peut entrevoir une matérialisation de ces craintes de part et d'autres à travers la perception différente qu'ont les deux acteurs de la notion d'exclusivité (cf. Figure ci-dessous) : en effet, 50% des grandes entreprises

[24] https://www.capital.fr/votre-carriere/6-echecs-historiques-que-tout-manager-doit-avoir-en-tete-1231141, source consultée le 21/07/20.
[25] https://lehub.bpifrance.fr/startups-grands-groupes-2-regles-jeu/, source consultée le 31/07/20.

interrogées la considèrent « assez ou totalement pertinente », contre 24% des startups qui préfèrent collaborer avec les grandes entreprises sur un mode plus indépendant.

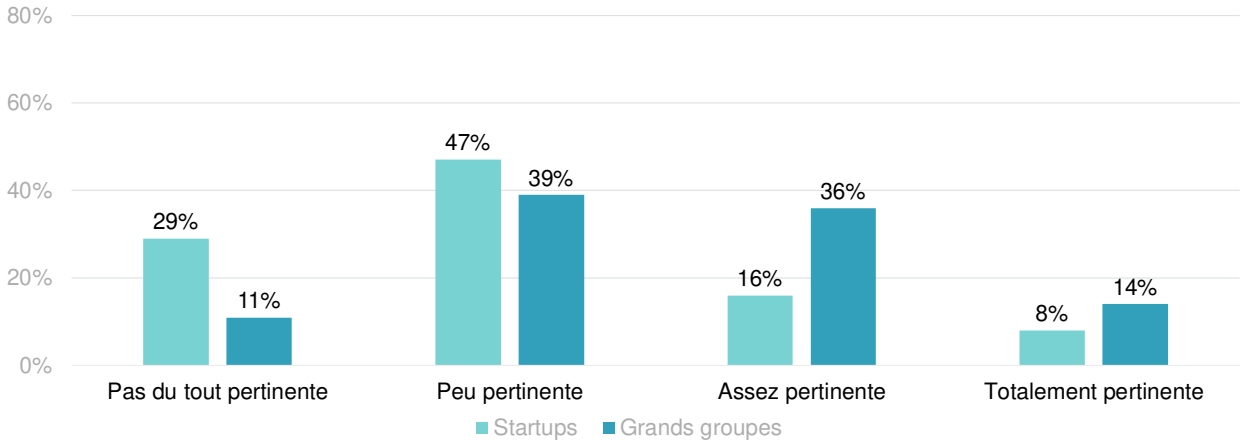


Figure 35 - Perception de la notion d'exclusivité dans la relation startups / grands groupes (Source : Cap Gemini)[26]

Par ailleurs, si l'on se place au niveau de la stratégie territoriale, on dénombrait en 2019 seulement 7 licornes[27] en France, alors que le Royaume-Uni (pays de taille proche de celle de la France en terme de population) en affichait 25 et les Etats-Unis 228 en juin 2020, selon le récent rapport de CB Insights. Dès lors, il apparaît légitime de se questionner sur ces écarts, dans une perspective d'amélioration de l'existant. Selon le Secrétaire d'Etat au Numérique : « *Il y a une façon de faire de la Tech à la française et à l'européenne et il y a une façon de faire de la Tech à la chinoise et à l'américaine. En France, on est toujours dans un équilibre entre performance et humanité*. »[28] Les valeurs et le sens seraient donc placés au centre de l'action en France, aux côtés de la performance, et expliqueraient en partie ces écarts. Pour d'autres, tels que Gilles Babinet[29], entrepreneur français et vice-président du Conseil National du Numérique, ces écarts seraient davantage liés à la culture de la prise de risque en France, à la très faible « polyculturalité » des fondateurs de startups, à des

[26] https://www.capgemini.com/fr-fr/news/le-village-by-ca-et-capgemini-presentent-les-resultats-du-barometre-2020-de-la-relation-start-up-grand-groupe/, 4ème baromètre Village by CA et Cap Gemini de la relation startup-grands groupes, Juin 2020. Source consultée le 01/08/20

[27] En référence à une startup devenue une entreprise dont la valeur dépasse 1 milliard de dollars

[28] https://www.gouvernement.fr/argumentaire/french-tech-2022-interview-mounir-mahjoubi, source consultée le 29/07/20.

défaillances d'ordre structurel tel qu'une faible maîtrise de l'anglais ou encore « *l'absence de vrais clusters réunissant les universités, les startups et les grandes entreprises* ».

Pourtant, la France compterait (ce chiffre variant d'une source à l'autre) plus de 10.000 startups en 2019, 51% d'entre elles étant concentrées sur Paris,[30] et de nombreux efforts ont été réalisés en faveur du développement des startups et de la dynamique de l'écosystème dans son ensemble sur tout le territoire français avec la création de SATT, d'incubateurs, d'accélérateurs, de startups studio, par exemple, et le soutien et les actions essentiels d'acteurs nationaux incontournables tels que la French Tech, créée en 2013, et bien sûr BPI France, pour ne citer qu'eux. Les acteurs publics et privés sont très nombreux et illustrent la volonté collective de soutenir l'entrepreneuriat au sein des écosystèmes français. En l'espace de moins de dix ans, le nombre d'accélérateurs et d'incubateurs actifs dans le monde a bondi de façon exponentielle, passant de 560 en 2009 à 2616 fin 2018[31]. La France compte 270 incubateurs et 56 accélérateurs en 2018, leur nombre ayant augmenté en un an respectivement de 12,5% et de 12%[32].

Enfin, lors du premier épisode 2020 de la pandémie liée au Covid-19, le gouvernement a décidé de soutenir les startups pour ces raisons invoquées par Cédric O, secrétaire d'Etat chargé du numérique : « *Les entreprises technologiques occupent une place de plus en plus importante dans notre économie en matière de croissance et de création d'emplois. Grâce aux innovations qu'elles développent, elles permettent également de répondre à de nombreux défis sociétaux. La période que nous traversons en est une illustration prégnante tant les outils de téléconsultation, de télétravail ou encore d'apprentissage en ligne se révèlent*

[29] http://blog-french-iot.laposte.fr/pourquoi-y-a-t-il-si-peu-de-licornes-en-france/, source éditée le 09/12/19, consultée le 01/08/20

[30] https://www.capterra.fr/blog/470/situation-economique-et-sociale-des-startups-francaises-en-2019, source consultée le 26/07/20

[31] https://www.bpifrance.fr/A-la-une/Actualites/Accelerateurs-et-incubateurs-5-fois-plus-nombreux-en-dix-ans-45467, selon une étude Roland Berger. Source consultée le 23/07/20.

[32] https://lespepitestech.com/blog/2019/02/12/point-detape-sur-lecosysteme-startups-francais-en-2019, source consultée le 26/07/20.

déterminants pour permettre à chacune et chacun de continuer à vivre malgré les conditions difficiles. »[33]

A la lumière de ces éléments contextuels, l'enjeu de soutenir les startups et les grandes entreprises à travers une meilleure connaissance des facteurs de succès de leurs collaborations pour innover apparaît ainsi comme fondamental à plusieurs niveaux :

- Economique : impact sur la croissance des startups, des grandes entreprises et par extension l'économie française, associée à une dynamique de l'emploi, à la pérennisation des emplois au sein des grandes entreprises et la création de nouveaux emplois par les startups

- Sociétal : les startups focalisant sur les besoins des clients et des usagers, leur offre est en phase avec les demandes de la société

- Ecologique : la société entame sa mutation vers l'innovation durable, qui devient à présent urgente, et les startups, innovantes et agiles, ont un rôle essentiel à jouer dans cette transition

Emergence de l'objet de recherche et problématique

Une recherche centrée sur des acteurs asymétriques

Startups et grandes entreprises constituant les parties prenantes principales sur lesquelles cette thèse se focalise, il est utile de préciser ici les définitions retenues dans cette thèse.

De l'entrepreneur au startuper

Le questionnement relatif à ce qu'est une startup ou un startuper a fait l'objet de discussions récurrentes avec les startupers interviewés dans le cadre de cette thèse.

[33] https://www.economie.gouv.fr/coronavirus-startup-mesures-de-soutien-economique, source consultée le 01/08/20

A l'origine du terme startup : le terme "entrepreneur", qui se trouve déjà dans les nouvelles françaises écrites au 14ème siècle[34]. Plus tard, au 18ème siècle, la première contribution au domaine de l'entrepreneuriat a été apportée par l'économiste Bernard Cantillon (Stevenson & Jarillo, 1990) qui a inventé la théorie de l'entrepreneur. Vers 1800, l'économiste français J.B. Say a désigné l'entrepreneur comme une personne qui "shifts economic resources out of an area of lower and into an area of higher productivity and greater yield" (Drucker, 1985). S'écartant de la vision traditionnelle de l'entrepreneur et de l'esprit d'entreprise, Schumpeter (1934) considère que l'essence des entrepreneurs est l'innovation et que "it is the carrying out of new combinations that constitutes the entrepreneur". Il définit (p.66) ces nouvelles combinaisons comme "the introduction of a new good (…) or of a new quality of a good, the introduction of a new method of production (…), the opening of a new market (…), the conquest of a new source of supply of raw materials or half-manufactured goods (…) and the carrying out of the new organization of any industry (…)." Depuis lors, les chercheurs ont continué à nourrir ces définitions de l'entrepreneur selon trois perspectives différentes basées sur "*what* happens when entrepreneurs act; *why* they act; and how *they* act " (Stevenson & Jarillo, 1990). Par exemple, pour Drucker (1985) :

> "*Entrepreneurs see change as the norm and as healthy. Usually, they do not bring about the change themselves. But -and this defines entrepreneur and entrepreneurship- the entrepreneur always searches for change, responds to it, and exploits it as an opportunity*".

De nombreuses études ont été entreprises sur les types d'entrepreneurs, sur leurs motivations. Un travail récent de Gruber & Macmillan (2017) sur le comportement entrepreneurial a identifié trois types d'entrepreneurs :

> "*The traditional seeker of rent, the entrepreneur who seeks to aid the community, and the entrepreneur who seeks to aid society at large*".

Partant de là, quel type d'entrepreneur est un « startuper » ? Possède-t-il des caractéristiques spécifiques distinctes de celles d'un "simple" entrepreneur ? Le

[34] *Nouvelles françoises en prose du XIVe siècle,* publié en 1858 à partir de manuscrits. Introduction et commentaires de Charles d'Héricault et Louis Moland. Texte disponible à la Bibliothèque nationale de France :

terme startup est maintenant largement employé partout dans le monde depuis des décennies, il n'existe toujours pas à ce jour de définition scientifique formelle et consensuelle pour les termes startup et startuper. Les dictionnaires donnent des définitions partielles très laconiques et applicables à de nombreux autres cas que celui des startups. Voici l'une de ces définitions : "une startup est une petite entreprise qui vient de démarrer". Ce type de définition est bien loin de retranscrire les spécificités originelles des startups qui les différencient des autres types d'entreprises. Selon Ries (2011), "a startup is a human institution designed to deliver a new product or service under conditions of extreme uncertainty." L'incertitude extrême est certes une dimension essentielle du cycle de vie d'une startup, mais cette dernière définition ne prend pas en considération, notamment, le fait que l'état des startups est par essence temporaire (Spender et al., 2017), les startups d'aujourd'hui étant les PME de demain (Schäfer & Ternès, 2016). En outre, selon Blank & Dorf (2012), une startup est innovante, caractérisée par la croissance et la recherche d'un modèle d'affaires reproductible et évolutif. La définition de Paul Graham insiste également sur l'idée de croissance rapide : "A startup is a company designed to grow fast. Being newly founded does not in itself make a company a startup. Nor is it necessary for a startup to work on technology, or take venture funding, or have some sort of "exit." The only essential thing is growth. Everything else we associate with startups follows from growth."[35] De plus, contrairement aux grandes entreprises qui ont une approche relativement traditionnelle des activités, les startups basent leur activité sur un "lean thinking" qui leur permet de créer de la valeur et d'être vraiment très proches de la demande du marché (Ries & Euchner, 2013).

Considérant ces éléments saillants de la littérature, voici la définition du terme « startup » proposée dans le cadre de cette thèse :

> *Les startups sont des entreprises nouvellement établies qui fournissent de nouveaux produits ou services, sont caractérisées par un potentiel de croissance élevé et rapide et donc désignées temporairement comme des startups. Leur but est de créer de la valeur pour le client, d'innover en suivant*

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http://gallica.bnf.fr/ark:/12148/bpt6k27756m/texteBrut

[35] http://paulgraham.com/growth.html

de très près la demande du marché et de développer de nouveaux business models durables et évolutifs. Elles évoluent dans des environnements extrêmement incertains et ont souvent un besoin crucial en ressources, parmi lesquelles des financements extérieurs. Structurellement, les startups sont ouvertes, agiles, flexibles et axées sur l'innovation. Enfin, les startups n'opèrent pas nécessairement dans le secteur de la technologie.

Ainsi, en raison de la nature de leur entreprise, les créateurs de startups sont profondément ancrés dans la nouveauté, dans l'innovation, ce qui les rapproche de la vision de l'entrepreneur de Schumpeter. Par ailleurs, ces créateurs d'entreprise, en raison du modèle d'affaires particulier d'une startup, doivent faire croître rapidement leur entreprise, ce qui a un impact sur le comportement du créateur ou de l'équipe de créateurs de startup ainsi que sur leur processus de prise de décision. Pour ces raisons, un startuper est désigné dans cette thèse comme un type particulier d'entrepreneur, à savoir un entrepreneur innovant soumis à une pression temporelle particulièrement forte en raison de la nature de son business model qui sous-tend la nécessité d'une croissance rapide.

La grande entreprise

La notion de grande entreprise fait davantage consensus que celle de startup et est fondée sur des critères quantifiables. Cette thèse a retenu la définition française « *définie par le décret d'application (n°2008-1354) de l'article 51 de la loi de modernisation de l'économie, relatif aux critères permettant de déterminer la catégorie d'appartenance d'une entreprise pour les besoins de l'analyse statistique et économique* » :

« Une grande entreprise est une entreprise qui vérifie au moins une des deux conditions suivantes :

- *Avoir au moins 5000 salariés;*

- *Avoir plus de 1,5 milliards d'euros de chiffre d'affaires et plus de 2 milliards d'euros de total de bilan. »*[36]

La grande entreprise est ainsi caractérisée par l'importance de ses ressources humaines et financières, et donc implicitement par son âge et son histoire laquelle détermine sa trajectoire au fil des ans. Tous les types de grandes entreprises sont considérés ici, cette thèse focalisant sur la dimension asymétrique de leur collaboration avec des startups (Kohler, 2016), c'est-à-dire une collaboration dans laquelle les parties prenantes diffèrent significativement en taille, ressources ou expérience commerciale (Minshall et al., 2010) et âge. Ainsi, aucune distinction n'est faite entre grandes entreprises privées, publiques, multinationales, nationales.

Un regain de l'intérêt académique depuis 2016 pour la recherche sur la collaboration startup - grande entreprise

Une recherche dans la base de données Ebsco (Business Source Premier) montre l'intérêt académique croissant porté au niveau mondial au sujet de la collaboration entre startups et grandes entreprises (cf. Figure 36). Les calculs ont été réalisés à partir d'une sélection d'articles à comité de lecture présents dans la base de données, soit au total 202 articles sur les cinquante dernières années (1971-2020). La sélection des articles ayant donné lieu à la figure ci-après a été réalisée à partir de la requête booléenne complexe suivante, afin de prendre en considération une variété de termes utilisés par les chercheurs pour caractériser la collaboration startup - grande entreprise:

« (alliance* OR collaboration* OR cooperation* OR partnership*) AND (startup* OR start-up*) AND (corporate* OR "large firm*" OR "large compan*" OR incumbent*) »

La requête est fondée sur des termes en anglais afin d'englober un maximum de publications, à l'échelle mondiale, la majorité des articles étant rédigée en anglais.

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36 https://www.insee.fr/fr/metadonnees/definition/c1035#:~:text=Une%20grande%20entreprise%20est%20une,euros%20de%20total%20de%20bilan., source consultée le 01/06/20

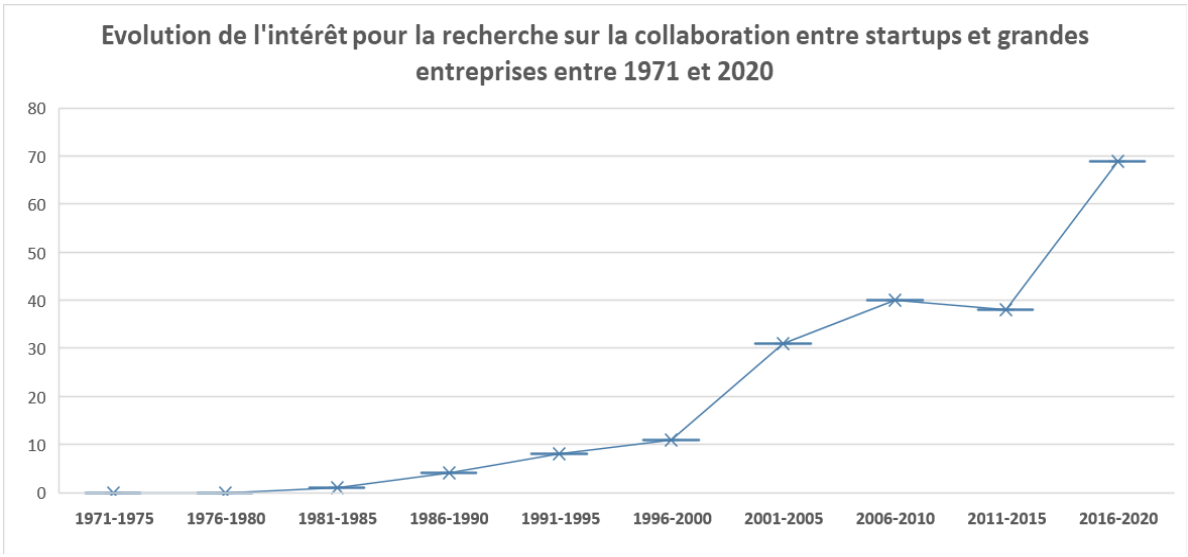


Figure 36 : Evolution de l'intérêt pour la recherche sur la collaboration entre startups et grandes entreprises entre 1971 et mai 2020 (calculée à partir des données d'Ebsco)

La courbe de l'évolution de l'intérêt pour ce sujet de recherche croit progressivement à partir des années 1996-2000, période marquée par les débuts d'internet, puis de façon plus nette ensuite jusqu'en 2010. Après une période (2011-2015) de légère baisse du nombre d'articles, à partir de 2016, on observe un rebond du nombre d'articles académiques publiés qui s'accélère très nettement : +81% d'articles entre 2016 et mai 2020 par rapport à la période précédente (2011-2015). Cela coïncide avec la « troisième révolution industrielle » telle que présentée par Plihon (2016) (cf. Figure 37) sur la base des travaux de Joseph Schumpeter.

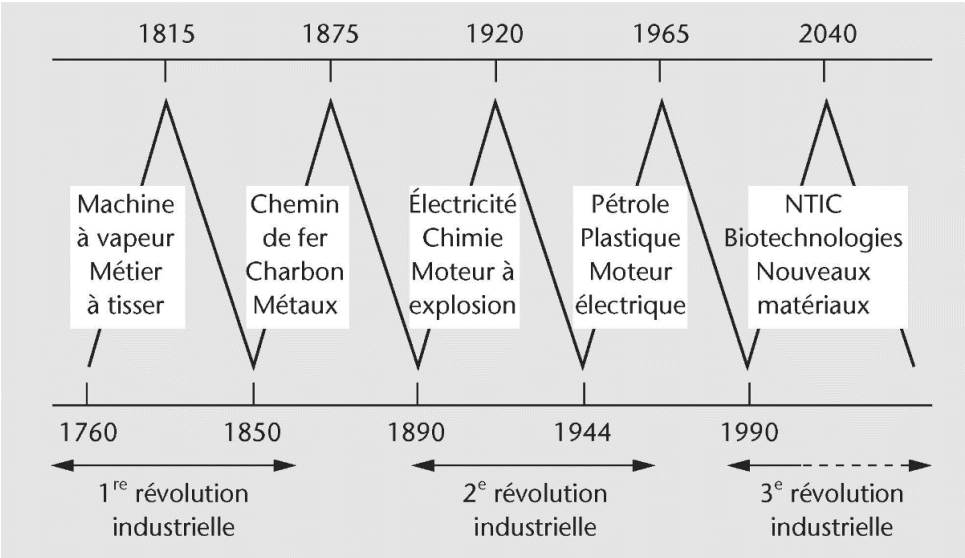


Figure 37 - Innovations technologiques et révolutions industrielles. Source : Plihon, 2016

Ce lien de corrélation entre un intérêt croissant pour ce type de collaboration et l'évolution des innovations technologiques n'est pas surprenant dans la mesure où les grandes entreprises sont bouleversées dans leurs business models par les technologies émergentes, et en particulier depuis ces toutes dernières années par les géants à la pointe de ces technologies, les GAFA(M) et les NATU. Dès lors, il apparait logique que les chercheurs se penchent sur ce phénomène.

La dimension relationnelle de la collaboration sous-explorée

Alors que la dimension transactionnelle (contractualisation, dimension financière) de la collaboration entre startups et grandes entreprises est représentée dans les travaux de recherche, des chercheurs ont souligné le manque de travaux relatifs à la dimension relationnelle de la collaboration malgré toute son importance (Dyer & Singh, 1998; Hill & Birkinshaw, 2014; Yoon & Hughes, 2016). Cette thèse a souhaité tenter de répondre à ces appels et adopte la définition du terme « relationnel » tel que décrit par Hill & Birkinshaw (2014, p. 1905) :

> "*We use the term relational to refer to ties that are embedded in social relationships, are typically long term in nature, and are evaluated on a subjective basis; relational ties are distinct from transactional ties, which are relatively at arm's length, short term, and objectively evaluated (cf. MacNeil, 1974; Poppo & Zenger, 2002; Rousseau, 1995; Uzzi, 1996, 1997)*."

Sans pour autant rejeter la dimension transactionnelle, essentielle dans de nombreux types d'alliances, la thèse focalise sur la dimension relationnelle « durable », c'est-à-dire de long terme, de la collaboration entre startups et grandes entreprises, celle-ci n'ayant pas reçu suffisamment d'attention jusqu'ici. Pour aborder cette dimension relationnelle, la collaboration entre startups et grandes entreprises a tout d'abord été considérée selon leurs liens de distance, qui marquent leurs différences. Dans un second temps, une exploration de leur rapprochement possible a été réalisée à travers le cadre théorique de la proximité géographique et non géographique. En effet, pour collaborer, les acteurs doivent interagir et donc se rapprocher selon différentes formes de proximité (géographique, cognitive, sociale, organisationnelle) présentées en Chapitre 1.

Le manque de travaux sur la dimension processuelle de la collaboration startup - grande entreprise

Le temps représente un bien précieux pour les startups de par leur nature les obligeant à rechercher une croissance rapide, et donc un lancement rapide sur le marché. De plus, la plupart d'entre elles, à l'instar des petites structures organisationnelles, manquent de temps (Sarasvathy, 2008). Aussi, il est crucial pour elle de le manager de la façon la plus judicieuse possible, en particulier dans le contexte du développement d'une collaboration avec une grande entreprise où le manque de temps peut constituer une barrière (Oumlil & Juiz, 2016; Ring & van de Ven, 1992). Ce type de collaboration s'inscrit sur le long terme pour la startup (Weiblen & Chesbrough, 2015). Aussi est-il crucial pour elle qu'elle puisse choisir la grande entreprise adéquate, celle qui lui permettra d'évoluer vers une croissance rapide. Compte tenu de l'importance de ce facteur temps pour les startups dans le cadre de leur collaboration avec de grandes entreprises, cette thèse adopte une approche processuelle de la collaboration. Ainsi, la collaboration n'est pas uniquement considérée selon sa finalité, le résultat espéré, mais également selon son cycle de vie qui est amené à se modifier au fur et à mesure que la collaboration évolue dans le temps :

> "*The structural emphasis of transaction cost economics leads it to neglect important processual issues resulting from their ongoing nature. Alliances are usually not one-off transactions but, rather, entail continuing exchange and adjustments, as a result of which process issues become salient (Khanna, 1997).*" (Gulati, 1998, p. 304)

L'idée est d'explorer chacune des différentes phases de la collaboration afin de mieux appréhender et évaluer la qualité de cette dernière selon la phase dans laquelle se trouvent les partenaires.

Le manque d'approche holistique de la collaboration startup – grande entreprise

En phase avec le choix d'une approche processuelle, il est apparu qu'une approche holistique de la collaboration startup – grande entreprise était nécessaire car quasi-

absente de la littérature. Aussi, la thèse adopte une vision holistique de cette collaboration, tout comme certaines entreprises peuvent le faire :

> "*Holistic thinking. [These] enterprises constantly scan the ecosystem to ensure that they are able to meet the short-term value delivery goals and simultaneously shape the long-term ecosystem within which the enterprise operates. [This kind of] enterprise requires leaders (and others) to take a holistic approach to considering all life cycle, leadership, and enabling processes in an integrative fashion, being careful not to suboptimize the performance of any one area*." (Kessler, 2013, p. 439)

Cette vision holistique a conduit à définir un cadre large associé à la collaboration, au-delà de la dyade startup – grande entreprise. La thèse prend en considération l'écosystème incluant les parties prenantes de la collaboration, en plus des acteurs principaux, dans la mesure où des éléments propres à l'écosystème sont susceptibles d'avoir une influence sur la collaboration elle-même. De ce fait, la thèse propose d'inclure différents niveaux d'analyse : intra-organisationnel de la startup, intra-organisationnel de la grande entreprise, inter-organisationnel et écosystémique. Dans cette optique de vision holistique, les cadres d'analyse retenus, fondés sur la théorie de la proximité, ainsi que sur les capacités dynamiques, se sont avérés particulièrement pertinents.

Intérêt de la recherche et objectifs de la thèse

Les éléments de contexte et de la littérature existante ont conduit à formuler la problématique transversale de la thèse de la façon suivante :

« Quels facteurs favorisent la collaboration symbiotique entre startups et grandes entreprises dans un écosystème d'innovation ouverte ? »

L'objectif de ce travail de recherche est d'explorer, dans un contexte d'innovation ouverte, quels facteurs internes et externes aux acteurs favorisent une relation symbiotique entre startups et grandes entreprises, et ainsi influent positivement sur

la qualité et le succès de la collaboration de ces partenaires asymétriques, à la fois différents et potentiellement complémentaires.

La thèse défend l'idée que les facteurs moteurs d'une collaboration symbiotique peuvent être (co-)construits s'ils font défaut à l'un des partenaires, voire aux deux. Cette thèse sous-tend ainsi l'idée, selon une approche évolutionniste et une analogie avec la symbiose biologique, que le symbiote (grande entreprise ou startup) peut évoluer, soit par nécessité absolue (aucune autre alternative possible pour assurer sa survie), soit par une intention conscientisée et volontariste, pour augmenter sa capacité à collaborer en contexte d'innovation ouverte et satisfaire *in fine* ses objectifs de survie. Les raisons ayant présidé à l'orientation vers une analogie avec la symbiose biologique (au sens mutualiste) sont exposées en Chapitre 1.

Les cadres d'analyse théorique retenus pour explorer la problématique reposent sur la théorie de la proximité et sur celle des capacités dynamiques. D'une part, la thèse s'appuie sur la hiérarchie plate des formes de proximité géographique et non géographique développée par (Boschma, 2005), de l'Ecole Hollandaise de la proximité, ainsi que sur les travaux des chercheurs de l'Ecole Française de la Proximité (Bouba-Olga & Grossetti, 2008; Kirat & Lung, 1999; Pecqueur & Zimmermann, 2002; Talbot, 2009; Torre & Rallet, 2005; Torre & Wallet, 2014). D'autre part, il est fait appel à la théorie des capacités dynamiques (Teece, Pisano, & Shuen, 1997) afin d'explorer les développements nécessaires à leur régénération pour favoriser la proximité entre les acteurs.

La démarche de réponse à la question de recherche de la thèse a été organisée progressivement, en quatre phases. A partir de la problématique de la thèse, une première sous-question de recherche a donné lieu à l'Article 1 (Chapitre 3). Cet article a soulevé différents questionnements, lesquels ont permis de faire émerger et de retenir trois autres sous-questions de recherche, qui ont ensuite été explorées à travers les articles 2, 3 et 4 (Chapitres 4, 5 et 6). Ces quatre articles et les sous-questions de recherche présentées ci-après ont structuré l'avancée de ce programme de recherche :

- **Article 1, Chapitre 3** : Quels sont les facteurs organisationnels qui favorisent la proximité (cognitive, sociale, organisationnelle, géographique) entre startups et

grandes entreprises et leur capacité à collaborer dans un contexte d'innovation ouverte ?

- **Article 2, Chapitre 4** : Dans quelle mesure le capital humain et social développé par les équipes fondatrices de startups influence-t-il leur capacité à collaborer avec les grandes entreprises tout au long du projet de collaboration d'innovation ?

- **Article 3, Chapitre 5** : Comment les grandes entreprises matures ouvrent-elles leur processus d'innovation pour collaborer avec des startups en développant leurs capacités dynamiques tout en réduisant leurs propres rigidités internes ?

- **Article 4, Chapitre 6** : Quels sont les rôles des intermédiaires d'un écosystème d'innovation ouverte sur la régénération des capacités dynamiques d'organisations traditionnelles, très hiérarchisées, pour développer de nouvelles collaborations avec des startups ?

Positionnement épistémologique et méthodologique

La question du positionnement épistémologique est une étape importante pour la cohérence du processus de recherche en tant que tel, et également pour la qualité de la réflexivité -nommée « *critique épistémologique interne* » par Piaget (Albert & Avenier, 2011, p. 28)- du chercheur sur ce dernier. Parmi les cinq principaux paradigmes existants (le rationalisme, l'empirisme, le positivisme, le constructivisme et le réalisme), le paradigme épistémologique choisi dans cette thèse est celui du constructivisme qui "*asserts that social phenomena and their meanings are continually being accomplished by social actors. It is antithetical to objectivism*" (Bryman, 2012). Cette démarche est pertinente dans le cadre de cette thèse dans la mesure où le « *travail réflexif à effectuer tout au long [du] processus de recherche […] vise à générer des savoirs scientifiques en mobilisant l'expérience de praticiens sur une question de recherche définie en référence à une problématique pratique persistante* » (Albert & Avenier, 2011, p. 23).

Le design de la recherche requiert du chercheur qu'il fasse également des choix d'ordre méthodologiques, dans une perspective de cohérence de l'ensemble de sa démarche de recherche. Dans le cadre de cette thèse, la méthodologie utilisée était principalement qualitative (pour trois articles). Elle a été complétée par une

méthodologie quantitative (Article 2), afin d'affiner des résultats obtenus par l'approche qualitative. Le recours à une méthodologie qualitative s'explique par la nature des questions soulevées et le fait que la démarche de cette thèse vise à comprendre un phénomène complexe (Wacheux, 1996).

Le raisonnement employé dans cette thèse est l'abduction qui, en outre, convient particulièrement bien aux approches constructivistes (Hallée & Garneau, 2019). L'abduction présente l'avantage d'augmenter la créativité du raisonnement :

> « *L'inférence abductive permet de combiner de manière créative des faits empiriques avec des cadres heuristiques de référence. L'utilisation de l'induction analytique et de l'abduction permet d'actualiser le travail créatif de la recherche qualitative tout en ayant recours aux connaissances existant dans le domaine auquel l'objet d'étude appartient.* » (Anadon & Guillemette, 2006)

La collecte de données s'est organisée autour d'études de cas. La question de recherche déterminant la sélection la plus appropriée des cas pour y répondre, la recherche d'une certaine diversité (en particulier en termes de secteur d'activité, de succès ou d'échec de la collaboration, de nombre de fondateurs dans la startup, de stratégies différentes de grandes entreprises en terme d'innovation ouverte) dans les cas étudiés a été de mise. En effet, l'ensemble du travail de recherche est fondé sur les différences, la notion de distance entre les acteurs (divergence) et leurs potentielles complémentarités (convergence). Aussi, les quatre articles visaient à rendre compte de cette diversité, des différences entre les cas afin d'en montrer les points de divergence et de convergence.

Cette thèse s'appuie sur le cadre de la théorie de la proximité et des capacités dynamiques (cf. Section 3 du Chapitre 1). Le modèle conceptuel ci-après présente l'articulation générale des quatre articles de la thèse suivant ce cadre théorique.

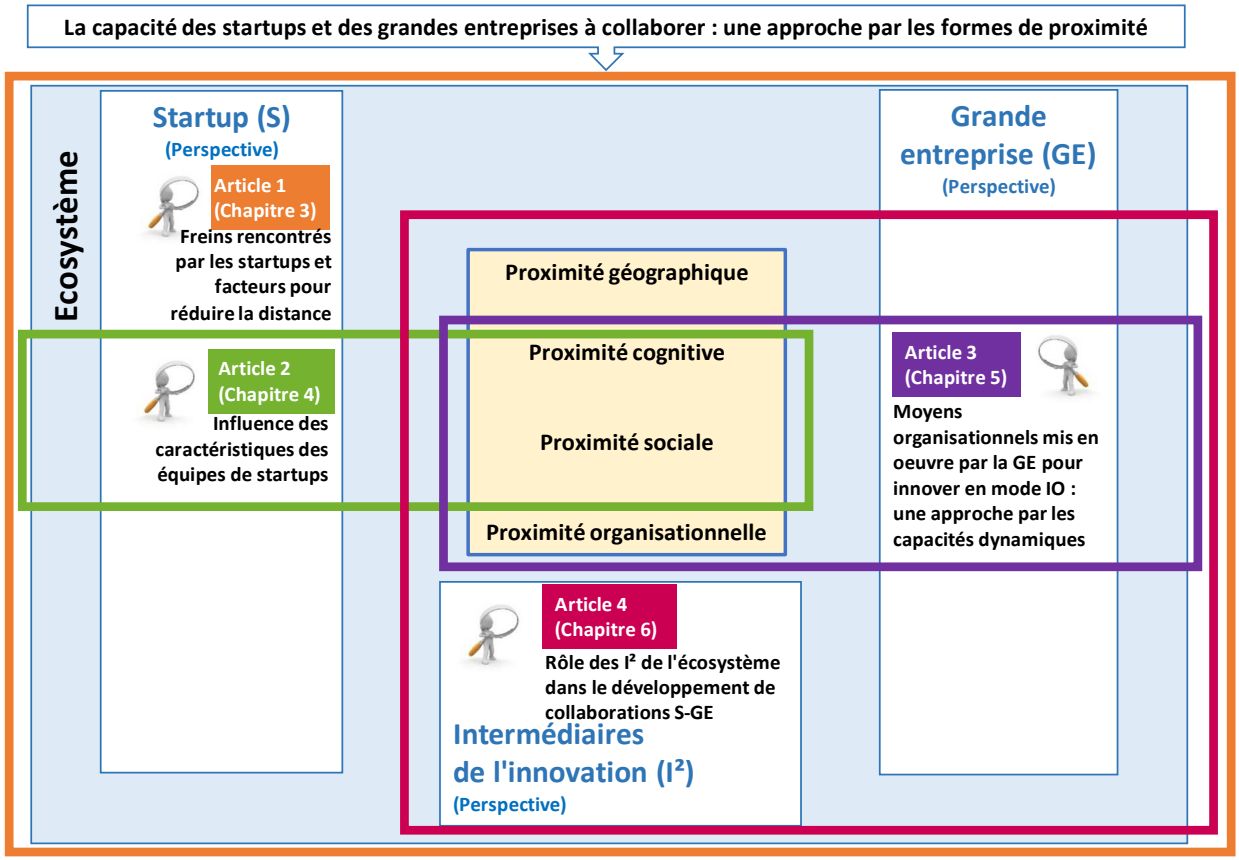


Figure 38 – Modèle conceptuel du programme de recherche

Structure et démarche du programme de recherche

Cette thèse est composée de huit chapitres. Les chapitres 3 à 6 sont dédiés aux quatre articles de la thèse qui défendent la thèse explicitée précédemment : *Les facteurs moteurs de la collaboration peuvent être (co-)construits s'ils font défaut à l'un ou l'autre des acteurs par une adaptation volontariste de celui-ci ou ceux-ci, bien que ce type de collaboration ne soit pas fondé sur la hiérarchie mais sur la confiance, l'exploration et l'agilité organisationnelle ; ces facteurs s'apparentent à ceux présents dans les relations symbiotiques de type mutualiste au sein des écosystèmes naturels*. Chacun des quatre articles répond à la problématique centrale de la thèse. Cette partie présente la structure et la démarche générale de la thèse.

Le ***Chapitre 1*** présente les éléments fondateurs de ce travail de recherche, ses objectifs et son cadre théorique. La section 1 présente le positionnement adopté au

regard de la littérature portant sur la collaboration entre startups et grandes entreprises et la capacité à collaborer dans un contexte d'innovation ouverte. La section 2 expose l'analogie proposée entre la collaboration pour innover et la symbiose biologique. La section 3 présente le cadre théorique de la proximité et des capacités dynamiques comme un cadre propice à une analyse holistique et dynamique du processus de collaboration. Ce premier chapitre conclut sur la question de recherche de la thèse et sur le modèle conceptuel développé dans le cadre de ce programme de recherche.

Le ***Chapitre 2*** présente l'approche épistémologique et méthodologique qui a été retenue dans le cadre de cette thèse. Dans un premier temps, le choix du paradigme épistémologique constructiviste est explicité. Dans un second temps, la méthodologie retenue (principalement qualitative et fondée sur des études de cas, mais également quantitative pour l'un des articles) est précisée, puis le design de la recherche développé, intégrant les méthodes de collecte de données utilisées, le mode de sélection des répondants, et enfin les méthodes d'analyse des données employées.

Les ***Chapitre 3, 4, 5 et 6*** présentent les articles développés au cours de ce programme de recherche pour répondre à la problématique générale de la thèse.

Le ***Chapitre 3*** (article 1, publié en février 2019 dans la revue *Innovations – Revue d'Economie et de Management de l'Innovation*, CNRS 4, FNEGE 3, HCERES C) répond à la sous-question de recherche suivante : *Quels sont les facteurs organisationnels qui favorisent la proximité (cognitive, sociale, organisationnelle, géographique) entre startups et grandes entreprises et leur capacité à collaborer dans un contexte d'innovation ouverte ?* Cet article explore la collaboration asymétrique startup-grande entreprise, selon la perspective des startups. Sont tout d'abord mis en exergue les freins de ce type de collaboration induits par leurs différences, marquant une distance cognitive initiale entre eux. Dans un second temps, sont étudiés les facteurs organisationnels favorisant les formes de proximité géographique et non géographique (cognitive, sociale et organisationnelle) sur cette collaboration, aux niveaux intra-organisationnel (de la startup et de la grande entreprise), inter-organisationnel, et écosystémique. Ce premier chapitre, centré sur la dyade et sur ce qui l'entoure et l'influence, a permis de mettre en lumière à la fois

des facteurs freinant et ceux dynamisant ce type de collaboration asymétrique, et de confirmer l'intérêt d'une vision holistique de la relation incluant une stratégie fondée sur la théorie de la proximité.

Le ***Chapitre 4*** (article 2, ayant fait l'objet de communications dans des conférences à comité de lecture) projette de répondre à la sous-question de recherche suivante : *Dans quelle mesure le capital humain et social développé par les équipes fondatrices de startups influence-t-il leur capacité à collaborer avec les grandes entreprises tout au long du projet de collaboration d'innovation ?* Cet article questionne le lien entre les ressources et compétences spécifiques des équipes de créateurs de startups technologiques et leur capacité à collaborer avec de grandes entreprises pour innover. L'objectif de cet article est de mieux comprendre, dans la lignée des résultats du précédent, le rapport entre le capital humain et social des équipes fondatrices de startups et *in fine* le succès de leur première collaboration avec une grande entreprise. Ce capital de l'équipe de fondateurs est mesuré via une étude quantitative. Sont explorés les liens potentiels entre ce capital, le succès de la collaboration avec la grande entreprise (lors de la toute première collaboration) et la proximité cognitive et sociale.

Le ***Chapitre 5*** (article 3, paru en juin 2020 dans l'ouvrage « Managing Digital Open Innovation » publié par World Scientific. Article ayant également fait l'objet de communications dans des conférences à comité de lecture) répond à la question suivante : *Comment les grandes entreprises matures ouvrent-elles leur processus d'innovation pour collaborer avec des startups en développant leurs capacités dynamiques tout en réduisant leurs propres rigidités internes ?* Cet article explore les difficultés rencontrées par de grandes organisations, en l'occurrence des banques, bouleversées par les technologies digitales et amenées à développer des stratégies d'innovation ouverte pour innover dans ce contexte. Le premier article (Chapitre 3) ayant permis de faire ressortir l'importance des facteurs intra-organisationnels de la grande entreprise dans le succès de la collaboration avec des startups, il est apparu pertinent d'investiguer les mécanismes organisationnels à l'œuvre au sein d'une grande organisation et entre l'organisation et l'externe. Cet article met en lumière les développements structurels, organisationnels et managériaux réalisés par ces organisations traditionnellement très hiérarchisée et centralisée pour se mettre en capacité de collaborer avec l'externe, dans un contexte de digitalisation croissante et

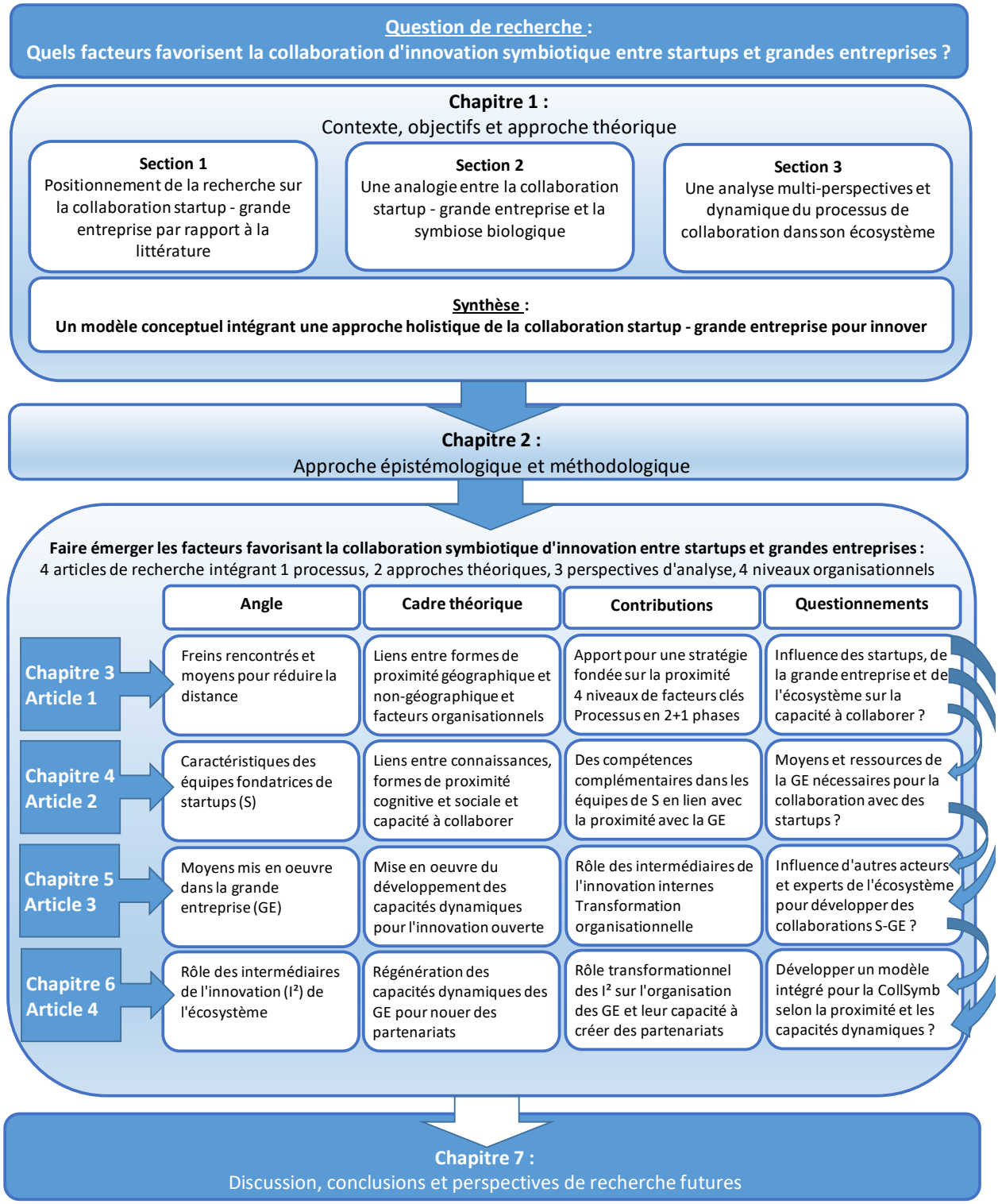
de la course à l'innovation. Cet article montre comment ces organisations développent leurs capacités dynamiques dans ce contexte.

Le ***Chapitre 6*** (article 4, ayant fait l'objet de communications dans des conférences à comité de lecture) s'attache à la sous-question de recherche suivante : *Quels sont les rôles des intermédiaires d'un écosystème d'innovation ouverte sur la régénération des capacités dynamiques d'organisations traditionnelles, très hiérarchisées, sans culture de l'innovation ouverte, pour développer de nouveaux partenariats avec des startups ?* Cet article étudie le rôle des intermédiaires de l'innovation d'un écosystème donné dans l'adaptation organisationnelle de grandes organisations. En effet, ceux-ci étant apparus comme de véritables clés de voûte dès le Chapitre 3 (article 1), il est apparu pertinent d'explorer plus avant leurs différents rôles dans la construction de collaborations à vocation d'innovation, avec des startups, et qui plus est dans un secteur d'activités particulièrement challengé à plusieurs niveaux : le secteur bancaire. L'analyse des différents rôles de ces intermédiaires dans la transformation du business model des banques s'appuie sur la théorie des capacités dynamiques.

Le ***septième chapitre*** propose une synthèse des principaux résultats obtenus à travers ce travail de recherche ainsi qu'une discussion des résultats transversaux au-delà de l'apport de chacun des articles de la thèse. La contribution théorique au regard des différentes littératures auxquelles cette recherche a fait appel (innovation ouverte, entrepreneuriat et écosystèmes) est ensuite présentée, ainsi que la contribution managériale pour les différents acteurs clés (startups, entreprises, structures de soutien à l'innovation, collectivités soutenant les écosystèmes locaux et régionaux). Enfin, les limites de ce travail et des pistes de recherches futures sont présentées, puis le projet de recherche envisagé à la suite de cette thèse.

Le ***Chapitre 8*** présente un résumé de la thèse en français.

Figure 39 – Structure et démarche générale de la thèse



CHAPITRE 1: Objectifs et approche théorique

Introduction du programme de recherche

La collaboration entre startups et grandes entreprises représente un véritable défi (Blomqvist, Hurmelinna, & Seppänen, 2005; Kohler, 2016; Minshall, Mortara, Valli, & Probert, 2010). En raison de leurs différences intrinsèques, la relation revêt un caractère asymétrique (Minshall et al., 2010). Cette asymétrie se manifeste notamment par des différences en termes de taille, de ressources et d'expérience commerciale (Hogenhuis, Van Den Hende, & Hultink, 2016; Minshall et al., 2010). Les partenaires doivent gérer cette asymétrie et conjuguer à la fois confiance et contractualisation pour maintenir un équilibre viable pour chacun des partenaires de la relation (Blomqvist et al., 2005) et assurer la poursuite de la collaboration d'innovation dans laquelle ils se sont engagés.

Doz (1987) soulignait déjà la complémentarité évidente entre grandes et petites entreprises technologiques. Kelly, Schaan, & Joncas (2000, p.74) montrent que cette complémentarité vient d'une adéquation entre ressources et besoins de chacun des partenaires : « *Alliances between small and large technology partners can be extremely beneficial due to the complementary fit of resources versus needs*.». Pourtant, selon Doz (1987, p. 32), trois points principaux posent problème et tendent à entraver la collaboration entre startups et grandes entreprises. Le premier point est la convergence des objectifs : "*a partnership is almost always partly competitive, the larger firm often attempting to capture the technology of the smaller one, to transfer it to its own operations, and, ultimately, to appropriate it*." Comme le relève l'auteur, "*technology is, after all, the only bargaining strength of the smaller firm*." Le second point concerne les jeux d'interaction et de pouvoir entre les différents acteurs de la grande entreprise, et ce à tous les niveaux hiérarchiques. Intérêts de l'entreprise et intérêts personnels ne sont en effet pas automatiquement alignés. Ces jeux politiques au sein de la grande entreprise entre individus percevant leurs gains ou pertes potentiels à collaborer peuvent impacter la qualité des collaborations engagées avec des partenaires externes. La troisième difficulté est, selon Doz, l'interface : le fait que les décisions de partenariat soient prises par le top management puis implémentées par le management intermédiaire peut poser

problème, de même que les différences culturelles entre la grande entreprise, à tendance bureaucratique et fragmentée, et la petite, agile et aux membres soudés.

Plus de trente ans après ces travaux, les mêmes problèmes demeurent, engendrant des défis managériaux persistants pour les startups comme pour les grandes entreprises (Sarrazin, 2017). En terme d'alliances stratégiques inter-entreprises au sens large (c'est-à-dire toutes collaborations confondues), les échecs sont nombreux (Gulati, Wohlgezogen, & Zhelyazkov, 2012). De plus, ces défis sont augmentés par des facteurs externes aussi contraignants que dynamisants : la globalisation, la digitalisation des activités, la demande croissante d'innovations technologiques de la part des clients hyper-connectés, et l'accélération du temps (Rosa & Scheuerman, 2009). Cet environnement changeant marqué par un rythme rapide à tous les niveaux engendre la nécessité de développer des innovations en des temps toujours plus réduits (accélération des besoins des marchés en innovation, cycle de vie du produit raccourci) et amène les différents acteurs économiques à intégrer davantage d'acteurs de leur écosystème au sein de leurs processus d'innovation, c'est-à-dire à s'ouvrir de plus en plus à des acteurs externes, hors des frontières de l'entreprise (Chesbrough, 2003; Pénin, Hussler, & Burger-Helmchen, 2011). Cette ouverture, cette stratégie d'innovation ouverte, est une opportunité dans la mesure où elle peut leur permettre de faire face à la cadence croissante des innovations et *in fine* de conserver ou gagner un avantage concurrentiel. Ainsi, la dynamique de la collaboration startup-grande entreprise se joue à plusieurs niveaux et la dimension dyadique de la collaboration elle-même semble laisser une place grandissante à la dimension d'innovation ouverte et écosystémique, où les différents acteurs satisfont les besoins des autres parties prenantes, en plus des leurs propres, et vice versa, en incluant dans leurs processus d'innovation davantage de parties prenantes que par le passé (Bogers et al., 2017).

C'est cette dynamique de collaboration aux allures symbiotiques, dans sa configuration idéale, c'est-à-dire mutualiste, qui est la perspective adoptée dans cette thèse.

La théorie de la proximité

L'importance des différences entre startups et grandes entreprises, qui conditionne la capacité des entreprises à collaborer, peut se traduire en termes de distance et de proximité entre les organisations. Comme évoqué précédemment, l'asymétrie entre startup et grande entreprise, du fait de leurs différences, est porteuse de collaborations potentiellement fructueuses car seuls des acteurs différents peuvent être complémentaires, mais elle est également associée à un risque fort de difficultés à interagir du fait de cette asymétrie. Afin d'étudier la collaboration startup – grande entreprise de façon holistique et ainsi d'en distinguer les différentes facettes, ce programme de recherche fait appel à la théorie de la proximité (Article 1, Chapitre 3 et Article 2, Chapitre 4).

La proximité reflète une ressemblance entre acteurs, laquelle traduit une similitude ou une proximité de caractéristiques et la plus ou moins grande facilité à interagir (Bourdeau-Lepage, Huriot, 2009). Les auteurs du groupe français Proximity Dynamics de l'Ecole de la Proximité distinguent deux types de proximité, la proximité géographique et la proximité non-géographique, cette dernière étant désignée par le terme de 'proximité organisée' par certains auteurs (Bouba-Olga, Grossetti, 2008 ; Torre, Rallet, 2005 ; Torre, Wallet, 2014). La proximité organisée est définie par la capacité d'une organisation à faire interagir ses membres (Torre, Rallet, 2005). D'autres auteurs, tel que Boschma (2005), placent l'ensemble des proximités sur un même niveau, selon une 'typologie plate' (Bouba-Olga, Grossetti, 2008). Selon Pecqueur et Zimmermann, 2004 (cités dans Bouba-Olga, Grossetti, 2008), la proximité organisationnelle fait partie de la proximité organisée et représente les processus de coordination qui sont fondés sur une interaction directe entre les acteurs. C'est la définition que nous retenons dans cette thèse. Récemment, Hansen (2015), en se basant sur le modèle des cinq formes de proximité de Boschma (2005) présentées ci-après, met en lumière empiriquement le fait que certaines formes de proximité non-géographiques peuvent se substituer à la proximité géographique, et que, par un phénomène de chevauchement, la proximité géographique peut permettre la proximité non-géographique. Ces travaux montrent la complémentarité

et la substituabilité de différentes formes de proximité déjà soulignées par Boschma (2005).

Ce programme de recherche est fondé sur la notion de proximité telle qu'appréhendée par Boschma (2005) comme un concept multidimensionnel, intégrant les formes de proximité cognitive, organisationnelle, sociale, institutionnelle et géographique. L'Article 1 (Chapitre 3) focalise sur la perception des startups de la proximité cognitive, sociale, organisationnelle et géographique et distingue ce qui relève de l'inter-organisationnel et de l'intra-organisationnel. L'Article 2 (Chapitre 4) étudie notamment les liens entre ressources et compétences des équipes fondatrices de startups, proximité cognitive et sociale de ces équipes et leur capacité à collaborer avec une grande entreprise.

La *proximité cognitive* inclut les valeurs, buts et culture partagés (Molina-Morales *et al.*, 2014), facilite l'acquisition des connaissances externes, ainsi que son assimilation et son exploitation par la capacité d'absorption de l'entreprise (Expósito-Langa *et al.*, 2011), et est en relation étroite avec d'autres formes de proximité (Molina-Morales *et al.*, 2014). Une trop faible proximité cognitive entre parties prenantes, que Nooteboom (2004) désigne comme une trop forte distance cognitive, peut engendrer l'incompréhension mutuelle par manque d'expériences et de connaissances de base communes, ce qui requiert qu'elles investissent dans cette compréhension mutuelle.

La *proximité organisationnelle* fait partie intégrante de la proximité cognitive et en a été séparée par l'auteur pour les besoins de l'analyse (Boschma, 2005). Cela inclut les mécanismes qui coordonnent les transactions, mais également les moyens qui permettent de transférer et d'échanger des informations et des connaissances dans un monde fait d'incertitudes. Selon Kirat et Lung (1999, p. 30), « *organizational proximity is deployed on the inside of organizations (firms and establishments) and, should the occasion arise, between organizations connected by a relationship of either economic or financial dependence/ interdependence (between member companies of an industrial or financial group, or within a network)*. » Boschma (2005) considère la proximité organisationnelle comme bénéfique à l'apprentissage et à l'innovation car elle permet par des mécanismes de contrôle forts d'assurer les droits de propriété intellectuelle et un retour suffisant sur ses propres investissements.

Toutefois, selon l'auteur, une trop grande proximité organisationnelle peut s'avérer néfaste à l'apprentissage et à l'innovation : c'est le cas des relations asymétriques où la taille et le pouvoir des parties prenantes diffèrent, entraînant une forte dépendance à l'égard des investissements spécifiques dans la communication et la compréhension. Le défi de ce type de collaboration est ainsi d'assurer une proximité aux niveaux inter-organisationnel et intra-organisationnel. Par ailleurs, la *proximité électronique* (Loilier, Tellier, 2001, p.562) est intégrée ici à la proximité organisationnelle, considérant qu'elle fait partie des moyens permettant d'échanger informations et connaissances. Ces auteurs la définissent comme « *la possibilité qu'ont des membres du réseau de consulter, d'échanger et d'élaborer des données informatisées* ». Selon Torre, 1993 (cité par Loilier, Tellier, 2001), une grande proximité électronique peut remplacer une faible proximité géographique, ce qui permet de tempérer la contrainte géographique (Loilier, 2010).

La *proximité sociale* est définie par (Boschma, 2005) par des relations socialement ancrées entre individus impliquant une confiance fondée sur l'amitié, la parenté et l'expérience. La proximité sociale entre deux entreprises est définie par Shi *et al.* (2016) en fonction du lien social entre les individus associés aux deux entreprises. Huber (2012, p. 1170), à travers l'étude de trois dimensions de la proximité sociale, suggère que « *la proximité sociale en termes de sentiment d'obligation personnelle et de proximité émotionnelle est très élevée, alors que la connaissance mutuelle en termes de vie privée est significativement moins importante.* »

La *proximité géographique* est la proximité habituellement mise en exergue dans la littérature. Selon Nooteboom (2004), s'attacher à la distance géographique est essentiel dans un contexte où des connaissances tacites doivent être échangées, le transfert nécessitant une interaction en face-à-face, contrairement à l'échange de documents. Pour Boschma (2005) également, la proximité géographique tend à favoriser le transfert de connaissances et l'innovation. Selon Pecqueur et Zimmermann (2002), cette proximité faciliterait la coordination et aurait donc un impact sur d'autres formes de proximité. Agrawal *et al.* (2008) ont montré que proximité géographique et proximité sociale peuvent, en termes d'interactions, se substituer l'une à l'autre au lieu de se compléter, alors que considérées indépendamment, elles améliorent le flux de connaissances entre les acteurs.

La *proximité institutionnelle* peut être définie par la similitude des contraintes informelles et des règles formelles partagées par les acteurs (Torre, Wallet, 2014). Cette proximité n'a pas été retenue ici, son cadre se situant au niveau macro (Boschma, 2005), qui n'est pas la perspective adoptée dans ce programme de recherche. La frontière entre proximité institutionnelle et organisationnelle fait l'objet d'un « *débat théorique récurrent (…) entre ceux qui soutiennent les approches institutionnelles (Gilly, Lung, 2008 ; Talbot, 2008), qui distinguent la proximité institutionnelle et la proximité organisationnelle, et les partisans d'approches plus interactionnistes (Pecqueur et Zimmermann, 2004 ; Rallet et Torre, 2005), qui ont décomposé la proximité organisée en une logique de similarité et d'appartenance.* » (Shearmur *et al.*, 2016, p.105).

Ces différentes dimensions de la proximité sont utilisées pour caractériser l'influence des facteurs favorables à la collaboration mis en évidence dans les chapitres 3 et 4.

Le cadre des capacités dynamiques

Le second cadre théorique mobilisé dans cette thèse est celui des capacités dynamiques et de leur régénération dans la course à la digitalisation des grandes entreprises, à la fois pour ce qui concerne leurs activités en interne et leur offre de produits aux clients. Ce cadre permet de mieux comprendre d'une part les obstacles rencontrés par les grandes entreprises, aux routines souvent ancrées et ardues à modifier, et d'autre part les moyens qu'elles mettent en œuvre pour pallier ce problème. Les capacités dynamiques ont été étudiées tout d'abord selon la perspective des grandes entreprises (Article 3, Chapitre 5), puis celle d'intermédiaires de l'innovation d'un écosystème, en tant que sources potentielles d'opportunités de changement pour les organisations (Article 4, Chapitre 6).

La digitalisation des activités commerciales à l'échelle mondiale donne lieu à une concurrence féroce entre un nombre toujours croissant d'acteurs. La démocratisation du digital entraîne également une accélération de la nécessité pour les organisations de modifier leur offre, de *se* modifier elles-mêmes et d'innover. Ces changements considérables et constants de l'environnement poussent les organisations à

s'adapter en permanence afin de pouvoir conserver leur avantage concurrentiel. Cela implique la nécessité de concevoir un nouveau business model, intégrant notamment de collaborer avec des startups, et permettant aux organisations de créer et de capturer de la valeur (Teece, 2018), pas seulement d'adopter de nouveaux outils technologiques. Les organisations doivent donc développer des capacités dynamiques afin de favoriser cette création et cette capture de valeur (Teece et al., 1997). Les capacités dynamiques permettent aux organisations d'identifier et de saisir des opportunités d'affaires grâce à un réalignement continu des actifs matériels et immatériels (Teece, 2007). Ces capacités sont d'un ordre supérieur car elles dépassent les capacités opérationnelles ordinaires (Teece, 2018 ; Winter, 2003). Ces capacités stratégiques d'ordre supérieur sont directement liées à l'avantage concurrentiel des organisations et à leur capacité à le maintenir dans le temps : il s'agit alors d'un avantage concurrentiel durable. Selon Teece et al. (1997), "*to be strategic, a capability must be honed to a user need (so there is a source of revenues), unique (so that the products/services produced can be priced without too much regard to competition) and difficult to replicate (so profits will not be competed away).*" Le cadre des capacités dynamiques consiste à détecter, saisir et transformer ce qui permettra à une organisation de concevoir puis de mettre en œuvre son nouveau business model (Teece, 2018). Les liens entre ces trois dimensions des capacités dynamiques et la digitalisation des activités sont soulignés ci-après.

Capacités de détection

Le développement des technologies numériques peut entraîner des menaces, mais aussi l'émergence de nombreuses opportunités d'affaires nouvelles, qui peuvent amener les organisations à s'engager dans de nouveaux domaines d'activité. L'identification et le façonnage des opportunités est un effort constant d'exploration "*across technologies and markets, both 'local' and 'distant'*" (March and Simon, 1958; Nelson and Winter, 1982 in Teece (2009, p.9))." Il s'agit d'une "activité de balayage, de création, d'apprentissage et d'interprétation". L'investissement dans la recherche et les activités connexes est généralement un complément nécessaire à cette activité" (Teece, 2009, p.9). Pour une organisation, les difficultés liées à la détection et à l'intégration de nouveaux domaines d'activité sont multiples et nécessitent le

développement d'activités d'analyse de l'environnement (Robinson & Simmons, 2018) et de prospective (Heger & Rohrbeck, 2012), en plus de l'orientation externe de l'organisation, orientée par les activités actuelles qui ne sont pas orientées vers la détection de l'émergence de nouveaux domaines. Les activités de prospective sont développées par certaines organisations pour accroître leur capacité à identifier rapidement de nouveaux domaines d'activité, qui sont des activités de détection nécessaires pour prendre des décisions stratégiques qui engagent la trajectoire de l'organisation dans une perspective à long terme (Heger & Rohrbeck, 2012).

Une vision périphérique est nécessaire pour détecter rapidement les opportunités et les menaces qui ne sont pas dans le champ d'action actuel de l'organisation (Day & Schoemaker, 2004). Robinson & Simmons (2018) montrent que le scanning n'est pas une activité individuelle au sein des organisations, mais que la capacité à engager l'organisation dans son ensemble pour recueillir des informations sur l'évolution de l'environnement est un élément clé des activités de scanning de l'environnement. Outre les équipes stratégiques qui utilisent des réseaux personnels et professionnels pour recueillir des informations, les employés qui ont des réseaux personnels et des relations personnelles avec les clients sont également de précieuses sources d'information. Les auteurs montrent également l'importance des sources d'information externes telles que les associations industrielles, les rapports de veille industrielle et commerciale, les réseaux personnels et les clients. Ces sources d'information externes complètent les sources d'information internes et organisées.

Au niveau intra-organisationnel, le nouveau rôle des cadres intermédiaires dans les organisations a été souligné, au-delà de leur rôle traditionnel qui consiste à faire partie du système de contrôle d'une entreprise (Floyd & Wooldridge, 1994). Il y a trois décennies, Wooldridge et Floyd (1990, p.240) ont déjà souligné que les cadres intermédiaires doivent être impliqués dans la stratégie pour améliorer la prise de décision stratégique, et que le contexte, les structures organisationnelles et la politique des ressources humaines doivent donc être "articulés (...) [pour] encourager les cadres intermédiaires à penser stratégiquement". Ce rôle est encore plus crucial en période de redéfinition de la stratégie de l'organisation, et dans un contexte d'ouverture aux acteurs extérieurs. Si l'ouverture de leurs frontières aux acteurs externes est une nécessité dans un contexte de stratégie d’innovation ouverte, les

organisations doivent également s'ouvrir à l'intérieur de leurs propres frontières en élargissant les contributeurs potentiels aux décisions stratégiques et en impliquant ainsi d'autres échelons dans le processus de prise de décision stratégique, comme les cadres intermédiaires (Baptista et al., 2017). Par conséquent, comme l'ont souligné plusieurs chercheurs (Birkinshaw, 2017 ; Hautz, Seidl et Whittington, 2017), la stratégie ouverte en tant que processus collectif nécessaire va de pair avec la transparence et l'inclusion.

Capacités de saisie (des opportunités)

Sur la base de la détection d'une opportunité, l'organisation doit alors offrir les produits, services ou processus adéquats (Teece, 2007). Les capacités de saisie comprennent la conception de modèles commerciaux conçus à la fois pour créer de la valeur pour le client et pour saisir cette valeur (Teece, 2018). Teece souligne qu'il n'existe pas de définition consensuelle du business model et suggère que "*a business model defines how the enterprise creates and delivers value to customers, and then converts payments received to profit*" ; he adds that "*in essence, a business model embodies nothing less than the organizational and financial 'architecture' of a business*" (Teece, 2010). Les capacités de saisie comprennent également la protection du capital matériel et immatériel (ressources humaines), une politique d'incitation attrayante pour les employés, ainsi que "strong relationships [that] must also be forged externally with suppliers, complementors, and customers" (Teece, 2011).

Capacités de reconfiguration

Les capacités de reconfiguration concernent le management des menaces et la transformation de l'organisation (Teece, 2007). Elles conduisent à la durabilité de l'avantage concurrentiel dans le temps : "*A key to sustained profitable growth is the ability to recombine and to reconfigure assets and organizational structures as the enterprise grows, and as markets and technologies change, as they surely will*" (Teece, 2007). Cela signifie que les organisations doivent se reconfigurer même en

période de croissance dans le but de maintenir leur avantage sur leurs concurrents et malgré les changements dans leur environnement. Le système de gestion, la base de compétences et de connaissances, les systèmes techniques, ainsi que les valeurs et les normes (fondement de la culture organisationnelle) sont des sources de rigidités qui entravent l'évolution et la reconfiguration de l'organisation. Les sources de rigidité les plus importantes sont la culture organisationnelle, car elle est collectivement partagée, construite au fil du temps, intangible et elle est faite de normes et de valeurs qui déterminent inconsciemment les comportements des membres de l'organisation (Greenwood & Suddaby, 2006 ; Leonard-Barton, 1992). Les capacités de reconfiguration reposent sur la capacité de l'organisation à apprendre et à surmonter les rigidités fondamentales qui entravent la capacité à mettre en œuvre de nouveaux modèles commerciaux. Les organisations doivent promouvoir l'apprentissage et donc déployer des systèmes d'incitation pour motiver les employés à apprendre et à partager des informations et des connaissances, pour en explorer de nouvelles également (Teece, 2007).

Ce cadre des capacités dynamiques est mobilisé dans les chapitres 5 et 6 pour appréhender les changements internes aux grandes entreprises qui favorisent leur capacité à s'engager dans des collaborations mutuellement bénéfiques avec des startups.

Conclusion du Chapitre 1

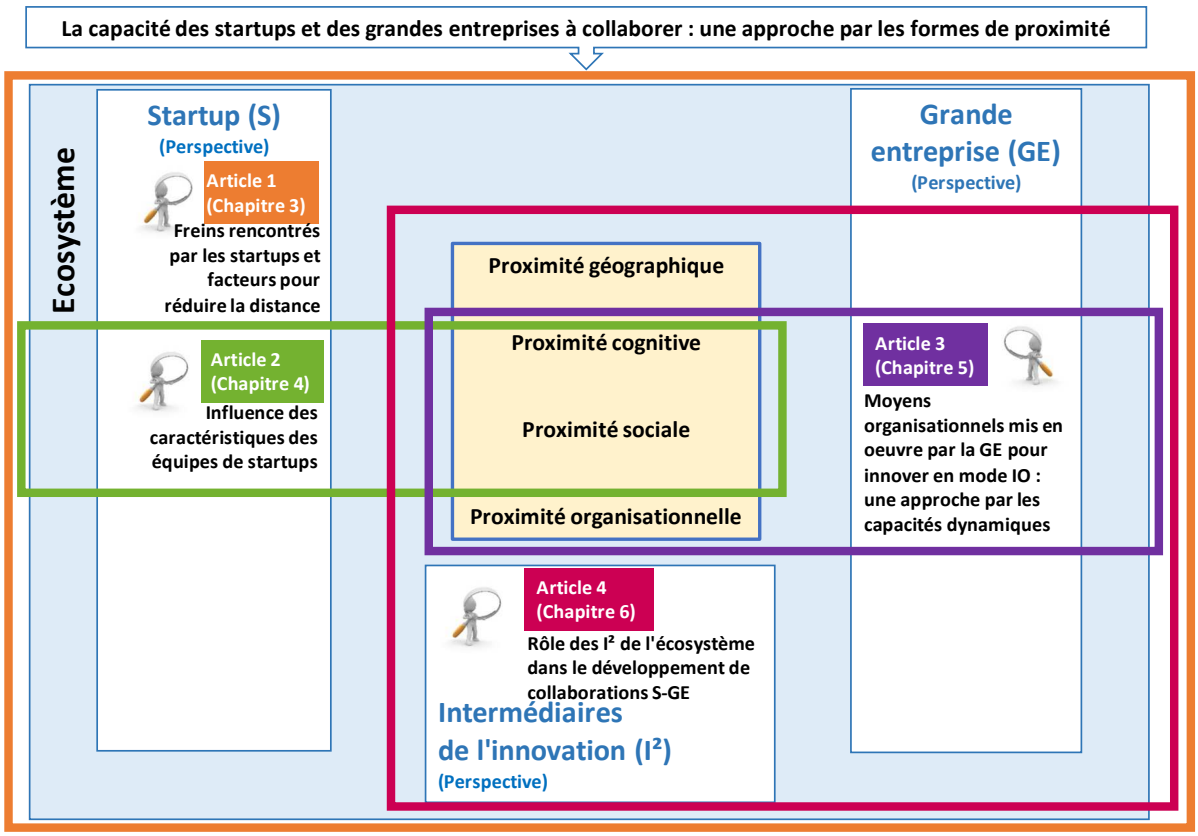
1.1. Question de recherche

Compte tenu de l'état de l'art et du positionnement de ce travail par rapport à la revue de littérature présentée, la question de recherche à laquelle cette thèse tente de répondre est la suivante :

« Quels facteurs favorisent la collaboration symbiotique entre startups et grandes entreprises dans un écosystème d'innovation ouverte ? »

1.2. Modèle conceptuel du programme de recherche

Figure 40 – Modèle conceptuel du programme de recherche



Légende : S = Startup, GE = Grande entreprise, I² = Intermédiaires de l'innovation, IO = Innovation Ouverte

CHAPITRE 2 - Approche épistémologique et méthodologique

La façon dont l'être humain approche la réalité peut être considérée comme un filtre qui façonne sa pensée et ses actions. Ce filtre sous-jacent est également à l'œuvre lors de la réalisation de travaux de recherche, où la réalité approchée est plus précisément celle de la science, des connaissances produites. Quel positionnement le chercheur adopte-t-il par rapport à la réalité et à la connaissance de celle-ci ? Conscientiser et choisir le paradigme épistémologique sous-jacent de sa pensée, de son raisonnement est une étape nécessaire dans la démarche de recherche et permet en outre de montrer la cohérence de la démarche de recherche. L'épistémologie fera l'objet du premier point de ce chapitre. S'ensuivra un point exposant la méthodologie retenue pour résoudre la question de recherche, en cohérence avec le paradigme épistémologique retenu.

2.1. Epistémologie

2.1.1.Choix épistémologique

L'épistémologie comporte différents paradigmes. Le chercheur se doit d'assoir ses choix méthodologiques sur l'un d'entre eux et de justifier ainsi la cohérence de sa démarche toute entière, depuis l'élaboration de la problématique jusqu'à sa résolution. Choisir un paradigme épistémologique n'est pas chose aisée. Tout d'abord, le chercheur se trouve confronté à un premier choix par rapport à la définition de l'épistémologie elle-même : en effet, laquelle retenir entre la définition française (ou allemande, avec le terme *Wirtschaftslehre*) qui en fait une « théorie de la science » et la définition anglo-saxonne, antérieure à la première, qui décrit l'épistémologie comme une « théorie de la connaissance », comportant un sens plus large que la première donc et étant davantage tournée vers la dimension philosophique (Blanché, 1972) ? A l'instar de Piaget, c'est la seconde proposition qui est retenue dans ce programme de recherche : « *La science et l'esprit scientifique,*

aussi bien dans l'évolution des sociétés que dans le développement de l'individu, se constituent progressivement, sans jamais parvenir à un état d'achèvement » (Blanché, 1972). Ainsi, l'approche retenue est fondée sur une définition plutôt ouverte de l'épistémologie, c'est-à-dire incluant les deux dimensions : scientifique et philosophique.

Ainsi, pour répondre à ma question de recherche : « *Quels facteurs favorisent la collaboration symbiotique entre startups et grandes entreprises dans un écosystème d'innovation ouverte ?* », je n'approche pas un phénomène qui serait immuable et stable, mais au contraire qui émerge et se développe sous certaines conditions soumises à différents facteurs de temps, de contingence propres à la configuration de l'écosystème (biotope et biocénose) des acteurs de la collaboration et qui évolue au fil du temps.

Le paradigme retenu est donc celui du constructivisme qui "*asserts that social phenomena and their meanings are continually being accomplished by social actors. It is antithetical to objectivism*" (Bryman, 2012). Cette démarche est pertinente dans la mesure où elle fait sens par rapport à ma question de recherche. Cet extrait des travaux d'Edgar Morin (1990) illustre cette vision sous-jacente de la thèse :

> « *Seule une raison ouverte peut et doit reconnaître l'irrationnel (hasards, désordres, apories, brèches logiques) et travailler avec l'irrationnel ; la raison ouverte est, non pas refoulement, mais dialogue avec l'irrationnel. La raison ouverte peut et doit reconnaître l'a-rationnel. Pierre Auger a fait remarquer qu'on ne pouvait se borner au diptyque rationnel-irrationnel. Il faut ajouter l'a-rationnel : l'être et l'existence ne sont ni absurdes ni rationnels ; ils sont.* »

2.2. Méthodologie

La méthodologie présentée ici est dans la ligne du paradigme épistémologique précédemment présenté. Les différentes étapes de la méthodologie sont présentées, depuis le design de la recherche jusqu'à l'analyse des données collectées pour élaborer les quatre articles (Chapitres 3 à 6) de cette thèse.

2.2.1.Synthèse du design de la recherche

Tableau 41 – Synthèse du design de la recherche

Question de recherche de la thèse	« Quels facteurs favorisent la collaboration symbiotique entre startups et grandes entreprises dans un écosystème d'innovation ouverte ? »
Sous-questions de recherche	• Article 1, Chapitre 3 : Quels sont les facteurs organisationnels qui favorisent la proximité (cognitive, sociale, organisationnelle, géographique) entre startups et grandes entreprises et leur capacité à collaborer dans un contexte d'innovation ouverte ? • Article 2, Chapitre 4 : Dans quelle mesure le capital humain et social développé par les équipes fondatrices de startups influence-t-il leur capacité à collaborer avec les grandes entreprises tout au long du projet de collaboration d'innovation ? • Article 3, Chapitre 5 : Comment les grandes entreprises matures ouvrent-elles leur processus d'innovation pour collaborer avec des startups en développant leurs capacités dynamiques tout en réduisant leurs propres rigidités internes ? • Article 4, Chapitre 6 : Quels sont les rôles des intermédiaires d'un écosystème d'innovation ouverte sur la régénération des capacités dynamiques (en particulier pour développer de nouveaux partenariats avec des startups) d'organisations traditionnelles, très hiérarchisées ?
Méthodes	• Qualitative (Articles 1, 3 et 4), basée sur la méthode des cas • Quantitative (Article 2)
Echantillons de données	4 terrains complémentaires : • Article 1 : 4 cas de collaboration, 6 entretiens de dirigeants de startups • Article 2 : 31 cas de startups, soit 31 observations exploitables de dirigeants de startups (équipes fondatrices et solos) • Article 3 : 2 études de cas, 4 entretiens de cadres dirigeants dans deux grandes organisations • Article 4 : 1 étude de cas d'écosystème, 12 entretiens dont 5 de cadres dirigeants de grandes organisations et 7 d'intermédiaires de l'innovation
Mode de collecte des données	• Guides d'entretien (études de cas) pour les Articles 1, 3 et 4 • Questionnaire pour l'Article 2
Critères de sélection des	• Sélection orientée information, avec objectif de réplication (Flyvberg, 2006)

répondants	• Article 1 : Différences entre les startups en terme de secteur d'activité, d'histoire, de type de solution innovante proposée, d'objectif stratégique pour collaborer avec de grandes entreprises, et de résultat de la collaboration (succès vs échec). • Article 2 : Startups basées sur la technologie, avec le même flux d'innovation (inside-out) et situées dans la "Grande Région". Différences entre les startups en terme de nombre de fondateurs (équipe vs solo) et d'expérience (ont déjà collaboré (ou tenté) ou pas) avec une grande entreprise. • Article 3 : Différences entre les deux grandes organisations étudiées (étude de cas comparative) : l'une est située en France, l'autre au Luxembourg. L'une agit au niveau national avec une forte présence régionale, l'autre à la fois au niveau local et international. L'une a démarré sa stratégie d'innovation ouverte il y a 7 ans, l'autre venait de commencer au moment de la collecte des données. • Article 4 : Un écosystème (le Luxembourg) axé sur la technologie, l'innovation et la digitalisation, comportant un vivier substantiel de startups et de fintech. Sélection de cadres dirigeants et managers du secteur investigué, issus de trois organisations différentes. Sélection d'intermédiaires de l'innovation : les premiers ont été retenus du fait de leurs liens avec certaines organisations, les suivants ont été recommandés par les premiers.
Analyse des données	• Raisonnement abductif • Articles 1, 3 et 4 : Méthode dite à la Gioia, fondée sur la structure des données • Article 2 : Méthode basée sur l'analyse de statistiques descriptives

2.2.2.Méthodes de collecte des données

Compte tenu de la nature de la question de recherche laquelle vise à comprendre le *comment* d'un phénomène pour en faire émerger des facteurs favorisant son émergence et sa continuité dans le temps, cette thèse adopte une méthodologie basée sur des études de cas visant à montrer la stabilité du phénomène exploré. Il s'agit donc d'une approche qualitative pour trois des quatre articles de la thèse. En effet, les enseignements issus du premier article ont permis d'élaborer à la suite un second article fondé sur une approche quantitative qui reste exploratoire, permettant

ainsi une complémentarité entre les deux approches, qualitative et quantitative, par rapport à l'objet de recherche. Par ailleurs, la quantité et la diversité des variables explorées à travers ce second article font que la méthode quantitative s'est avérée être la plus appropriée. Ainsi, cette thèse n'oppose pas recherche qualitative et recherche quantitative, dans la lignée de Dumez (2016) :

« *Le social ne s'aborde pas en dissociant et opposant les éléments qui le constitueraient et leurs proportions. Surtout, on ne voit pas pourquoi la démarche qualitative s'interdirait de produire, de manier et de traiter des chiffres. Pour au moins trois raisons fondamentales. La première est que les acteurs qui sont étudiés par les sciences sociales sont des agents calculateurs (Callon, 1998). (…) La question se pose encore plus directement quand les agents en question sont collectifs : des États, des entreprises, des organisations, et même des associations à but non lucratif. Les organisations produisent des chiffres en permanence, elles y sont d'ailleurs obligées légalement. Elles le font à usage interne, pour prendre leurs décisions, élaborer une stratégie, se développer, et à usage externe dans leur dialogue et leurs interactions avec leur environnement (…) Enfin, troisième raison, c'est l'une des tâches du chercheur que de produire lui-même des chiffres et de les traiter, pour mieux comprendre ce que font les acteurs qu'il étudie, notamment pour prendre de la distance avec ce qu'ils disent de leurs actions*. »

La méthode de recherche fondée sur des études de cas est souvent celle retenue lorsque le phénomène exploré comporte des questions de type « pourquoi » ou « comment ». Cette méthode des cas, dont la présentation des données empiriques doit être rigoureuse et juste, ne doit pas être confondue ni assimilée à la méthode des cas dans le cadre d'enseignements ou encore de pratiques. Par ailleurs, la méthode des cas n'a pas uniquement une visée exploratoire ; elle peut en effet également être descriptive et explicative (Yin, 1994). Il est également essentiel de justifier pourquoi la méthode des cas était la plus adaptée (Goffin, Åhlström, Bianchi, & Richtnér, 2019). Les études de cas sélectionnées pour ce programme de recherche visent à permettre d'étudier un phénomène complexe (Wacheux, 1996) et de faire émerger les facteurs organisationnels favorisant ce phénomène. Parmi les stratégies de sélection de cas et d'échantillons proposées par Flyvbjerg, (2006, p. 230), cette thèse se positionne sur un type de sélection « orienté information » (par opposition à une sélection aléatoire) qui permet « de maximiser l'utilité de

l'information provenant de petits échantillons et de cas uniques. Les cas sont sélectionnés sur la base des attentes quant à leur contenu informatif. »

Cette conclusion de Flyvbjerg (2006, p. 241), qui va à l'encontre des idées reçues, met en exergue l'importance et la validité de la méthode des cas pour ce type d'objectif :

> "*Today, when students and colleagues present me with the conventional wisdom about case-study research -for instance, that one cannot generalize on the basis of a single case or that case studies are arbitrary and subjective- I know what to answer. By and large, the conventional wisdom is wrong or misleading. For the reasons given above, the case study is a necessary and sufficient method for certain important research tasks in the social sciences, and it is a method that holds up well when compared to other methods in the gamut of social science research methodology*."

Méthodes de collecte de données : l'entretien et le questionnaire

La collecte de données a été réalisée selon deux modes : des entretiens pour la collecte de données qualitatives, un questionnaire pour celle quantitative. Il est à noter que pour chaque perspective investiguée (une par article), le terrain était différent puisque soit les acteurs qui « détenaient » la perspective investiguée changeaient, soit la méthode retenue l'imposait (qualitative pour l'Article 1 et quantitative pour l'Article 2). Le

Tableau **42** ci-après synthétise cette partie de la démarche, et l'encadré 2 fournit davantage de détails concernant la collecte de données proprement dite pour chacun des chapitres.

Tableau 42 – Synthèse de la démarche de collecte de données

Article/ Chapitre	**Méthode de collecte**	**Nombre de cas explorés**	**Volume de données**	**Autres sources**
Article 1 (perspective	Entretiens semi-directif	4 cas de collaboration	6 entretiens de 30 à 90 minutes	Visite des locaux, des espaces de

des startups)			chacun, soit un total de 7,07 heures (424 minutes)	travail. Consultation des sites web et profils LinkedIn des dirigeants des startups
<u>Article 2</u> (perspective des startups)	Questionnaire avec questions fermées pour la plupart et quelques questions ouvertes	31 cas de startups (équipes fondatrices et solos) ayant eu une collaboration avec une grande entreprise	4 répondants en ligne, 27 répondants en face à face (environ 45 à 120 minutes chaque)	Visite des locaux et des espaces de travail.
<u>Article 3</u> (perspective de la grande entreprise)	Entretiens semi-directifs	2 cas de grandes entreprises	4 entretiens de 45 à 60 minutes chacun, soit un total de 3,25 heures (195 minutes)	Consultation des sites web et des articles de presse accessibles en ligne
<u>Article 4</u> (perspective des intermédiaires de l'innovation)	Entretien semi-directif	1 cas d'un écosystème	12 entretiens de 30 à 90 minutes chacun, soit un total de 10,6 heures (635 minutes)	Visite des locaux et des espaces de travail, recherche d'articles de presse en ligne

Au total, ce travail de recherche a conduit à la réalisation de 21 heures d'entretiens à visée qualitative, lesquels ont été retranscrits en texte dans leur intégralité. Les verbatim retenus pour les articles ont par ailleurs été traduits en anglais. Quant aux entretiens à visée quantitative, ils représentent environ 37 heures de rendez-vous en face à face. Les réponses au questionnaire ainsi collectées ont ensuite été saisies

dans le formulaire Sphinx dédié, s'ajoutant aux quelques observations obtenues en ligne. Les données ont ensuite été transférées sous SPSS.

Ethique relative aux données collectées

Concernant la collecte par entretien, avant le démarrage de chacun d'entre eux, l'accord des répondants quant à leur enregistrement audio a été demandé, en vue de retranscrire les entretiens en texte et analyser ensuite confidentiellement les verbatim dans le cadre de ce travail de recherche. Concernant la collecte par questionnaire, l'anonymat des données a été garanti aux répondants et est explicitement indiqué directement dans le formulaire, qu'ils aient répondu en ligne ou en face à face : aucun lien n'a été fait entre la raison sociale des startups et les questionnaires remplis.

2.2.3. Sélection des cas

La question de recherche détermine la sélection la plus appropriée des cas pour y répondre. Dans le cadre de cette thèse, la recherche d'une certaine diversité dans les cas étudiés a été de mise. En effet, l'ensemble du travail de recherche est fondé sur les différences, la notion de distance entre les acteurs (divergence) et leurs potentielles complémentarités (convergence). Aussi, les quatre articles visaient à rendre compte de cette diversité, des différences entre les cas afin d'en montrer les points de divergence et de convergence. Le quatrième article visant d'autre part une comparaison entre deux groupes (les fondateurs de startups en équipes vs les fondateurs solos) au regard de l'objet d'étude (la collaboration startup – grande entreprise), les startups ont été ciblées en conséquence.

2.2.4. Analyse des données

Raisonnement déductif, inductif et abductif

Deux principaux modes de raisonnement existent en recherche : le mode déductif et la mode inductif. Une approche combine les deux raisonnements : l'abduction.

Le raisonnement employé dans cette thèse est l'abduction qui, en outre, convient particulièrement bien aux approches constructivistes (Hallée & Garneau, 2019). L'abduction présente l'avantage d'augmenter la créativité du raisonnement :

> « *L'inférence abductive permet de combiner de manière créative des faits empiriques avec des cadres heuristiques de référence. L'utilisation de l'induction analytique et de l'abduction permet d'actualiser le travail créatif de la recherche qualitative tout en ayant recours aux connaissances existant dans le domaine auquel l'objet d'étude appartient.* » (Anadon & Guillemette, 2006)

Approche qualitative de la construction de la théorie

Parmi les méthodes d'analyse existantes visant à élaborer la théorie à partir des données empiriques, celle qui a été utilisée principalement dans cette thèse est la méthode dite de Gioia (Corley & Gioia, 2004; Gioia & Chittipeddi, 1991; Gioia, Corley, & Hamilton, 2012). Elle a été employée pour les articles 1, 3 et 4, l'article 2 étant fondé sur une méthode quantitative. La méthode de Gioia fait sens d'un point de vue épistémologique et méthodologique. L'ensemble du processus de codage et d'analyse de cette méthode est fondé sur la structure des données, sur laquelle repose la rigueur scientifique de cette démarche qualitative ; Gioia la synthétise par ce « mantra » sans équivoque : "You got no data structure, you got nothing" (Gehman et al., 2018, p.186). Cette structure de données, base de l'analyse, pourra émerger à la suite d'un codage des données brutes en deux étapes : un codage dit de premier ordre fait ressortir les concepts, puis un codage de second ordre les thèmes liés à ces concepts, puis les dimensions agrégées liées à ces thèmes. Les éléments dominants exprimés par les répondants sont mis en exergue lors du premier niveau d'analyse, puis un second niveau d'analyse, plus théorique, permettra par la suite au chercheur d'aboutir à « un cadre explicatif pour mettre l'histoire dans une perspective plus théorique » (Gioia & Chittipeddi, 1991). L'ensemble de ce processus de codage repose également sur une représentation graphique montrant l'évolution du codage depuis les données brutes jusqu'aux dimensions théoriques, ce qui constitue un des socles démontrant la rigueur de la méthode.

La *méthode de Gioia* depuis l'analyse de données jusqu'à l'émergence d'une théorie comporte les étapes suivantes (Gioia et al., 2012, traduction adaptée):

- « Effectuer le codage initial des données, en maintenant l'intégrité des termes de premier ordre (centrés sur le répondant)
- Élaborer un recueil complet des termes de premier ordre
- Organiser les codes de premier ordre en thèmes de second ordre (centrés sur la théorie)
- Transformer les thèmes de second ordre en dimensions théoriques globales (le cas échéant)
- Rassembler les termes, les thèmes et les dimensions dans une "structure de données".
- Établir des relations dynamiques entre les concepts de second ordre dans la structure des données
- Transformer la structure des données statiques en un modèle théorique dynamique fondé sur le terrain
- Procéder à des consultations supplémentaires de la littérature pour affiner l'articulation des relations et des concepts émergents »

D'autres méthodes d'analyse qualitative existent. Celles auxquelles les chercheurs se réfèrent souvent en plus de celle de Gioia, sont notamment celles de la « construction des théories à partir de la recherche sur les études de cas » (building theories from case study research) développée par Kathleen Eisenhardt (Eisenhardt, 1989), et de « Stratégies de théorisation à partir des données de processus » (strategies for theorizing from process data) développée par Ann Langley (Langley, 1999).

Par ailleurs, les méthodes proposées par Gioia et Eisenhardt présentent des similitudes (Gehman et al., 2018, p.288): *"[Building theory from data] almost invariably involves collecting data, breaking it up into what Denny [Gioia] calls first-order and second-order themes, or what I call "measures" and "constructs," and then abstracting at a higher level. Regardless of the terms, this process is at the heart of what most theory-building qualitative researchers are doing."*

CHAPTER 3 – Article 1: Proximity and Organizational Factors for Startup – Large Firm Collaboration in an Open Innovation Context[37]

La version originale de cet article a été publiée en français en février 2019 dans la revue "Innovations" comme suit : BERTIN, Clarice, "Proximité et facteurs organisationnels pour la collaboration startup - grande entreprise en contexte d'innovation ouverte", Innovations - Revue d'Economie et de Management de l'Innovation/Journal of Innovation Economics and Management, Février 2019, vol. 58, no. 1, pp. 135-160.

Résumé étendu

Résumé

Cet article a pour objectif d'identifier les facteurs organisationnels favorisant la proximité entre startups et grandes entreprises, partenaires asymétriques, afin de comprendre les éléments sous-tendant leur capacité à collaborer, essentielle en contexte d'innovation ouverte. L'approche par la théorie de la proximité permet d'analyser une collaboration donnée de façon holistique, dans le temps et dans l'espace géographique et non-géographique. Fondée sur quatre cas de collaboration, cette recherche exploratoire adopte la perspective des startups, quasi-absente de la littérature. Les résultats montrent les différences qui sont sources de distance cognitive entre startups et grandes entreprises et mettent en évidence quatre niveaux de facteurs favorisant leur proximité : interne à la startup, interne à la grande entreprise, inter-organisationnel et écosystémique. Cette recherche présente un intérêt pour les entreprises souhaitant collaborer avec des partenaires asymétriques en contexte d'innovation ouverte. Elle s'adresse également aux politiques régionales d'innovation qui visent à soutenir les écosystèmes d'innovation et d'entrepreneuriat.

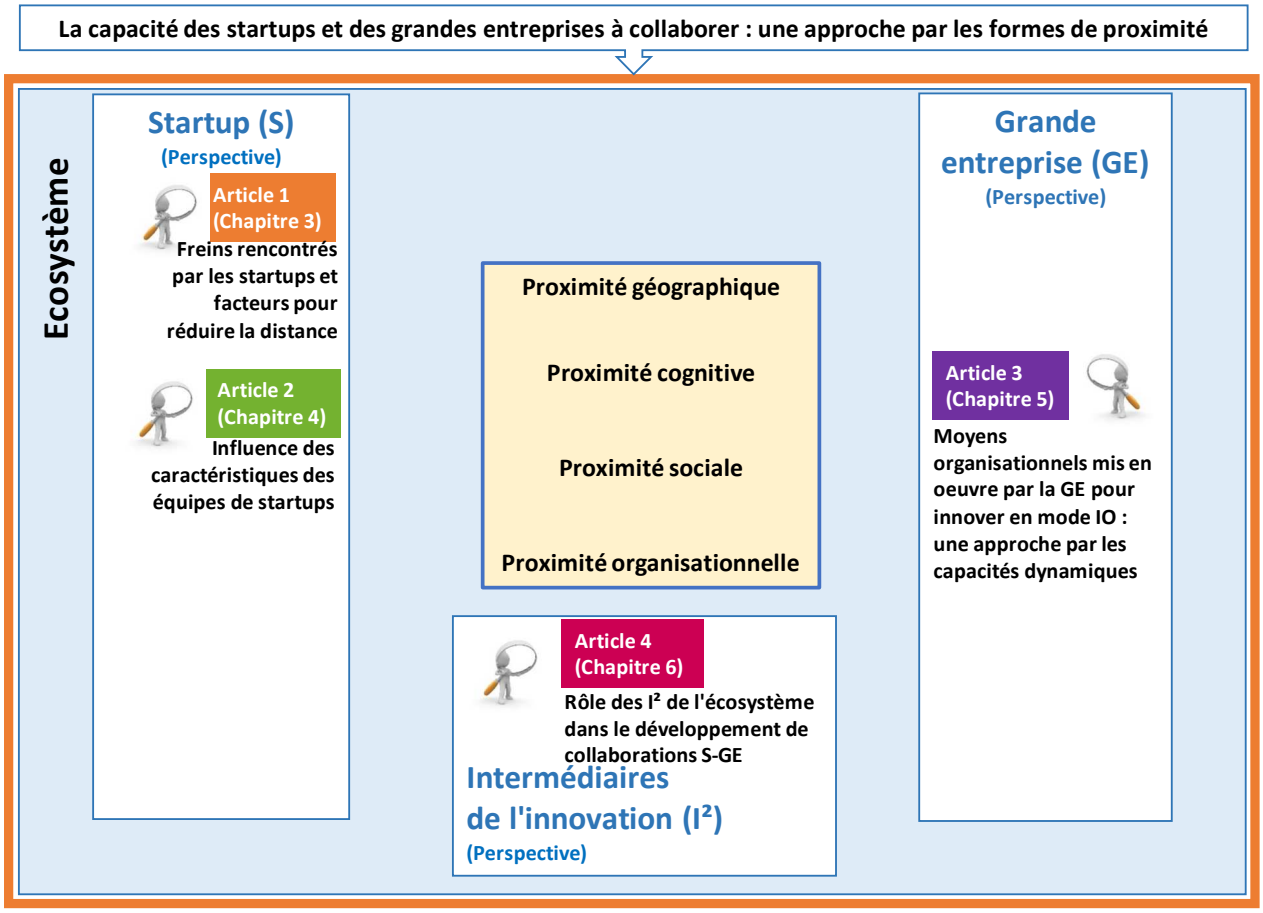
Mots-clés : Capacité à collaborer, Théorie de la proximité, Asymétrie, Facteurs organisationnels, Startup, Grande entreprise, Innovation ouverte.

[37] This version is the translation by the author of her original article firstly published in French in February 2019.

Positionnement de l'article dans la thèse

Ce premier article pose les fondations de la thèse. Il présente les éléments clés de la recherche, en montre l'intérêt et introduit le cadre théorique fondé sur les formes de proximité géographique et non géographique. La figure ci-après illustre le fait que ce premier article (cadre orange), tout en adoptant la perspective de la startup, développe, grâce notamment au cadre théorique choisi, une vision holistique de la collaboration startup – grande entreprise afin d'en percevoir les dimensions-phares, lesquelles seront explorées dans les articles suivants.

Figure 41 – Positionnement de l'Article 1 dans le cadre conceptuel de la thèse



Légende : S = Startup, GE = Grande entreprise, I² = Intermédiaires de l'innovation, IO = Innovation Ouverte

Principaux résultats et originalité

Les résultats montrent que la qualité de la collaboration startup-grande entreprise dépend surtout des efforts déployés par la grande entreprise pour améliorer sa capacité à collaborer, et ce bien en amont de la collaboration. L'interface apparaît

comme le catalyseur de plusieurs formes de proximité. Les cas explorés indiquent que la prise en considération de toutes les proximités étudiées est essentielle. Prises individuellement, chacune s'avère nécessaire mais pas suffisante pour la collaboration, du fait de leurs liens d'interdépendance. L'approche par la théorie de la proximité permet une vision holistique de la collaboration et adaptable selon les partenaires. De ce fait, une réflexion stratégique fondée sur la proximité apparaît pertinente pour les entreprises souhaitant développer leur capacité à collaborer avec des partenaires asymétriques dans un contexte d'innovation ouverte.

Cet article contribue ainsi à intégrer la théorie de la proximité à la réflexion stratégique en contexte d'innovation ouverte, et apporte une grille de lecture des facteurs organisationnels augmentant les formes de proximité de la collaboration asymétrique startup-grande entreprise. Cette recherche montre en particulier le rôle essentiel et central de l'intermédiaire de l'innovation à toutes les phases identifiées (*Amont, Design, Processus*) de la collaboration.

Implications pour ce travail de recherche doctoral

Ce premier article a permis de mettre en lumière les divergences et points de convergence entre les cas étudiés. A partir des résultats obtenus, le questionnement suivant a émergé : Quelle est l'influence des startups, des grandes entreprises et des acteurs de l'écosystème sur la capacité à collaborer des protagonistes ? La suite du programme de recherche a ainsi été élaborée autour de trois grands axes : le rôle des compétences (la dimension intra-organisationnelle) de la startup dans cette capacité à collaborer avec de grandes entreprises, la transformation intra-organisationnelle de la grande entreprise, en lien avec l'externe, pour se mettre en capacité de collaborer avec des startups, et enfin les rôles des intermédiaires de l'innovation sur la capacité des startups et grandes entreprises à collaborer. Ces trois axes ont donné lieu aux trois articles à visée exploratoire suivants.

Valorisation des travaux de recherche

Publication dans une revue à comité de lecture en 2019

"Proximité et facteurs organisationnels pour la collaboration startup - grande entreprise en contexte d'innovation ouverte", *Innovations - Revue d'Economie et de*

Management de l'Innovation / Journal of Innovation Economics and Management, Février 2019, vol. 58, no. 1, pp. 135-160 | CNRS Rank 4 | FNEGE Rank 3 | HCERES Rank C.

Processus de soumission de l'article (de 2017 à 2018)

30/11/2017 Soumission de l'article intitulé: "Impact des proximités cognitive, organisationnelle et géographique sur la collaboration startup-grande entreprise en contexte d'innovation ouverte", pour le numéro spécial portant sur « l'innovation agile » de la revue *Innovations - Revue d'Economie et de Management de l'Innovation/Journal of Innovation Economics and Management* (I-REMI), rang 4 CNRS, 4 FNEGE, C HCERES.

26/12/2017 Article sélectionné pour entrer dans le processus de publication de la revue *Innovations*.

04/01/2018 Soumission de l'article sur la plateforme dédiée de la revue *Innovations*.

26/03/2018 Demande de révisions majeures.

02/05/2018 Soumission de la version révisée. Nouvel intitulé: "Impact des formes de proximité sur la collaboration startup-grande entreprise en contexte d'innovation ouverte".

30/07/2018 Demande de révision mineure par un évaluateur, majeure pour le second.

14/09/2018 Soumission de l'article révisé. Nouvel intitulé : "Proximité et facteurs organisationnels pour la collaboration startup-grande entreprise en contexte d'innovation ouverte".

15/11/2018 Demande de révision mineure.

22/11/2018 Soumission de la version révisée.

04/12/2018 Décision finale : article accepté pour publication.

01/02/2019 Article publié.

Présentation en séminaire de recherche en 2017

“Impact of cognitive, organizational and geographical proximities on startup-large firm collaborations in open innovation context”, ICN Business School Brown Bag Seminar, Nancy, December 19, 2017.

CHAPTER 4 – Article 2: The nature of startup teams' knowledge and their innovation collaborations with large firms

Résumé étendu

Résumé

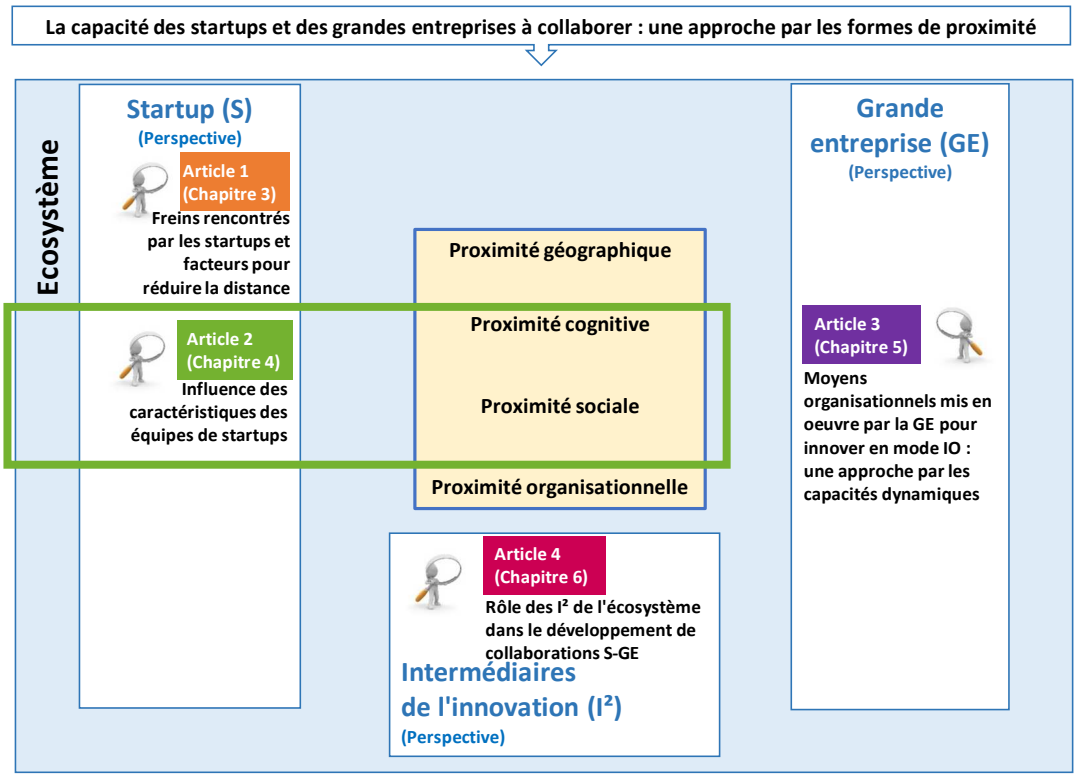
Cet article vise à étudier dans quelle mesure le capital humain et social, en tant que ressources basées sur les connaissances, développé par les équipes fondatrices des startups, influence leur capacité à collaborer avec les grandes entreprises dans un contexte d'innovation ouverte. Les chercheurs n'ont pas encore étudié cette question. L'objectif de ce travail de recherche est de mieux comprendre le rôle et la nature des ressources basées sur les connaissances des équipes fondatrices de startups dans leur collaboration en matière d'innovation avec les grandes entreprises, notamment au regard de leur succès. La théorie de la proximité est utilisée pour aborder cette question car elle représente un indicateur pertinent et central à la fois du potentiel et de la réalité des interactions entre des partenaires asymétriques impliqués dans des projets de collaboration pour innover. Cette recherche aboutit à un modèle prenant en compte la dimension temporelle de la collaboration. Les résultats devraient intéresser les startups et les entreprises dans le cadre de leur approche des collaborations stratégiques avec des partenaires asymétriques dans un contexte d'innovation ouverte. Ils sont également destinés aux politiques régionales d'innovation pour soutenir les moteurs de l'innovation ouverte et les écosystèmes entrepreneuriaux tout au long des phases du processus entrepreneurial.

Mots-clés : Équipes fondatrices de startups, Startups technologiques, Innovation ouverte, Capacité de collaboration, Capital humain, Capital social, Complémentarité des connaissances, Distance cognitive, Proximité.

Positionnement de l'article dans la thèse

A la suite des enseignements et questionnements du premier article, ce second article explore l'influence des seules ressources dont disposent les startups, leur capital humain et social, sur leur capacité à collaborer avec de grandes entreprises. Les formes de proximité cognitive et sociale des startups ayant émergé dans l'article qualitatif précédent comme essentielles à la réussite de leur collaboration avec de grandes entreprises, l'idée de ce second article est d'explorer plus avant, via une méthode quantitative, les facteurs issus du capital humain et social des startups qui seraient liés à ces formes de proximité ainsi qu'à la capacité à collaborer des startups. Cet article, comme le précédent dont il est le prolongement direct, adopte la perspective de la startup. La figure ci-après présente le positionnement de l'article (cadre vert) dans le cadre conceptuel de la thèse.

Figure 42 – Positionnement de l'Article 2 dans le cadre conceptuel de la thèse



Légende : S = Startup, GE = Grande entreprise, I² = Intermédiaires de l'innovation, IO = Innovation Ouverte

Principaux résultats et originalité

Cette étude a tout d'abord montré une propension des équipes de fondateurs de startups à disposer de plus de compétences complémentaires et essentiellement de

plus haut niveau que les fondateurs solos, à tous les niveaux, à savoir : éducation et parcours professionnel, et au niveau social, notamment en ce qui concerne la densité de leur réseau. L'étude a également montré un avantage potentiel des équipes fondatrices sur les fondateurs solos en termes de capacité à collaborer avec de grandes entreprises, mais seulement pendant la phase de conception de la collaboration, pas celle de processus. En outre, les alliances de R&D étant rarement associées au succès de la collaboration, des recherches supplémentaires seraient nécessaires dans ce sens pour mieux comprendre les obstacles et les leviers qui sont à l'œuvre dans le contexte particulier de collaborations asymétriques entre startups et grandes entreprises. Cette étude a également montré, à travers une vue processuelle de la collaboration, les problèmes susceptibles de survenir à chaque phase (Amont, Design, Processus) et qu'il est intéressant pour les startups d'anticiper.

Implications pour ce travail de recherche doctoral

Ce second article a permis de faire émerger des facteurs clés relatifs à la capacité des startups à collaborer avec de grandes entreprises, sur la base d'une analyse quantitative de leurs compétences. D'une part, la startup s'adapte à la grande entreprise via une certaine dose d'empathie à l'égard de cette dernière, d'autre part son accès aux grandes entreprises est facilité grâce à son réseau personnel construit en amont de la collaboration. Cet article a également mis en exergue la force que représente la complémentarité des compétences au sein des équipes fondatrices de startups en comparaison avec les fondateurs solos. Toutefois, il semble que d'autres facteurs de contingence que ceux explorés dans cet article participent à la proximité entre les acteurs et au succès de la collaboration. Une question se pose à la suite de ce travail ainsi que du premier article : quels sont les moyens et ressources déployés par la grande entreprise pour se mettre en capacité de collaborer avec des startups ? Cette question est explorée dans l'article 3.

Valorisation des travaux de recherche

Communications dans des conférences à comité de lecture en 2018 et 2019

"Knowledge-based resources of startup teams and their capability to collaborate with large firms in open innovation context", *17th OUI -Open & User Innovation-Conference*, University of Utrecht, The Netherlands, July 8-10, 2019.

"Antecedents and impact of startupper teams' skills on their collaborations with large firms", *2018 Research Network in Innovation (RNI) Congress - Innovation Forum VIII*, Nîmes, June 4-5, 2018.

"Influence of startupper teams' skills on their collaborations with large firms to innovate", *The Global Interdisciplinary Conference: Green Cities, Business, Engineering, Architecture, Design & Technology*, Nancy, June 27-30, 2018.

CHAPTER 5 – Article 3: Organizational impact of digital open innovation in retail banks: Managing external and internal pressure

Cet article est co-écrit avec Véronique Schaeffer[38]

Cet article a été publié en juin 2020 dans un ouvrage collectif international comme suit : BERTIN, Clarice, & SCHAEFFER, Véronique (2020). Organizational impact of digital open innovation in retail banks: Managing external and internal pressure, Chapter 11, in Managing Digital Open Innovation, Vol. 5, Book Series Open Innovation: Bridging Theory and Practice, World Scientific Publishing, pp. 297-322, May.

Résumé étendu

Résumé

Cet article a pour but d'étudier comment de grandes organisations, en l'occurrence les banques, développent leurs capacités dynamiques et font face aux rigidités associées dans le contexte de l'innovation digitale ouverte. Notre analyse de deux études de cas approfondies souligne les défis auxquels les banques sont confrontées à l'ère de la digitalisation. Elle indique que les banques se transforment profondément en termes de structure organisationnelle, de processus et d'interactions internes, et de compétences individuelles ; la résistance humaine au changement et les rigidités associées étant les problèmes les plus difficiles à résoudre. Nos résultats montrent que les pratiques de gestion centrées sur les personnes - plutôt que sur la technologie - semblent très prometteuses pour développer des capacités dynamiques au sein des banques. Pour réussir à développer leurs capacités d'innovation, les banques doivent trouver le bon équilibre entre les contraintes externes dues à la spécificité de leurs activités et le désir et le besoin d'innover afin de satisfaire leurs clients interconnectés. Pour parvenir à cet équilibre délicat et procéder aux changements structurels et organisationnels

appropriés, l'esprit collectif insufflé par la direction des banques apparaît certainement comme l'un des facteurs déterminants, sinon le premier, de la réussite.

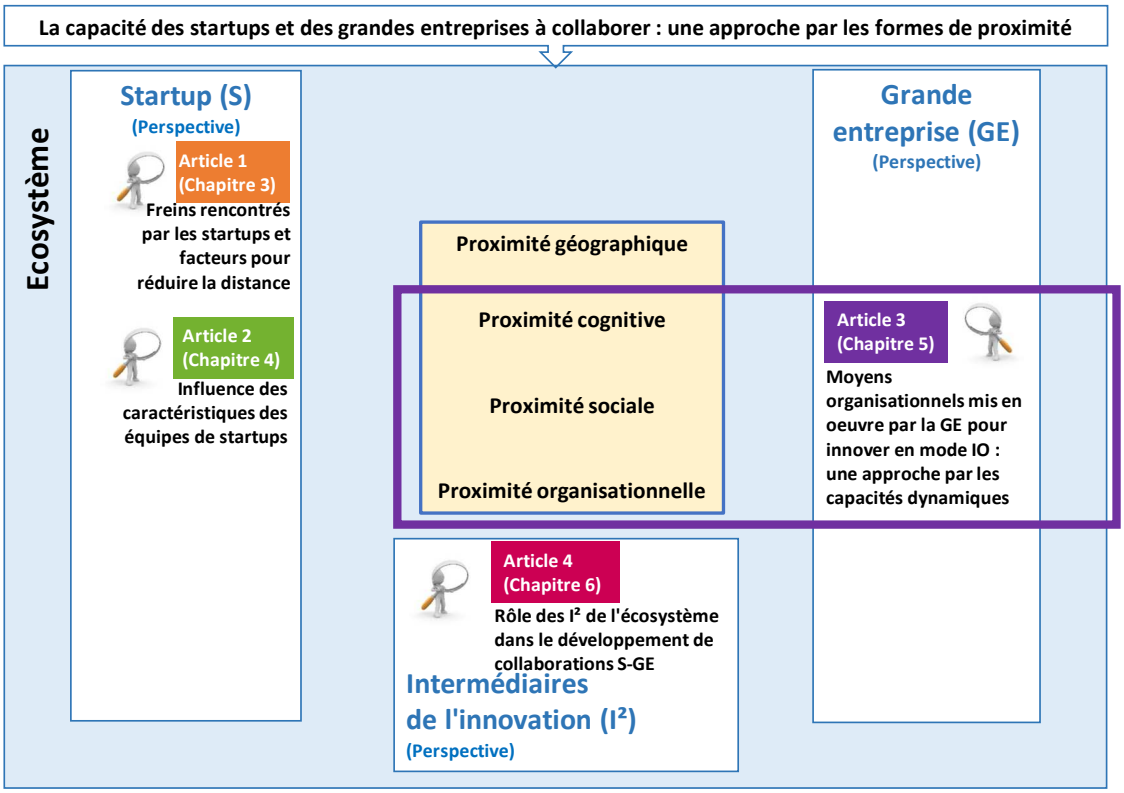
Mots-clés : Capacités dynamiques, routines, rigidités, banque de détail, processus internes, résistance au changement, gestion du changement, agilité organisationnelle, centralité du client, exploration des connaissances, exploitation des connaissances, ambidextrie, cadres intermédiaires, innovation financière, autonomisation.

Positionnement de l'article dans la thèse

Le premier article de la thèse avait montré la nécessité d'une adaptation de la grande entreprise en amont de la collaboration avec des startups. Les résultats du second article montrent que d'autres facteurs que ceux associés aux seules compétences de la startup ont une influence sur sa collaboration avec de grandes entreprises. Ce troisième article propose donc d'explorer, selon la perspective de la grande entreprise cette fois, les changements opérés par de grandes organisations, typiquement fortement hiérarchisées et ancrées dans la routine de leurs processus, pour ouvrir leur processus d'innovation à des acteurs externes telles que les startups. Les banques ont été retenues pour cette raison ainsi que pour les nombreux challenges qu'elles ont à relever en matière d'innovation et d'ouverture de leurs frontières. La figure ci-après présente le positionnement de l'article (cadre violet) dans le cadre conceptuel de la thèse.

[38] Une estimation de la contribution personnelle pour cet article est disponible en Appendix 1.

Figure 43 – Positionnement de l'Article 3 dans le cadre conceptuel de la thèse



Légende : S = Startup, GE = Grande entreprise, I² = Intermédiaires de l'innovation, IO = Innovation Ouverte

Principaux résultats et originalité

Les résultats indiquent que les grandes organisations, dans cet article les banques, se transforment profondément à trois niveaux, à savoir en termes de structure organisationnelle, de processus et d'interactions internes, et de compétences individuelles. Le plus difficile semble être la résistance humaine au changement face à l'introduction d'une digitalisation massive dans les activités. Cette résistance interne est renforcée par des rigidités propres aux processus et procédures nécessairement très stricts du secteur, à la structure organisationnelle et au processus décisionnel des banques. Il apparaît à travers les cas que les pratiques centrées sur les personnes - impliquant la création de communautés, des échanges informels entre les membres du personnel, le management participatif - semblent très prometteuses pour développer des capacités dynamiques au sein des banques. Une approche purement technique ne conduit pas à un apprentissage organisationnel et ne permet de résoudre les problèmes qu'à court terme. Pour parvenir à un équilibre entre les contraintes externes dues aux spécificités de leurs activités et le désir et le besoin d'innover pour satisfaire leurs clients fortement

interconnectés, et ainsi procéder aux changements structurels et organisationnels appropriés, l'intelligence collective insufflée par le top management apparait certainement comme l'un des facteurs déterminants, sinon le premier, pour réussir.

Implications pour ce travail de recherche doctoral

Ce troisième article a mis en exergue l'importance du facteur humain dans la transformation des grandes entreprises pour ouvrir leur processus d'innovation à des acteurs externes tels que les startups. En particulier, l'intelligence collective insufflée par le top management facilite et permet le développement de ce processus de transformation. Il n'en reste pas moins que ces changements restent difficiles en termes d'implémentation en interne et de construction et maintien de liens avec l'externe. Le premier article de la thèse avait montré le rôle de clé de voûte des intermédiaires de l'innovation dans la collaboration startup – grande entreprise, tout au long de la collaboration. Ces intermédiaires de l'écosystème, en tant qu'acteurs externes et experts, sont-ils à même d'influencer la construction de ces collaborations en agissant directement sur les capacités des grandes entreprises à collaborer ? C'est à cette question que tente de répondre le quatrième et dernier article de la thèse.

Valorisation des travaux de recherche

Chapitre dans un ouvrage collectif international

"Organizational impact of digital open innovation in retail banks: Managing external and internal pressure", in *"Managing Digital Open Innovation" Book Series Open Innovation: Bridging Theory and Practice*, World Scientific Publishing, pp. 297-322, June 2020.

Processus de soumission de l'article (de 2018 à 2019)

26/01/2018 Proposition de résumé étendu pour le chapitre d'ouvrage intitulé : "Organizational impact of digital open innovation in retail banks: Managing external and internal pressure", dans le volume spécial sur : *"Managing Digital Open Innovation"* de la collection d'ouvrages dédiés à : *"Open Innovation: Bridging Theory and Practice"*, et publiée par

World Scientific Publishing.

01/02/2018 Proposition acceptée

14/09/2018 Soumission de l'article complet

07/05/2019 Demande de révisions de forme

27/05/2019 Soumission de l'article révisé

16/12/2019 Demande de révisions de forme avant publication

17/12/2019 Soumission de l'article révisé

02/06/2020 Publication du chapitre d'ouvrage

Communication dans une conférence à comité de lecture en 2018

"Organizational impact of digital open innovation in retail banks: Managing external and internal pressure", *Digital Innovation, Entrepreneurship & Financing (DIF) 2018*, AIMS, AEI, Lyon, June 11-12, 2018.

Présentations dans des séminaires de recherche en 2015 et 2016

"Open innovation in retail banking: Organizational perspective of an ecosystem", *ICN Business School Research Seminar*, Nancy, October 6, 2016.

"Crowdsourcing within the French banking sector: Exploring the impact on bank-client relationship", *BETA Laboratory Seminar*, Nancy, June 14, 2016.

"Organizing R&D for efficient crowdsourcing activities", *ICN Business School Research Seminar*, November 2015.

CHAPTER 6 – Article 4: Innovation intermediaries' roles in the development of firms' capability to establish new partnerships with startups: the case of banks in the Luxembourg ecosystem

Cet article est co-écrit avec Véronique Schaeffer[39]

Résumé étendu

Résumé

L'objectif de cet article est d'étudier les rôles des intermédiaires de l'innovation dans la régénération des capacités dynamiques des organisations traditionnelles, très hiérarchisées et challengées en termes d'innovation. En particulier, c'est leurs rôles sur la capacité à construire de nouvelles collaborations qui est explorée dans cet article. Nous nous concentrons sur le secteur bancaire qui est actuellement confronté à d'énormes défis en matière d'innovation et qui doit gérer la transition d'une activité hautement structurée vers une forte implication dans le monde ouvert et mouvant de l'économie numérique. Notre approche est qualitative et basée sur des observations et des entretiens avec des acteurs impliqués dans un écosystème d'innovation ouvert. Nous utilisons le cadre des capacités dynamiques pour comprendre comment certains de ces intermédiaires de l'innovation influencent la capacité des banques à établir de nouvelles collaborations avec les fintech et les startups. Nos résultats montrent le rôle crucial et interdépendant des intermédiaires de l'innovation, tant externes qu'internes, dans la régénération des capacités dynamiques des banques, dont ils sont de véritables ressources. Ils montrent également que les banques ne s'adaptent pas seulement à leur écosystème d'innovation, mais qu'elles sont aussi

des acteurs à part entière de sa co-construction, ce qui les rend complémentaires des intermédiaires d'innovation externes de l'écosystème. Un troisième résultat souligne l'importance cruciale du développement des capacités relationnelles dans la dynamique de l'ensemble de l'écosystème.

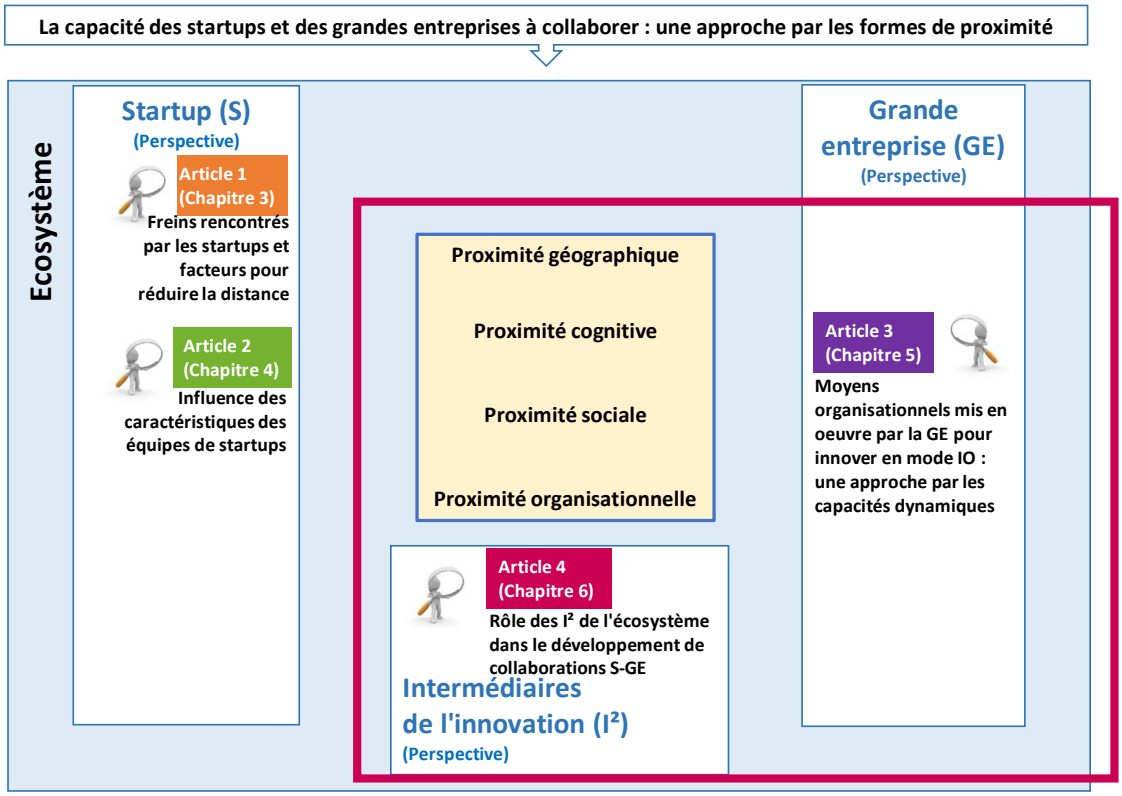
Mots-clés : Intermédiaires de l'innovation, Secteur bancaire, Capacités dynamiques, Technologies numériques, Écosystème de l'innovation ouverte, Accélérateurs, Consultants numériques, Club d'entreprises de l'innovation ouverte.

Positionnement de l’article dans la thèse

Ce quatrième article représente la troisième perspective explorée sur la collaboration startup – grande entreprise : celle des intermédiaires de l’innovation. Dès le premier article de la thèse, ils sont apparus comme des clés de voûte de cette relation, mais également comme des leviers dans l’indispensable dynamique de l’écosystème dans lequel ils évoluent. Sur la base du cas unique d’un écosystème, cette étude qualitative s’est portée sur le développement des collaborations entre banques et fintech ou startups, étant donné les challenges auxquels ces acteurs sont confrontés, tant en matière d’innovation que de collaboration. La figure ci-après présente le positionnement de l’article (cadre magenta) dans le cadre conceptuel de la thèse.

[39] Une estimation de la contribution personnelle pour cet article est disponible en Appendix 1.

Figure 44 – Positionnement de l'Article 4 dans le cadre conceptuel de la thèse



Légende : S = Startup, GE = Grande entreprise, I² = Intermédiaires de l'innovation, IO = Innovation Ouverte

Principaux résultats et originalité

Nos résultats ont montré la présence d'une diversité d'intermédiaires au sein de l'écosystème possédant des rôles différents, mais aussi des rôles qui se chevauchent. Cela souligne non seulement leurs liens avec les acteurs de l'écosystème, mais aussi leurs interactions les uns avec les autres, ce qui participe sûrement à la bonne coordination, plate, de leurs actions en faveur des acteurs de cet écosystème. Cette recherche contribue à la connaissance des différents rôles des intermédiaires de l'innovation dans le processus de régénération des capacités dynamiques des grandes organisations qui sont fortement mises à l'épreuve par la digitalisation, la concurrence digitale, une réglementation stricte et de fortes routines internes. Ainsi, un nouveau rôle des intermédiaires de l'innovation dans ce contexte est leur capacité à transformer les organisations en interne. En ce sens, les intermédiaires de l'innovation peuvent être considérés comme des ressources intangibles des organisations qui font appel à eux. Nous avons également attiré l'attention sur le fait que le rôle de catalyseur des intermédiaires externes de

l'innovation sur la dynamique de l'écosystème collectif n'est possible que s'ils peuvent rencontrer les acteurs internes appropriés et engagés, c'est-à-dire les cadres intermédiaires de l'innovation déployés par les banques, pour se connecter et co-construire avec eux des solutions de collaboration incluant Fintech ou des startups.

Implications pour ce travail de recherche doctoral

Ce quatrième article vient d'une part conforter les premiers résultats portés par le premier article et en apporte d'autres, plus précis, sur le rôle de ces acteurs externes en tant que ressources intangibles d'organisations dont elles sont externes et indépendantes (sans hiérarchie). Ce quatrième et dernier article montre également que la dynamique de l'écosystème d'innovation ouverte résulte d'une réelle contribution collective à son développement, incluant notamment intermédiaires de l'innovation, entreprises, startups, Fintech, nombreux experts de différents domaines, et collectivités publiques. Cette intelligence collective fait de l'écosystème pour innover une communauté dynamique et interconnectée.

Valorisation des travaux de recherche

Communications dans des conférences à comité de lecture en 2019

"Regenerating dynamic capabilities in innovation ecosystems: the case of the banking sector facing digitization", *EURAM 19 - European Academy of Management Conference*, SIG Innovation, 2019, Lisbon, Portugal, June 26-28, 2019.

"Building dynamic capabilities within an innovation ecosystem: the case of the banking sector", *RADMA - R&D Management Conference*, Ecole Polytechnique et HEC, Paris, June 17-21, 2019.

"Building dynamic capabilities in the digital era: the case of the banking sector", *28ème Conférence de l'AIMS - Association Internationale de Management Stratégique, 2019*, Dakar, Senegal, June 12-14, 2019.

Présentation dans un séminaire de recherche en 2016

“Open innovation in retail banking: Organizational perspective of an ecosystem”, *ICN Business School Research Seminar*, Nancy, October 6, 2016.

CHAPITRE 7 : Discussion, conclusions et perspectives de recherches futures

7.1. Résultats principaux du programme de recherche

Cette partie présente les principaux résultats de la thèse qui ont émergé des quatre articles de recherche (Chapitres 3 à 6). Une synthèse visuelle de ces résultats est proposée pour chacune des trois perspectives étudiées (startups, grandes entreprises, intermédiaires de l'innovation). Une discussion s'ensuit qui porte sur les dimensions transversales de ces résultats et qui soutiennent la thèse. Enfin, un modèle intégré et holistique pour la collaboration symbiotique entre startups et grandes entreprises est proposé.

7.1.1. Synthèse des résultats principaux

Les résultats principaux présentent les facteurs qui ont émergé tout au long du programme de recherche à travers les quatre articles. Ils sont organisés selon leur niveau d'analyse (intra-organisationnel, inter-organisationnel, écosystémique), leur perspective (startup, grande entreprise, intermédiaires de l'innovation dans l'écosystème) et les 2+1 phases de la collaboration identifiées (phase *Amont*, phase de *Design* de la collaboration, phase du *Processus* de la collaboration), offrant ainsi une vision holistique du phénomène étudié.

7.1.2. Synthèse des résultats selon les trois perspectives étudiées

Cette partie propose une première synthèse du design de la thèse depuis la problématique jusqu'à la thèse défendue. Les trois perspectives étudiées (startup, grande entreprise, intermédiaires) donnent ensuite lieu à trois synthèses des résultats présentées sous forme de schémas, puis un tableau de questionnements issu des résultats et spécifiquement dédié aux startups. Ces éléments de synthèse montrent les connections réalisées entre les perspectives, la chronologie de la collaboration et les niveaux organisationnels.

Tableau 43 – Design de la thèse

Question de recherche du programme de recherche
« Quels facteurs favorisent la collaboration symbiotique entre startups et grandes entreprises dans un écosystème d'innovation ouverte ? »
Sous-questions de recherche
• Article 1, Chapitre 3 : Quels sont les facteurs organisationnels qui favorisent la proximité (cognitive, sociale, organisationnelle, géographique) entre startups et grandes entreprises et leur capacité à collaborer dans un contexte d'innovation ouverte ? • Article 2, Chapitre 4 : Dans quelle mesure le capital humain et social développé par les équipes fondatrices de startups influence-t-il leur capacité à collaborer avec les grandes entreprises tout au long du projet de collaboration d'innovation ? • Article 3, Chapitre 5 : Comment les grandes entreprises matures ouvrent-elles leur processus d'innovation pour collaborer avec des startups en développant leurs capacités dynamiques tout en réduisant leurs propres rigidités internes ? • Article 4, Chapitre 6 : Quels sont les rôles des intermédiaires d'un écosystème d'innovation ouverte sur la régénération des capacités dynamiques (en particulier pour développer de nouvelles collaborations avec des startups) d'organisations traditionnelles, très hiérarchisées ?
Cadre théorique mobilisé
Théorie de la proximité géographique et non géographique (cognitive, sociale, organisationnelle) et de la régénération des capacités dynamiques.
Résultats principaux
• Identification des facteurs favorisant la collaboration symbiotique entre startups et grandes entreprises, selon trois perspectives (startup, grande entreprise, intermédiaires), selon les 2+1 phases de la collaboration (*Amont, Design, Processus*) et quatre niveaux organisationnels : intra-organisationnel de la startup, intra-organisationnel de la grande entreprise, inter-organisationnel, et écosystémique. • Identification des moyens d'adaptation permettant d'augmenter la capacité des acteurs à collaborer selon les 2+1 phases de la collaboration. • Analogie avec la symbiose biologique reconsidérant la notion d'écosystème.
Thèse soutenue
Les facteurs moteurs de la collaboration symbiotique peuvent être (co-)construits s'ils font défaut à l'un ou l'autre des acteurs par une adaptation volontariste de celui-ci ou ceux-ci, bien que ce type de collaboration ne soit pas fondé sur la hiérarchie mais sur la confiance, l'exploration et l'agilité organisationnelle. Ces facteurs s'apparentent à ceux présents dans les relations symbiotiques de type mutualiste dans les écosystèmes naturels.

Trois schémas de synthèse sont proposés ci-après pour visualiser les résultats plus en détails selon chacune des perspectives prises en considération :

- **La Figure 45** présente les facteurs de collaboration symbiotique suivants les 2+1 phases de la collaboration, les niveaux organisationnels et la **perspective des grandes entreprises**. Les résultats transversaux montrent les changements organisationnels parfois lourds que la grande entreprise doit opérer lors de la phase *Amont* pour augmenter sa capacité à collaborer avec des startups, lesquels peuvent être facilités par les interactions avec les intermédiaires de l'écosystème. Ils montrent également les questions que la startup devrait se poser avant de s'engager dans une collaboration avec une grande entreprise, afin d'optimiser sa proximité géographique et non-géographique avec elle et ainsi maximiser les chances de succès (cf. **Tableau 44** – S'engager ou ne pas s'engager ? Une grille de questionnements à destination des startups).
- **La Figure 46** présente les facteurs de collaboration symbiotique suivants les 2+1 phases de la collaboration, les niveaux organisationnels et la **perspective des startups**. Les résultats transversaux soulignent l'importance, en plus de la maîtrise technologique, de plusieurs habiletés cognitives et sociales des startupers, en particulier l'empathie, la capacité à établir des liens sociaux avec des acteurs de la grande entreprise, et la constitution d'un réseau (en phase *Amont*).
- **La Figure 47** présente les facteurs de collaboration symbiotique suivants les 2+1 phases de la collaboration, les niveaux organisationnels et la **perspective des intermédiaires**. Les résultats transversaux indiquent leur rôle crucial, d'une part dans le développement de partenariats startups - grandes entreprises, et d'autre part dans le développement de la capacité des grandes entreprises à collaborer avec des startups.

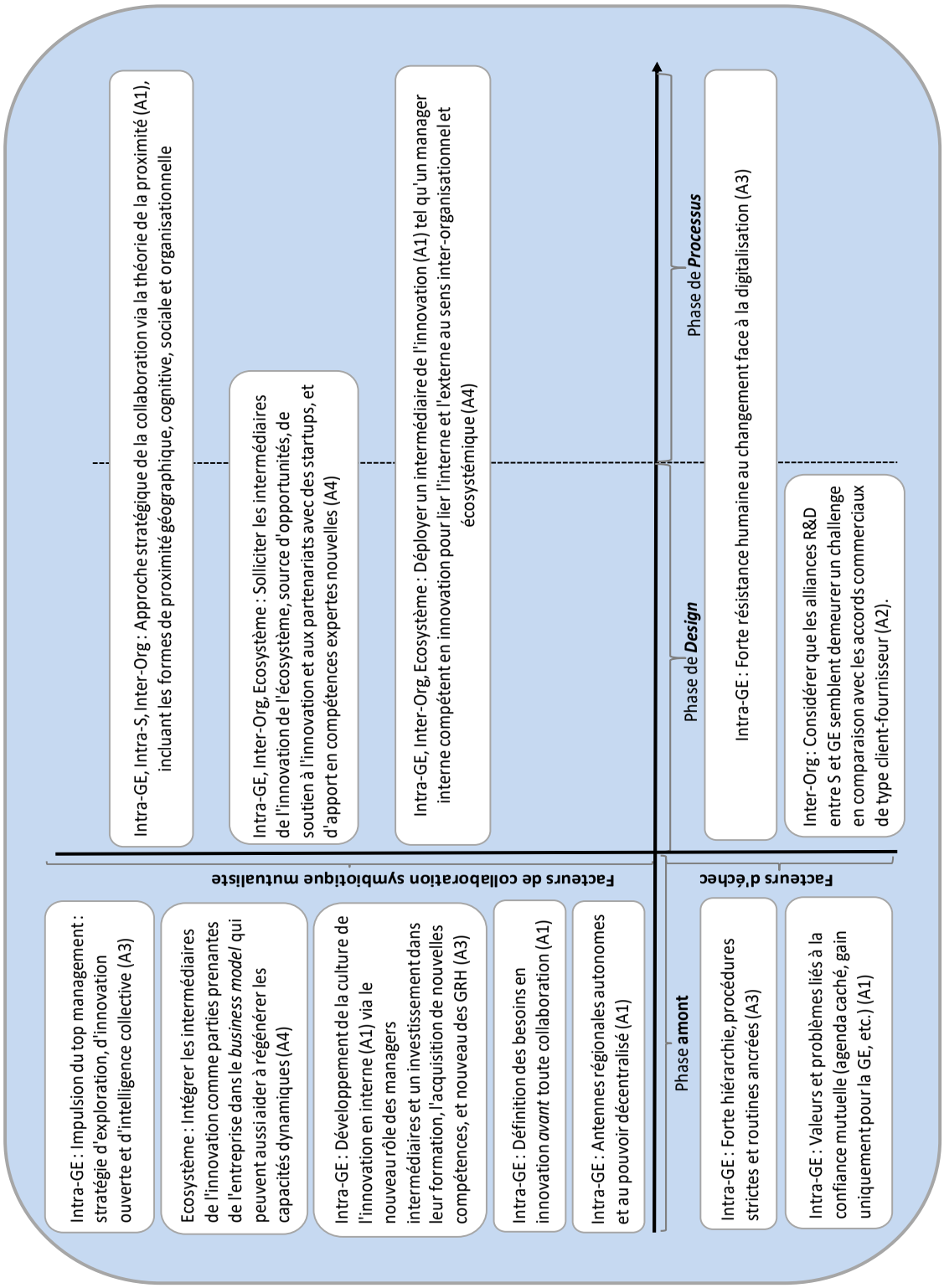


Figure 45 – Facteurs de collaboration symbiotique suivants les 2+1 phases de la collaboration, les niveaux organisationnels et la perspective de la grande entreprise

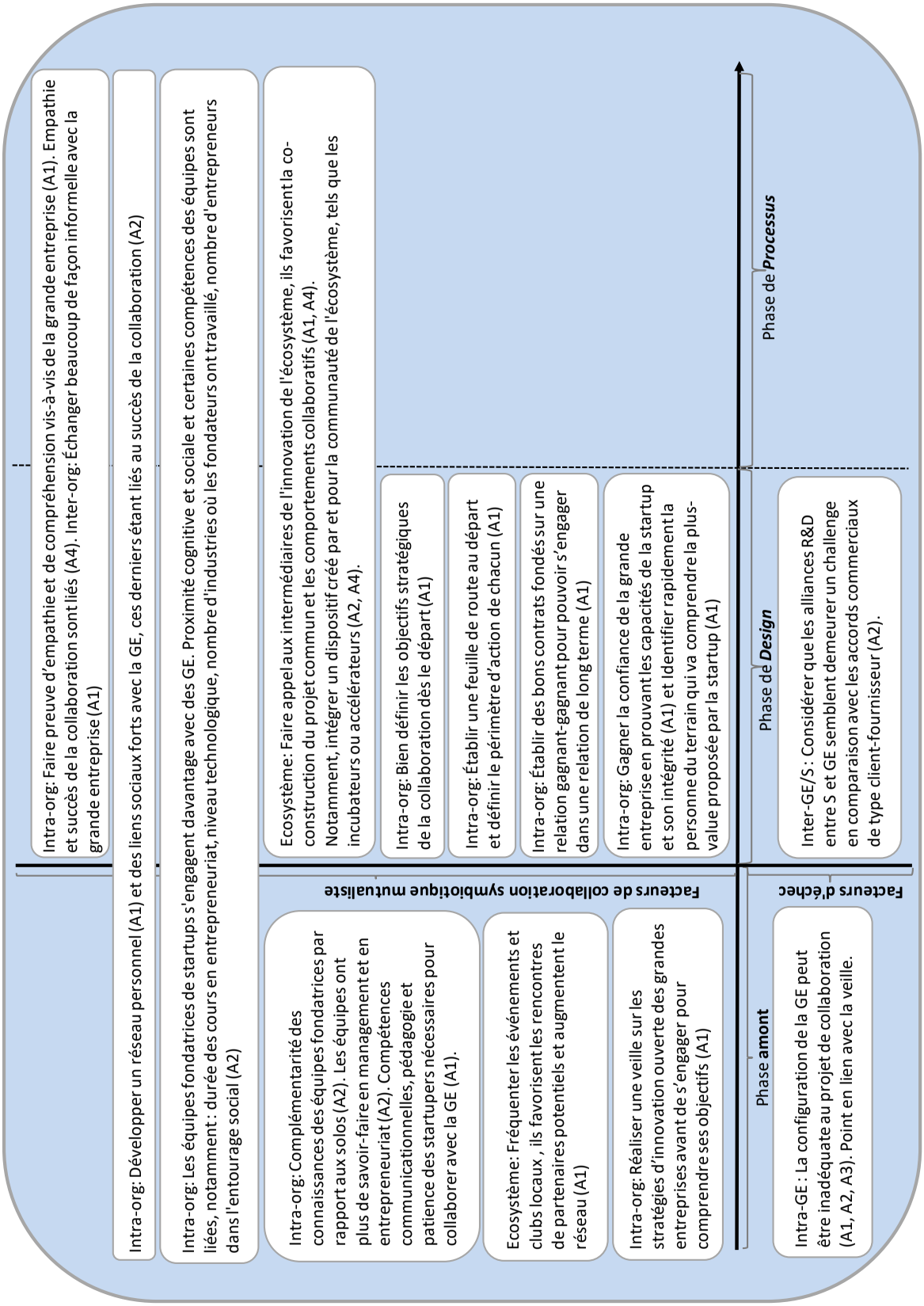


Figure 46 - Facteurs de collaboration symbiotique suivants les 2+1 phases de la collaboration, les niveaux organisationnels et la perspective de la startup

Figure 47 – Facteurs de collaboration symbiotique suivants les 2+1 phases de la collaboration, les niveaux organisationnels et la perspective des intermédiaires

Tableau 44 – S'engager ou ne pas s'engager ? Une grille de questionnements à destination des startupers

	1	2	3	4	5	6	7
Nous avons effectué une veille sur la grande entreprise avant de collaborer avec elle							
Les besoins des grandes entreprises ont été clairement définis dès le départ, avant d'imaginer notre collaboration							
Nous avons établi (ou prévoyons d'établir) une feuille de route commune							
Nous nous comprenons toujours très facilement							
Ma startup s'adapte à la réalité de la grande entreprise et fait preuve d'une certaine empathie à son égard							
Nous avons des connaissances technologiques proches							
Nous avons des compétences technologiques complémentaires							
Nos interactions se font principalement en face à face							
Nous avons établi des liens sociaux forts, parfois amicaux, avec une ou plusieurs personnes de cette grande entreprise							
Une personne ou une équipe compétente en matière d'innovation a mis en relation ma startup avec les acteurs de la grande entreprise. (Cet intermédiaire est soit interne à la grande entreprise ou externe à elle : il peut provenir de l'écosystème).							
Ma startup est (ou devrait être *a priori*) relativement autonome dans la réalisation des différentes activités liées au projet de collaboration avec la grande entreprise							
Cette grande entreprise dispose d'une branche locale ou régionale autonome dans sa prise de décision, avec laquelle ma startup interagit directement							
Cette grande entreprise est très accessible tout au long du processus de collaboration							
L'échange d'informations et de connaissances avec cette grande entreprise est facile et simple							
Nous pouvons facilement nous rendre dans cette grande entreprise, qui est géographiquement proche de notre startup (en km/temps de trajet)							
Nous interagissons avec cette grande entreprise via des outils en ligne asynchrones (tels que le courrier électronique et/ou la plate-forme)							
Nous interagissons avec cette grande entreprise via des outils en ligne synchrones (tels que la messagerie instantanée ou les conférences web : Slack ou Skype, par exemple)							

7.2. Discussion

Cette partie discute les résultats transversaux de ce programme de recherche, au-delà de l'apport propre à chacun des articles. Les résultats transversaux suivants ont émergé de ce travail :

- La pertinence d'une approche holistique, processuelle et dynamique de la collaboration startup – grande entreprise pour favoriser leur capacité à collaborer pour innover
- La capacité à collaborer est favorisée par le déploiement en amont d'une intelligence collective des grandes entreprises et par la complémentarité des équipes fondatrices de startups
- Les intermédiaires de l'innovation internes et externes, ressources essentielles pour les collaborations startups - grandes entreprises et la dynamique de l'écosystème
- Les résultats à la lumière de la symbiose biologique : vers une complémentarité des acteurs et leur contribution à la communauté de l'écosystème

Préalablement à la discussion des résultats transversaux, une synthèse est proposée ci-après, qui met en lien les résultats, les points discutés et le fond théorique associé. La discussion en tant que telle est développée dans le chapitre 7 de la thèse.

Tableau 45 - Synthèse des résultats transversaux de la thèse

#	Résultats transversaux	Points discutés	Fond théorique
1	**La pertinence d'une approche holistique, processuelle et dynamique de la collaboration startup – grande entreprise pour favoriser leur capacité à collaborer pour innover**	• L'intégration empirique des différentes formes de proximité pour une vision holistique de la collaboration startup – grande entreprise • La pertinence d'une vision processuelle des collaborations asymétriques	Littérature sur la théorie de la proximité et sur la collaboration

2	**La capacité à collaborer est favorisée par le déploiement en amont d'une intelligence collective des grandes entreprises et par la complémentarité des équipes fondatrices de startups**	• La nécessité d'une adaptation organisationnelle dynamique des grandes entreprises, fondée sur l'intelligence collective • La complémentarité des équipes fondatrices de startups et les habiletés sociales et cognitives des startups favorisent leur capacité à collaborer avec les grandes entreprises	Littérature sur et les capacités dynamiques, le capital social et humain des équipes de startups
3	**Les intermédiaires de l'innovation internes et externes, ressources essentielles pour les collaborations startups - grandes entreprises et la dynamique de l'écosystème**	• La capacité des intermédiaires externes à agir sur la transformation organisationnelle des grandes entreprises • L'interdépendance entre les intermédiaires internes, externes et la communauté	Littérature sur les intermédiaires de l'innovation et sur les capacités dynamiques
4	**Les résultats à la lumière de la symbiose biologique : vers une complémentarité des acteurs et leur contribution à la communauté de l'écosystème**	• La complémentarité comme valeur des écosystèmes dynamiques et vertueux • La contribution des acteurs à la communauté de l'écosystème	Littérature sur la symbiose et la coopétition

Figure 48 présente une synthèse issue des résultats transversaux de la thèse sous forme de modèle intégré et holistique pour la collaboration symbiotique entre startups et grandes entreprises mobilisant la théorie de la proximité et des capacités dynamiques.

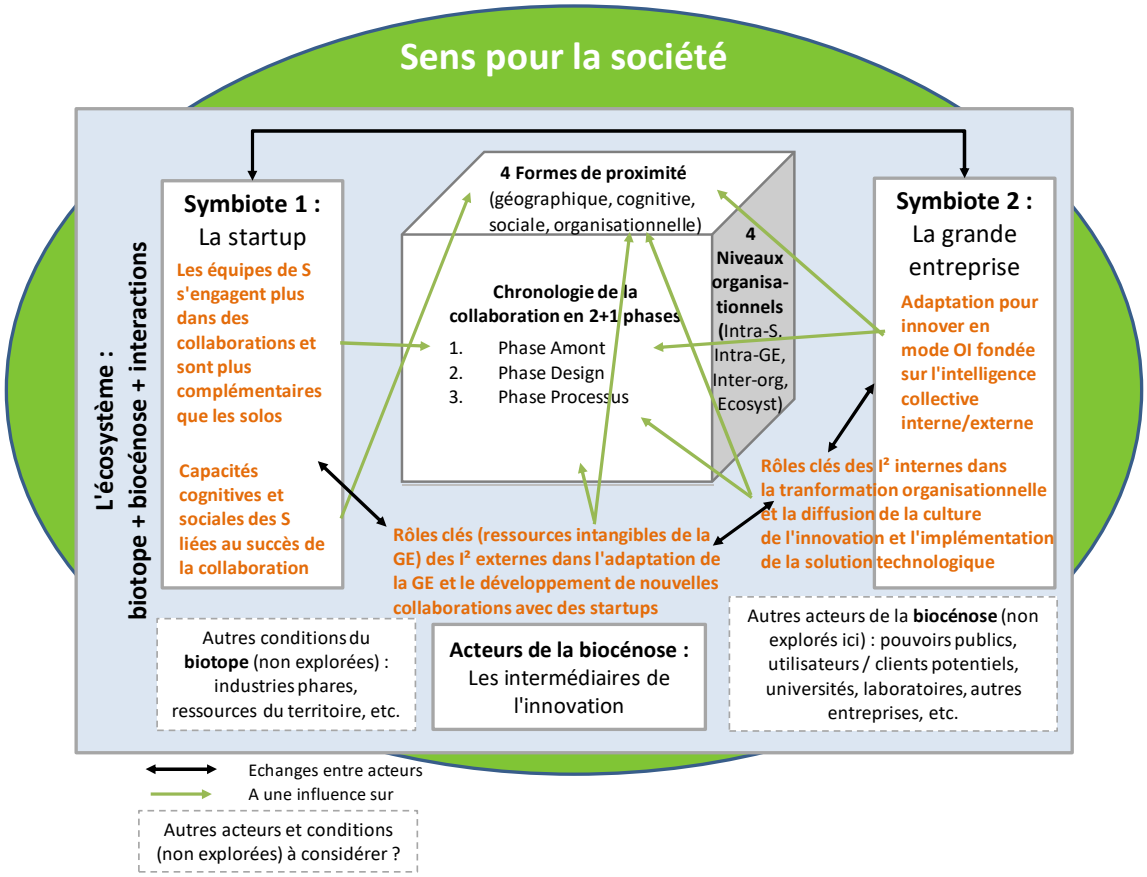


Figure 48 - Proposition de modèle intégré et holistique pour la collaboration symbiotique entre startups et grandes entreprises mobilisant la théorie de la proximité et des capacités dynamiques

7.3. Conclusions du programme de recherche

Cette partie présente les contributions théoriques et managériales de ce programme de recherche, puis les limites et les perspectives de recherche futures, et enfin le projet de recherche prévu à la suite de cette thèse.

7.3.1. Contribution théorique

Les contributions d'ordre théorique concernent les champs suivants de la littérature : l'innovation ouverte, l'entrepreneuriat, et les écosystèmes. Ces contributions sont présentées ci-après.

7.3.1.1. Contribution à la littérature en innovation ouverte

Cette thèse focalise sur la collaboration symbiotique entre startups et grandes entreprises en contexte d'innovation ouverte. Dans ce cadre, l'exploration de l'objet de recherche s'est effectuée suivant différents niveaux, répondant ainsi aux appels de Chesbrough & Bogers (2014) et de Bogers et al. (2017) : le niveau intra-organisationnel (celui de la startup et celui de la grande entreprise), le niveau inter-organisationnel et le niveau écosystémique. La thèse a ainsi contribué à montrer comment les protagonistes s'organisent, avec l'aide de la communauté de leur écosystème, en mode innovation ouverte pour augmenter leur capacité à collaborer. L'association de ces différents niveaux avec la théorie de la proximité s'est avérée fructueuse dans la mesure où la collaboration a été étudiée de façon holistique, dans le temps et dans l'espace géographique et non-géographique. De ce fait, le même objet de recherche, évoluant dans un contexte d'innovation ouverte, a été étudié de la façon la plus systémique possible dans le cadre de cette thèse, et a permis de mettre en lumière les facteurs favorisant la collaboration symbiotique en mode innovation ouverte, mais également les liens d'interdépendance entre les différents éléments étudiés (niveaux, acteurs, facteurs). Ce travail apporte un éclairage supplémentaire à la littérature en innovation ouverte, en particulier dans le cadre de collaborations asymétriques où les acteurs sont indépendants aux niveaux organisationnel et financier.

Par ailleurs, cette thèse contribue également au développement de stratégies d'innovation ouverte : tel que souligné par Chesbrough et al. (2006, p. 231), "*central to an Open Innovation strategy is to maintain diverse types of ties to a diverse set of institutions*." Le cadre de la théorie de la proximité s'est avéré particulièrement fructueux pour mettre en lumière les éléments d'une stratégie d'innovation ouverte structurée selon des facteurs précisant la nature et la diversité des formes de proximité de la collaboration startup – grande entreprise, tout en les croisant avec différents niveaux organisationnels. Ce cadre holistique centré sur la proximité géographique et non géographique enrichit la réflexion sur les stratégies d'innovation ouverte avec des partenaires asymétriques, mais pourrait être utilisé *a fortiori* pour des partenariats plus symétriques. De ce point de vue, cette thèse participe à rendre plus transparent le phénomène de stratégie d'innovation ouverte tel que suggéré par Hautz et al. (2017), s'inscrit dans la lignée de Lichtenthaler (2011) qui suggère que l'innovation ouverte n'est pas une mode managériale, mais davantage une tendance durable, ainsi que dans celle de Felin & Zenger (2020) qui préconisent une orientation de la stratégie d'innovation ouverte centrée sur le problème de l'entreprise et non sur son environnement dans son ensemble :

> "*Thus we argue that the commonly-used funnel or filtering metaphor of open innovation -where the firm seeks to be more and more open to the environment- is misleading and problematic. Instead, openness should be conceived of as a directed activity: an activity directed by the theories, hypotheses and problems of the firm. To use a metaphor, rather than increase the aperture, lens size, breadth and overall capacity to be open to and absorb external factors (information, ideas, products, solutions), we argue that the best outcomes from openness emerge from a more targeted search- or flashlight approach.*"

Enfin, ce travail contribue à une meilleure compréhension des liens entre innovation ouverte et cadre des capacités dynamiques (Teece, 2020). Les capacités dynamiques permettent d'approcher la collaboration asymétrique en devenir de façon processuelle, depuis l'exploration de l'environnement au sens large jusqu'à l'implémentation de la solution adoptée pour résoudre le problème d'innovation. Ce travail a permis de montrer d'une part l'intérêt d'une vision temporelle du processus d'innovation ouverte dans un contexte de collaboration asymétrique, et d'autre part

que l'organisation en quête de régénération de ses propres capacités dynamiques ne réalise pas cette transformation nécessairement seule et peut s'appuyer sur les intermédiaires de l'innovation pour mener cette transformation. Ce travail contribue ainsi à montrer qu'en s'ouvrant davantage, en développant une stratégie d'innovation ouverte, l'organisation bénéficie d'un effet positif en interne induit par des ressources externes (dans le cas présent, les intermédiaires de l'innovation) de son écosystème qui contribuent à la régénération de ses capacités dynamiques.

7.3.1.2. Contribution à la littérature en entrepreneuriat

Dans ce travail de thèse, le startuper tient une place prépondérante, le point de vue des startups étant quasi-absent de la littérature sur leur collaboration avec les grandes entreprises (Usman & Vanhaverbeke, 2017). Par ailleurs, l'objectif était de mieux comprendre l'impact des ressources des équipes sur leur capacité à collaborer avec de grandes entreprises, et *in fine* sur le succès de leurs collaborations, cette question étant absente de la littérature. Le lien entre la diversité au sein des équipes dirigeantes et leur performance a déjà fait l'objet de nombreux travaux (Abatecola & Cristofaro, 2018; Bjornali et al., 2016; Boss et al., 2018; Guo et al., 2018; Li, 2014; Vanaelst et al., 2006; West III, 2007), mais des travaux de recherche sur la capacité à collaborer étudiée dans cette thèse n'ont pas été trouvés. Ce travail contribue au champ de l'entrepreneuriat, en particulier aux connaissances sur l'influence de la complémentarité des ressources basées sur les connaissances (capital humain et social) des équipes fondatrices de startups sur leur capacité à collaborer avec de grandes entreprises. Par ailleurs, ce travail a également contribué à répondre à l'appel de Marvel et al. (2014) qui ont souligné l'importance du capital humain tout au long du processus entrepreneurial et demandé davantage de recherches sur le rôle interactif joué par le capital humain dans les relations. Ce travail apporte un complément aux travaux à Hogenhuis et al. (2016), en montrant que les startups constituées par des équipes de fondateurs disposent d'un savoir-faire en management nettement plus élevé que les fondateurs solos. Cette recherche étudiant à la fois le capital humain et social et adoptant une vision processuelle de la collaboration, elle répond également au récent appel de Clough et al. (2019) lesquels préconisent une perspective processuelle de la mobilisation des ressources entrepreneuriales, au-delà du lien direct entre ces ressources et le résultat final. Le

travail proposé dans cette thèse intègre les 2+1 phases (*Amont, Design, Processus*) de la collaboration entre startups et grandes entreprises, mettant ainsi en lumière les spécificités propres à chacune des 2+1 phases de la collaboration, sous forme de processus.

La contribution de ce travail se situe également dans le croisement quantitatif réalisé entre le capital humain et social des équipes fondatrices de startups, leur capacité à collaborer avec de grandes entreprises et la théorie de la proximité, fondé sur les enseignements du premier article (Bertin, 2019). Les différentes formes de proximité ont notamment été mesurées quantitativement, ce qui contribue également à la littérature existante relative à la capacité à collaborer, qui est davantage fondée sur des méthodes qualitatives.

7.3.1.3. Contribution à la littérature sur les écosystèmes

Cette thèse contribue à la littérature sur les écosystèmes, en particulier ceux disposant de caractéristiques favorisant l'innovation ouverte. En proposant une analogie biologique, une question émerge quant à la nécessité des nombreux types d'écosystèmes présents dans la littérature. L'écosystème au sens biologique de milieu (biotope) et communauté (biocénose) ne serait-il pas le plus adapté ? En effet, le recours à la caractérisation d'un écosystème biologique, qui est à l'origine de la notion d'écosystème utilisée dans la littérature en management, montre que les termes d'innovation, d'affaires ou d'entrepreneurial qui sont associés aux écosystèmes conduisent à une approche restreignant les perspectives de l'objet étudié. Ainsi, la littérature distingue les écosystèmes d'affaires des écosystèmes d'innovation, le premier focalisant sur la capture de valeur et le second sur la création de valeur. Or, une approche par l'écosystème biologique montre qu'une vision holistique (par opposition à réductionniste) peut permettre l'émergence de facteurs de contingence clés de diverses natures, enrichissant ainsi l'exploration de l'objet étudié. Les différentes restrictions terminologiques présentes dans la littérature sur les écosystèmes sont susceptibles d'induire la non prise en considération de certains facteurs de contingence alors que la notion simple « d'écosystème » peut, elle, inclure toute caractéristique de cet écosystème sans en exclure d'autres, et ainsi participer à une vision plus holistique du phénomène étudié. Cette thèse a certes fait mention de la terminologie d'écosystème d'innovation

ouverte, par souci de compréhension du contexte de la recherche. Mais cette question terminologique est apparue au fil de cette recherche. L'analogie biologique contribue, selon cette thèse, à la réflexion sur la notion même d'écosystème et surtout la véritable nécessité de la création et de l'utilisation d'une multitude de types d'écosystèmes. D'autant plus que, comme le souligne Scaringella & Radziwon (2018), cette diversité terminologique engendre une concurrence entre les courants de la littérature sur les différents écosystèmes, empêchant de faire progresser la littérature sur les écosystèmes dans son ensemble.

La contribution sur la notion d'écosystème inclut celle relative à la littérature sur les intermédiaires de l'innovation, lesquels font partie de la communauté (biocénose) de l'écosystème. Les résultats de la thèse confirment les travaux existants sur les rôles de broker, networker, architectes de ces intermédiaires (Agogué et al., 2013) et apportent en outre une contribution quant à ces rôles, les intermédiaires de l'innovation étant apparu comme des ressources intangibles de la grande entreprise accompagnant cette dernière dans le développement de sa capacité dynamique à créer de nouvelles collaborations avec des startups.

7.3.2. Contribution managériale

Au niveau managérial, les retombées de ce programme de recherche sont susceptibles d'intéresser les parties prenantes principales, à savoir les startups, les grandes entreprises, les incubateurs, les accélérateurs, les pôles de compétitivité, les clubs d'innovation ouverte, les consultants ainsi que les collectivités publiques qui soutiennent l'innovation, en particulier la Région Grand Est qui a financé cette thèse. La contribution managériale de cette thèse peut leur permettre de mieux appréhender les facteurs de divergence et surtout de convergence de la collaboration symbiotique entre startups et grandes entreprises, et ainsi participer à son succès, ainsi qu'à la dynamique de l'écosystème dont ils font partie.

7.3.2.1. Apport pour les startups

L'objectif originel de la thèse en termes de contribution était d'apporter des pistes de solutions aux startups rencontrant des difficultés à collaborer avec de grandes entreprises. La contribution de cette thèse pour les startups porte sur différentes

dimensions. La première concerne une connaissance structurée des points de divergence avec les grandes entreprises et des solutions de convergence possibles. Le premier article de la thèse (Bertin, 2019) a permis d'associer ces éléments en vue d'une meilleure compréhension de ce type de collaboration asymétrique à travers l'appel à la théorie de la proximité géographique et non géographique, et une vision processuelle de la collaboration en 2+1 phase (*Amont, Design, Processus*). La thèse montre l'importance de la phase *Amont* de la collaboration, et en particulier du choix déterminant de la grande entreprise avec laquelle collaborer. La veille est un moyen à privilégier avant tout engagement dans ce type de collaboration, car elle peut permettre de retenir l'entreprise *a priori* la plus adéquate, car la plus proche de la startup aux niveaux cognitif, social, organisationnel et géographique, celle qui est également la mieux préparée à ce type de collaboration, notamment via le déploiement réalisé d'une stratégie d'innovation ouverte. La phase de *Design* de la collaboration (depuis la rencontre jusqu'à l'engagement contractuel) viendra confirmer ou infirmer ce niveau de proximité. A ce titre, les questionnements associés au niveau de proximité avec la grande entreprise et proposés dans le deuxième article peuvent être une aide à la prise de décision pour les startups de s'engager (ou pas) dans une collaboration avec telle ou telle grande entreprise.

Une autre contribution de la thèse concerne la composition de la startup. Le deuxième article a montré une complémentarité élevée des équipes fondatrices de startups, ainsi qu'un lien entre cette complémentarité des compétences des équipes et la proximité avec les grandes entreprises. Cette proximité des équipes concernait les compétences associées au niveau élevé des facteurs suivants : durée de formation en entrepreneuriat, niveau de compétences technologiques, nombre d'entreprises où les fondateurs ont travaillé précédemment, nombre de connaissances dans l'entourage ayant des activités d'entrepreneur, nombre de contacts sur les réseaux sociaux, soutien d'un accélérateur. Il semble ainsi judicieux de fonder une startup en équipe afin de combiner les compétences nécessaires à sa croissance et à sa proximité avec de grandes entreprises. Hormis un niveau de compétences technologiques (*hard skills*) élevé évident, des compétences plus douces (*soft skills*) sont nécessaires pour collaborer avec une grande entreprise, notamment des qualités relationnelles, de communication, d'empathie et de patience. A contrario, une proximité plus naturelle avec les PME, l'agilité y étant plus proche de

celle des startups, a été rencontrée dans les cas étudiés. En fonction de sa situation et du degré d'urgence de commercialisation par exemple, les startups peuvent avoir intérêt à se tourner également ou dans un premier temps vers les PME avec lesquelles les relations sont plus symétriques, et donc la proximité globalement plus élevée. C'est une option intéressante pour les startups, en raison notamment de la rapidité des prises de décision des PME, en comparaison avec les prises de décision souvent lentes des grandes entreprises car généralement centralisées sur la capitale.

Cette thèse a également montré l'intérêt pour les startups de se connecter à leur écosystème local et régional, et notamment aux incubateurs et accélérateurs. En effet, les ressources des startups étant limitées, les compétences et le réseau d'experts apportés par ces dispositifs peut permettre aux startups de croître plus rapidement et également d'être plus proche des besoins des acteurs de leur écosystème (utilisateurs, clients). Ce travail de recherche a montré que les startups solos se trouvent davantage dans des incubateurs et les startups fondées par des équipes plutôt dans des accélérateurs. Cela suggère que les équipes atteindraient un stade de maturité de leur produit plus avancé que les solos. Ce résultat reste toutefois à nuancer en raison des critères de sélection des startups par les accélérateurs dont celui d'être constituée par plusieurs fondateurs peut faire partie.

7.3.2.2. Apport pour les entreprises, grandes et PME

La contribution dédiée aux entreprises s'adresse en priorité aux grandes entreprises, mais également PME, n'ayant pas encore ouvert leurs frontières et, donc, n'ayant pas encore développé de stratégie d'innovation ouverte. Les résultats de cette recherche peuvent leur permettre de percevoir les bénéfices en termes d'innovation que constitue une telle démarche à la fois pour l'entreprise et pour son écosystème local et régional. Elle pourra également leur être utile pour mieux comprendre et appréhender d'une part les obstacles inhérents à la collaboration avec des startups, et d'autre part les facteurs favorisant le succès de collaborations harmonieuses, symbiotiques avec des startups, orientées vers un bénéfice mutuel. La vision processuelle adoptée dans cette thèse permettra également de structurer et d'organiser les potentiels changements organisationnels à opérer en fonction de la phase de la collaboration concernée, ces changements pouvant s'avérer plus lourds

et plus longs pour une grande entreprise que pour une PME, en raison de sa taille qui en fait une structure plus ardue à faire évoluer. De ce point de vue, les résultats ont permis de relever une proximité cognitive plus naturelle entre les startups et les PME, leurs différences étant moindres, ce qui constitue un avantage et un gain de temps certain pour les PME dans le cadre du développement de collaborations avec des startups.

Pour les grandes entreprises ayant déjà déployé une stratégie d'innovation ouverte incluant des collaborations avec des startups, cette recherche peut constituer un complément utile, en particulier en cas de difficultés lors de la collaboration avec des startups. Cette contribution peut leur permettre de mieux comprendre les raisons sous-jacentes à certains points de divergence. Elle peut également permettre *in fine* une meilleure compréhension mutuelle entre grandes entreprises et startups, en faisant émerger leurs différences de départ et la façon dont les rapprochements nécessaires peuvent être réalisés pour les réduire afin de collaborer efficacement et innover.

Le premier constat qui est apparu dès le premier article de la thèse est la nécessité pour la grande entreprise d'anticiper sa collaboration avec des startups. Tout comme la stratégie d'innovation ouverte, à laquelle elle est liée, ce type de collaboration asymétrique ne s'improvise pas. Ainsi, la phase dénommée *Amont* de la collaboration est cruciale : cette thèse suggère aux grandes entreprises de fonder leur réflexion stratégique relative à l'innovation ouverte et à la collaboration avec des startups sur la théorie de la proximité. Cette thèse propose dans le premier article (Bertin, 2019) une grille de lecture des formes de proximité nécessaires au rapprochement entre startups et entreprises. Cette grille directement opérationnelle permet d'une part de comprendre l'importance de la proximité géographique et non géographique dans la collaboration, ainsi que d'une vision holistique de celle-ci, et de mettre en place les dispositifs organisationnels adéquats qui la favoriseront et *in fine* en augmenteront les chances de succès pour le bénéfice de chacune des deux parties prenantes. Les points majeurs de changements relevés sont en premier lieu d'ordre culturels : la diffusion d'une culture de l'innovation en interne est essentielle, de même que le déploiement d'une intelligence collective insufflée par le top management (Bertin & Schaeffer, 2020). Dans cette optique, la thèse a montré l'apport substantiel du déploiement par la grande entreprise d'une ou plusieurs

personnes compétentes en interne, d'une part pour faire le lien entre l'entreprise et l'écosystème (dont les startups), et d'autre part pour diffuser la culture de l'innovation et favoriser l'implémentation de la solution retenue au sein de l'entreprise. D'un point de vue structurel, une décentralisation des activités en régions via des antennes autonomes dans leurs prises de décision est également très favorable aux collaborations avec des startups, lesquelles ont besoin, de par leur nature qui requiert d'elles une croissance rapide, de prises de décision rapides et de proximité géographique pour interagir et avancer dans le projet commun de collaboration. D'un point de vue organisationnel, les services organisés en silos sont défavorables à la collaboration et à une vision holistique de celle-ci. De ce fait, cette thèse invite la grande entreprise à s'organiser de façon plus transversale où tout ou partie des services de l'entreprise participent au projet de collaboration avec la startup. Cela suppose également une structure hiérarchique plus plate, comportant moins de strates hiérarchiques, moins fondée sur le contrôle et davantage sur la coordination horizontale en mode agile, afin d'encourager la transversalité, le partage d'informations et de connaissances, la prise d'initiatives, la créativité et l'innovation collective et de favoriser l'implication de tous les collaborateurs. En ce sens, l'implication forte des services des ressources humaines dans le processus d'évolution vers une culture de l'innovation s'avère un facteur favorisant la mise en œuvre du changement.

Une autre contribution de la thèse en direction des entreprises envisageant de collaborer avec des startups concerne l'indispensable connexion aux intermédiaires de l'innovation de l'écosystème local et régional pour développer de nouvelles collaborations avec des startups, notamment : les incubateurs, accélérateurs, pôles de compétitivité, clubs d'innovation ouverte, et consultants spécialisés dans le management du digital. Ces acteurs externes à l'entreprise peuvent être présents depuis la compréhension du problème de l'entreprise jusqu'à l'implémentation d'une solution technologique apportée par une ou plusieurs startups. Ils accompagnent également l'entreprise dans les changements organisationnels associés à sa stratégie d'innovation ouverte, grâce notamment à leurs interactions avec les indispensables intermédiaires de l'innovation internes déployés par l'entreprise. D'autre part, l'implication des entreprises dans leur écosystème local qui les « nourrit » par le partage de leur expertise avec les parties prenantes (la

communauté de cet écosystème), telles que les startups, est favorable à la dynamique de cet écosystème. Ce cercle vertueux fondé sur la réciprocité participe à son dynamisme et à sa pérennité, dont bénéficie en retour sa communauté.

7.3.2.3. Apport pour les structures de soutien à l'innovation dans l'écosystème

Bien que la thèse ne soit pas centrée sur ces intermédiaires de l'innovation, leur importance dans le développement de collaborations symbiotiques entre startups et grandes entreprises a conduit à les inclure comme parties prenantes indispensables au développement de cette relation. Cette recherche confirme l'apport crucial à leur écosystème local et régional des incubateurs, accélérateurs, clubs d'innovation ouverte, pôles de compétitivité, consultants dans le management du digital, et collectivités publiques. Le premier article (Bertin, 2019) a montré le rôle de clé de voûte de l'intermédiaire de l'innovation dans la collaboration startup – grande entreprise, lequel permet d'augmenter leur proximité cognitive, sociale et organisationnelle, qui se sont avérées être des formes de proximité essentielles au succès de ce type de collaboration asymétrique. Le troisième article (Bertin & Schaeffer, 2020) a montré le potentiel transformationnel des intermédiaires de l'innovation sur la grande entreprise à chacune des étapes de la régénération de leurs capacités dynamiques (*Sensing, Seizing, Transforming*). Ainsi, au sein de l'écosystème dynamique exploré, les incubateurs et accélérateurs se placent davantage au service des acteurs de l'écosystème local (la communauté) dans son ensemble qu'au service des startups uniquement. Cet état d'esprit génère une grande quantité d'interactions avec un grand nombre de parties prenantes et d'experts, qui profitent à l'écosystème tout entier. Cette thèse a mis en exergue le fait que les intermédiaires de l'innovation compétents, en plus d'être des *brokers*, des *networkers* et des architectes (Agogué et al., 2013) de la collaboration, constituent des ressources expertes intangibles pour les grandes entreprises.

7.3.2.4. Apport pour les politiques d'innovation des écosystèmes locaux et régionaux

Enfin, cette thèse contribuant à une meilleure compréhension des facteurs favorisant la collaboration symbiotique entre startups et grandes entreprises, elle présente un intérêt pour les politiques de soutien à l'innovation au sein des écosystèmes locaux

et régionaux. Une originalité de la thèse réside dans la vision holistique de cette collaboration, ce qui a conduit à étudier différentes perspectives fructueuses en matière de résultats.

Tout d'abord, la collaboration entre ces acteurs asymétriques ne se suffit pas à elle-même. Elle fait partie intégrante de la communauté de l'écosystème dans lequel les acteurs évoluent. Cette communauté a la faculté, par ses actions coordonnées de façon relativement organiques (sans hiérarchie établie), de soutenir ce type de collaboration en vue de la mener au succès. Les collectivités publiques, aux côtés des intermédiaires de l'innovation, font partie intégrante de cette communauté. L'écosystème étudié dans cette thèse (Article 4) a montré que la collaboration entre les acteurs de cette communauté autour d'un objectif commun de développer l'entrepreneuriat et l'innovation au sein de l'écosystème est essentielle. Aussi, la communication et la proximité géographique et non géographique entre ces parties prenantes est également cruciale.

Cette thèse préconise tout d'abord une collaboration collégiale entre l'ensemble des parties prenantes de la communauté de l'écosystème visant à développer l'innovation (acteurs politiques locaux et régionaux, incubateurs, accélérateurs, pôles de compétitivité, experts dans le management du digital, ainsi que des représentants de startups et d'entreprises). Définir les objectifs communs visant à favoriser l'innovation et l'entrepreneuriat pour un écosystème donné, avec ses facteurs de contingence, sa réalité propre, serait le premier point. L'investissement dans les dispositifs permettant la dynamique des collaborations pour innover serait le second. Un soutien régional aux startups dans le cadre de leurs projets de collaboration avec des entreprises, grandes ou PME, serait pertinent, en particulier lors de la phase *Amont* et de la phase *Design* de la collaboration qui nécessitent temps et ressources, ce dont les startups manquent par nature. Cette recherche a par exemple montré lors de la phase *Amont* l'influence positive de formations en entrepreneuriat d'une durée conséquente. De même, des formations sur la veille, qu'ils la réalisent eux-mêmes ou la fassent réaliser, pourraient s'avérer fort utiles aux startupers, si ce n'est indispensable, dans leur choix d'une grande entreprise. Bien que cette thèse ne focalisait pas sur les PME, les échanges avec les startups ont montré que la collaboration entre startups et PME s'avérait plus naturelle qu'entre startups et grandes entreprises, car plus proches par nature. L'exploration par les pouvoirs

publics d'actions de subventionnement en faveur des collaborations startups – PME pourraient être fructueuses pour le développement rapide d'innovations au sein de l'écosystème, d'autant plus si l'on considère le fait que les PME sont les plus pourvoyeuses d'emplois en France : environ 4 millions de PME, soit 99,9 % des entreprises, 6,3 millions de salariés, 43 % de la valeur ajoutée[40].

Pour définir les différents axes ayant un impact sur les collaborations pour innover au sein d'un écosystème donné, la thèse invite les collectivités publiques à alimenter leur réflexion à l'aide de la grille de lecture relatives aux formes de proximité cognitive, sociale, organisationnelle et géographique, lesquelles ont un réel impact sur la qualité et le succès de la collaboration et présentent également l'intérêt d'une vision holistique de celle-ci.

Enfin, il semble qu'une meilleure communication et diffusion de l'information en direction de toute la communauté de l'écosystème serait un moteur pour les collaborations d'innovation. Les échanges avec un nombre substantiel de startups ont fait ressortir un souhait de centralisation au niveau local et régional de l'information relative aux acteurs et experts de l'écosystème susceptibles de les accompagner ou de les soutenir. La simple connaissance de ces ressources potentielles propre à l'écosystème local, qu'elles soient humaines, techniques, matérielles, financières, permettrait, en particulier aux startups, de gagner un temps précieux et de faire des choix parfois plus éclairés car fondés sur des informations fiables et pertinentes. Le déploiement d'une plateforme digitale interactive semblerait à ce titre très utile.

7.4. Limites, perspectives et projet de recherche futur

Cette partie présente les limites afférentes à ce travail de recherche et suggère des perspectives de recherche futures. L'ultime point de ce travail présente le programme de recherche dont le développement est envisagé à la suite de cette thèse.

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[40] https://www.economie.gouv.fr/cedef/chiffres-cles-des-pme

7.4.1. Limites et perspectives de recherches futures

Le point de départ de cette thèse était l'étude de la collaboration pour innover de la dyade startup - grande entreprise. Au fil de la recherche, d'autres parties prenantes de la communauté de l'écosystème local, essentielles au succès de cette collaboration asymétrique, sont venues s'ajouter, dont la perspective a été étudiée. Il semblerait pertinent d'élargir cette perspective par des recherches futures, c'est-à-dire d'étudier des écosystèmes locaux et de caractériser leurs facteurs de contingence. Cela permettrait de mettre en relation ces facteurs de contingence et les besoins des parties prenantes, afin d'identifier leur effet positif ou négatif sur le design et le processus des collaborations. Cela apporterait un éclairage supplémentaire tant d'un point de vue théorique que pratique, notamment au regard des prises de décision des collectivités publiques qui financent les dispositifs d'innovation de leur écosystème.

La diversité des cas étudiés dans cette thèse a permis de considérer une grande diversité de facteurs freinant ou favorisant la collaboration asymétrique. La limite associée est le manque d'étude sur la durée d'un cas précis de collaboration startup - grande entreprise. Des études longitudinales seraient intéressantes pour mettre en exergue les facteurs de contingence propres à une situation donnée. Un autre axe pertinent en termes de recherches futures serait des études longitudinales incluant des cas de collaborations ayant échoué, ce qui manque dans la littérature (Tucci et al., 2016, p. 286) :

> "*Our current open innovation [OI] research is unbalanced, in that we have many, many more examples of "success" than "failure." The failure cases are critical to defining the limits of OI, and to revealing latent conditions that may thwart the effective use of OI in certain situations. Failure cases may also sharpen our definition of OI by examining where it does not work well*."

De même, étant donné l'impact de la préparation de la grande entreprise durant la phase *Amont* sur la qualité de la collaboration, des études longitudinales pourraient être menées depuis la prise de décision d'adopter une stratégie d'innovation ouverte et de collaborer avec des startups jusqu'à la collaboration effective (phases de *Design* et *Processus*), ce qui permettrait d'affiner encore, et sur un axe temporel, les

facteurs favorisant la transformation des grandes entreprises dans cette optique de collaboration.

L'étude quantitative de cette thèse (Article 2) avait une visée exploratoire. Aussi, le nombre de startups étudiées (31) représente une limite pour généraliser les résultats. Des études quantitatives futures portant sur les variables clés ayant émergé de ce travail et engageant un échantillon substantiel de startups, permettraient de confirmer ou infirmer ces premiers résultats. Les variables à étudier seraient notamment l'influence des liens sociaux entre la startup et la grande entreprise ou encore celle de l'empathie de la startup vis-à-vis de la grande entreprise sur le succès de la collaboration. De telles recherches pourraient se concentrer sur un même cas étudié en profondeur suivant les différentes perspectives des acteurs. Enfin, il serait intéressant de poursuivre les travaux sur la nature du lien entre la durée des formations en entrepreneuriat des équipes fondatrices de startup et leur niveau de proximité avec les grandes entreprises. Là encore, des études longitudinales depuis l'idée de la naissance de la startup jusqu'à son ascension en terme de chiffre d'affaires seraient très éclairantes.

7.4.2. Projet de recherche futur

La complémentarité des ressources et compétences est le moteur-phare, la force favorisant l'émergence de la collaboration. D'une part la complémentarité des ressources entre les startups et grandes entreprises est à l'origine même de leur volonté commune de collaborer pour innover, et d'autre part la complémentarité des compétences au sein des équipes fondatrices de startups s'est révélée comme favorisant la proximité avec la grande entreprise. La seconde force relevée chez les acteurs est l'adaptabilité, notamment du côté de la grande entreprise, amenée à remettre son business model existant en question pour adopter une stratégie globale d'innovation ouverte. Enfin, la troisième force, le soutien compétent, apportée aux partenaires par la communauté (intermédiaires de l'innovation en particulier) de l'écosystème local et régional s'est avérée essentielle au développement de ces collaborations.

Les résultats de la thèse ont permis d'envisager une poursuite de ce programme de recherche. Le projet de recherche futur envisagé portera sur l'adaptation de la

communauté, au sens large (biocénose), de l'écosystème local et régional pour augmenter la capacité à collaborer des acteurs économiques en mode innovation ouverte et dans un contexte de durabilité. Le cadre développé dans la thèse sur la base de la théorie de la proximité servira de modèle pour ce nouveau projet. Le premier volet de ce programme de recherche portera tout d'abord sur l'analyse structurée de l'ensemble des facteurs de contingence d'un écosystème local influençant d'une part l'innovation ouverte (création *et* capture de la valeur) selon la perspective de la proximité cognitive, sociale, organisationnelle et géographique, et d'autre part contribuant à donner du sens à l'action collective. Ce programme s'inscrira dans le cadre de l'Agenda 2030 de l'Organisation des Nations Unies relatif aux Objectifs de Développement Durable, et en particulier dans celui de l'« ODD n°17 » dédié à la collaboration, aux « partenariats pour la réalisation des objectifs » :

> « *Le dix-septième et dernier objectif promeut des partenariats efficaces entre les gouvernements, le secteur privé et la société civile qui sont nécessaires pour la réalisation des Objectifs du développement durable (ODD) au niveau mondial, régional, national et local. Ces partenariats doivent être inclusifs, construits sur des principes et des valeurs communes, et plaçant au cœur de leur préoccupation les peuples et la planète*. »[41]

De plus,

> *« En raison de la pandémie de COVID-19, l'économie mondiale devrait connaître une forte contraction de 3 % en 2020, sa pire récession depuis la Grande dépression.*
>
> *Une coopération internationale forte est plus que jamais nécessaire pour garantir à tous les pays les moyens de se remettre de la pandémie, de reconstruire mieux et d'atteindre les objectifs de développement durable. »*[42]

Sur la base de ces éléments relatifs aux facteurs de contingence écosystémiques, le deuxième volet pourra être envisagé. Il s'agira d'explorer les liens entre les facteurs de contingence propres à l'écosystème local et régional favorisant la proximité entre les startups et les PME et leur collaboration symbiotique pour innover.

Poursuivre ce travail sur la collaboration entre startups et PME apparaît pertinent à plusieurs titres. En effet, tel qu'évoqué précédemment, les PME pourvoient l'essentiel des emplois en France. Contribuer à les soutenir dans leurs efforts d'innovation permettrait de participer d'une part à l'accélération de ses innovations et donc à leur (sur)vie, et d'autre part à l'augmentation de leur capacité à embaucher. De plus, dans le contexte pandémique actuel, il est plus que jamais nécessaire de conjuguer toutes les forces possibles en direction de l'emploi et de l'innovation. Les startups étant source d'innovation, leur association avec des PME apparaît comme très fructueuse, d'autant que ces acteurs sont relativement symétriques et donc proches d'un point de vue cognitif et organisationnel. Le problème ne résidera plus dans l'asymétrie de la relation tel que c'était le cas entre startups et grandes entreprises, mais dans le manque de ressources, notamment de temps, et dans l'adéquation rapide de leurs innovations avec les objectifs de développement durable. Ce volet s'appuiera notamment sur la littérature portant sur les stratégies d'innovation ouverte des PME (Anderson et al., 2014; Brunswicker & Ehrenmann, 2013; Brunswicker & Vanhaverbeke, 2015; Leckel et al., 2020; Lee et al., 2010; Usman et al., 2018; van de Vrande et al., 2009).

Le premier épisode de la pandémie a mis en évidence les métiers utiles, nécessaires et les autres. Cette expérience vécue par l'humanité toute entière invite à repenser davantage encore que par le passé le sens donné à l'ensemble de nos actions, en tant qu'individus et en tant qu'acteurs économiques. Cette pandémie peut être considérée positivement pour l'avenir, en dépit du drame qu'elle représente, comme un « catalyseur du changement » (Mention et al., 2020). Ce nouveau programme de recherche envisagé s'inscrit dans cette recherche de création de valeur pour le collectif, afin de participer à repenser la contribution de l'être humain à l'écosystème qui le soutient, au vivant, à la nature, dont il fait partie intégrante. Dans l'optique de cette nouvelle recherche stimulante, qui intègrera des approches multidisciplinaires, il sera fait appel à la littérature portant sur l'économie symbiotique, associée à un changement structurel majeur du mode de production actuel (García-Olivares & Solé, 2015, p. 41) :

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[41] https://www.agenda-2030.fr/odd/odd17-partenariats-pour-la-realisation-des-objectifs-56
[42] https://www.un.org/sustainabledevelopment/fr/globalpartnerships/

> "*Given the obvious structural and world-view differences between the old and the new system, this plausible and needed economic evolution should be considered as a structural change in the present mode of production, that we can call growth capitalism, in order to turn into what could be called Symbiotic Economy*."

Ce programme de recherche se situera ainsi dans la lignée des travaux de recherche réalisés en faveur d'une innovation conduite selon les objectifs de développement durable et un rapprochement de l'être humain avec son écosystème naturel, son environnement écologique (Kiron et al., 2013; Kivimaa et al., 2019; Shrivastava, 2015; Shrivastava et al., 2020; Shrivastava & Berger, 2010; Wasieleski, David M. Waddock & Shrivastava, 2020; Wasieleski & Weber, 2020) et intégrant les individus comme parties prenantes *actrices*, individuellement et collectivement, *de et pour* leur écosystème local et régional.

REFERENCES

REFERENCES

A

Aarikka-Stenroos, L., & Ritala, P. (2017). Network management in the era of ecosystems: Systematic review and management framework. *Industrial Marketing Management*, *67*, 23–36.

Abatecola, G., & Cristofaro, M. (2018). Hambrick and Mason's "Upper Echelons Theory": evolution and open avenues. *Journal of Management History*, In Press.

Agogué, M., Yström, A., & Le Masson, P. (2013). Rethinking the role of intermediaries as an architect of collective exploration and creation of knowledge in open innovation. *International Journal of Innovation Management*, *17*(2), 1–24.

Agrawal, A., Kapur, D., & McHale, J. (2008). How do spatial and social proximity influence knowledge flows? Evidence from patent data. *Journal of Urban Economics*, *64*(2), 258–269.

Albert, M., & Avenier, M.-J. (2011). Légitimation de savoirs élaborés dans une épistémologie constructiviste à partir de l'expérience de praticiens. *Recherche Qualitative*, *30*(2), 22–47.

Ambrosini, V., & Bowman, C. (2009). What are dynamic capabilities and are they a useful construct in strategic management? *International Journal of Management Reviews*, *11*(1), 29–49.

Ambrosini, V., Bowman, C., & Collier, N. (2009). Dynamic capabilities: An exploration of how firms renew their resource base. *British Journal of Management*, *20*, 9–24.

Anadon, M., & Guillemette, F. (2006). La recherche qualitative est-elle nécessairement inductive ? *Recherches Qualitatives*, *Mai*.

Anderson, R. W., Acur, N., & Corney, J. (2014). *Connecting with the Crowd - An SME Approach to Crowdsourcing and Open Innovation*. 1–7.

Auge-Dickhut, S., Koye, B., & Liebetrau, A. (2016). *Customer Value Generation in Banking - The Zurich Model of Customer-Centricity*. Springer International Publishing AG Switzerland.

B

Baden-fuller, C., & Haefliger, S. (2013). Business Models and Technological Innovation. *Long Range Planning*, *46*, 419–426.

Baptista, J., Wilson, A. D., Galliers, R. D., & Bynghall, S. (2017). Social Media and the Emergence of Reflexiveness as a New Capability for Open Strategy. *Long Range Planning*, *50*(3), 322–336.

Barlatier, P.-J., Giannopoulou, E., & Pénin, J. (2016). Les intermédiaires de l'innovation ouverte entre gestion de l'information et gestion des connaissances : le cas de la valorisation de la recherche publique. *Innovations*, *1*(49), 55–77.

Barney, J. (1991). Firm resources and sustained competitive advantage. *Journal of Management*, *17*(1), 99–120.

Baron, R. A., & Markman, G. D. (2000). Beyond social capital: How social skills can enhance entrepreneurs' success. *Academy of Management Executive*, *14*(1), 106–116.

Barratt-pugh, L., Bahn, S., & Gakere, E. (2013). Managers as change agents. Implications for human resource managers engaging with culture change. *Journal of Organizational Change Management*, *26*(4), 748–764.

Barreto, I. (2010). Dynamic Capabilities : A Review of Past Research and an Agenda for the Future. *Journal of Management*, *36*(1), 256–280.

Barrett, M., Davidson, E., Prabhu, J., & Vargo, S. (2015). Service innovation in the digital age: key contributions and future directions. *MIS Quarterly*, *39*(1), 35–154. Retrieved November 2, 2018, from

Ben Mahmoud Jouini, S., & Charue-Duboc, F. (2018). Construction of relations with distant suppliers on the cognitive and relational dimensions to co-explore discontinuous innovations. *Innovations*, *1*(55), 61–87.

Bertin, C. (2019). Proximity and organizational factors for startup - large firm collaboration in an open innovation context. *Innovations - Journal of Innovation Economics & Management*, *58*(1), 135–160.

Bertin, C., & Schaeffer, V. (2020). Organizational impact of digital open innovation in retail banks: Managing external and internal pressure. In *Managing Digital Open Innovation. Book Series "Open Innovation: Bridging Theory and Practice"* (pp. 297–322). World Scientific Publishing.

Birkinshaw, J. (2017). Reflections on open strategy. *Long Range Planning*, *50*(3), 423–426.

Bjornali, E. S., Knockaert, M., & Erikson, T. (2016). The Impact of Top Management Team Characteristics and Board Service Involvement on Team Effectiveness in High-Tech Start-Ups. *Long Range Planning*, *49*(4), 447–463.

Blanché, R. (1972). *L'épistémologie*. Presses Universitaires de France.

Blank, S., & Dorf, B. (2012). *The startup owner's manual - the Customer Development Manifesto* (K&SRanch (Ed.)).

Block, J. H., Fisch, C. O., & van Praag, M. (2017). The Schumpeterian entrepreneur: a review of the empirical evidence on the antecedents, behaviour and consequences of innovative entrepreneurship. *Industry and Innovation*, *24*(1), 61–95.

Blomqvist, K., Hurmelinna, P., & Seppänen, R. (2005). Playing the collaboration game right - Balancing trust and contracting. *Technovation*, *25*(5), 497–504.

Blomqvist, K., & Levy, J. (2006). Collaboration capability. A focal concept in knowledge creation and collaborative innovation in networks. *International Journal of Management Concepts and Philosophy*, *2*(1), 31–48.

Bogers, M., Sims, J., & West, J. (2019). What Is an Ecosystem? Incorporating 25 Years of Ecosystem Research. *Academy of Management*.

Bogers, M., & West, J. (2012). Managing Distributed Innovation: Strategic Utilization of Open and User Innovation. *Creativity and Innovation Management*, *21*(1), 61–75.

Bogers, M., Zobel, A.-K., Afuah, A., Almirall, E., Brunswicker, S., Dahlander, L., Gruber, M., Hilgers, D., Majchrzak, A., Rossi-lamastra, C., Milano, P., Hagedoorn, J., & Sims, J. (2017). The Open Innovation Research Landscape: Established Perspectives and Emerging Themes Across Different Levels of Analysis. *Industry and Innovation*, *24*(1), 8–40.

Boldrini, J. C., & Schieb-Bienfait, N. (2016). How to Initiate a Collective Exploration? Proposal of an Organizational Scheme: A Prelude to Exploration Partnerships. *Innovations*, *49*(1), 15–38.

Boschma, R. A. (2005). Proximity and innovation: A critical assessment. *Regional Studies*, *39*(1), 61–74.

Boss, V., Dahlander, L., Ihl, C., & Jayaraman, R. (2018). The Effect of Choosing Teams and Ideas on Entrepreneurial Performance: Evidence from a Field Experiment. *DRUID Academy Conference*.

Bouba-Olga, O., & Grossetti, M. (2008). Socio-économie de proximité. *Revue d'Économie Régionale & Urbaine*, *3*(Octobre), 311–328.

Bouchez, J.-P. (2020). *Innovation collaborative - La dynamique d'un nouvel écosystème prometteur*. De Boeck Sup.

Bourdeau-Lepage, L., & Huriot, J. M. (2009). Proximités et interactions : Une reformulation. *Geographie Economie Societe*, *11*(3), 233–249.

Brandenburger, A. M., & Nalebuff, B. J. (1996). *Co-opetition*. Currency Doubleday.

Brunswicker, S., & Ehrenmann, F. (2013). Managing open innovation in SMEs: A good practice example of a german software firm. *International Journal of Industrial Engineering and Management*, *4*(1), 33–41.

Brunswicker, S., & Vanhaverbeke, W. (2015). Open Innovation in Small and Medium-Sized Enterprises (SMEs): External Knowledge Sourcing Strategies and Internal Organizational Facilitators. *Journal of Small Business Management*, *53*(4), 1241–1263.

Bryman, A. (2012). *Social research methods*. Oxford University Press.

Brynjolfsson, E., & Mcafee, A. (2012). *Race Against The Machine: How The Digital Revolution Is Accelerating Innovation, Driving Productivity, and Irreversibly Transforming Employment and The Economy* (Issue January, p. 8). The MIT Center for Digital Business.

C

Charbonnier-Voirin, A. (2011). Développement et test partiel des propriétés psychométriques d'une échelle de mesure de l'agilité organisationnelle. *M@n@gement*, *14*(2), 119–156.

Cheah, S., Bellavitis, C., & Muscio, A. (2020). The impact of technology complexity on the financial performance of R&D projects: evidence from Singapore. *Journal of Technology Transfer*.

Chen, T. (1999). Critical success factors for various strategies in the banking industry. *International Journal of Bank Marketing*, *17*(2), 83–91.

Chesbrough, H. (2003). Open Innovation - The new imperative for creating and profiting from technology. In *Harvard Business School Press*.

Chesbrough, H., & Appleyard, M. M. (2007). Open Innovation and Strategy. *California Management Review*, *50*(1), 57–77.

Chesbrough, H., & Bogers, M. (2014). Explicating Open Innovation: Clarifying an Emerging Paradigm for Understanding Innovation Keywords. In *New Frontiers in Open Innovation* (pp. 1–37). Oxford University Press.

Chesbrough, H., Kim, S., & Agogino, A. (2014). Chez Panisse: Building an open innovation ecosystem. *California Management Review*, *56*(4), 144–171.

Chesbrough, H., Vanhaverbeke, W., & West, J. (2006). Open Innovation: Researching a New Paradigm. In *Oxford*. Oxford University Press.

Chevelard, I., Auther, P., & Maitre, T. (2015). *Bankruption* (Kea (Ed.)). The Transformation Alliance, Paris.

Clough, R. D., Fang, T. P., Vissa, B., & Wu, A. (2019). Turning Lead into Gold: How do Entrepreneurs Mobilize Resources to Exploit Opportunities? *Academy of Management Annals*, *13*(1).

Cohen, W. M., & Levinthal, D. A. (1990). Absorptive Capacity : A New Perspective on Learning and Innovation. *Administrative Science Quarterly*, *35*(1), 128–152.

Cohendet, P., & Llerena, P. (2010). The knowledge-based entrepreneur. The need for a relevant theory of the firm. In F. Malerba (Ed.), *Knowledge-Intensive Entrepreneurship and Innovation Systems. Evidence from Europe* (pp. 31–51). Routledge Studies in Global Competition.

Collis, D. J. (1994). Research note: How valuable are organizational capabilities? *Strategic Management Journal*, *15*(Winter), 143–152.

Colombo, M. G., & Grilli, L. (2005). Founders' human capital and the growth of new technology-based firms: A competence-based view. *Research Policy*, *34*(6), 795–816.

Corley, K. G., & Gioia, D. A. (2004). Identity Ambiguity and Change in the Wake of a Corporate Spin-off. *Administrative Science Quarterly*, *49*(2), 173–208.

D

Das, T. K., & He, I. Y. (2006). Entrepreneurial firms in search of established partners: Review and recommendations. In *International Journal of Entrepreneurial Behaviour & Research* (Vol. 12, Issue 3).

Daugherty, P. J., Richey, R. G., Roath, A. S., Min, S., Chen, H., Arndt, A. D., & Genchev, S. E. (2006). Is collaboration paying off for firms? *Business Horizons*, *49*, 61–70.

Day, G. S., & Schoemaker, P. J. H. (2004). Driving through the Fog: Managing at the Edge. *Long Range Planning*, *37*(2), 127–142.

De Silva, M., Howells, J., & Meyer, M. (2018). Innovation intermediaries and collaboration: Knowledge-based practices and internal value creation. *Research Policy*, *47*(1), 70–87.

Deville, A., Ferrier, G. D., & Leleu, H. (2014). Measuring the performance of hierarchical organizations: An application to bank efficiency at the regional and branch levels. *Management Accounting Research*, *25*(1), 30–44.

Doz, Y. L. (1987). Technology partnerships between larger and smaller firms: some critical issues. *International Studies of Management & Organization*, *XVII*(4), 31–57.

Doz, Y. L. (1996). The Evolution of Cooperation in Strategic Alliances: Initial Conditions or Learning. *Strategic Management Joumal*, *17*(17), 55–83.

Drucker, P. F. (1985). *Innovation and Entrepreneurship. Practice and principles*. HarperCollins Publishers.

Dumez, H. (2016). *Méthodologie de la recherche qualitative : les questions clés de la démarche compréhensive*.

Dyer, J. H., & Singh, H. (1998). The Relational View: Cooperative Strategy and Sources of Interorganizational Competitive Advantage. *The Academy of Management Review*, *23*(4), 660–679.

E

Edgar Morin. (1990). Science avec Conscience. In *Editions du Seuil*.

Eisenhardt, K. M. (1989). Building Theories from Case Study Research. *Academy of Management Review*, *14*(4), 532–550.

Eisenhardt, K. M., & Martin, J. A. (2000). Dynamic capabilities: What are they? *Strategic Management Joumal*, *21*, 1105–1121.

Etemad, H., Wright, R. W., & Dana, L. P. (2001). Symbiotic International Business Networks: Collaboration between Small and Large Firms. *Thunderbird International Business Review*, *43*(4), 481–499.

Expósito-Langa, M., Molina-Morales, F. X., & Capó-Vicedo, J. (2011). New product development and absorptive capacity in industrial districts: A multidimensional approach. *Regional Studies*, *45*(3), 319–331.

F

Fasnacht, D. (2009). *Open innovation in the financial services*. Springer-Verlag Berlin Heidelberg.

Felin, T., Foss, N. J., Heimeriks, K. H., & Madsen, T. L. (2012). Microfoundations of Routines and Capabilities : Individuals , Processes , and Structure. *Journal of Management Studies*, *49*(8), 1351–1374.

Felin, T., & Zenger, T. R. (2020). Open Innovation: A Theory-Based View. *Strategic Management Review*, *1*(2), 223–232.

Fichman, R. G., Dos Santos, B. L., & Zheng, Z. E. (2014). Digital innovation as a fundamental and powerful concept in the information system curriculum. *MIS*, *38*(2), 329–353.

Floyd, S. W., & Wooldridge, B. (1994). Dinosaurs or dynamos? Recognizing middle management's strategic role. *Academy of Management Perspectives*, *8*(4), 47–57.

Flyvbjerg, B. (2006). Five misunderstandings about case-study Research. *Qualitative Inquiry*, *12*(2), 219–245.

G

Gans, J. S., Hsu, D. H., & Stern, S. (2002). When Does Start-Up Innovation Spur the Gale of Creative Destruction? *The RAND Journal of Economics*, *33*(4), 571–586.

García-Olivares, A., & Solé, J. (2015). End of growth and the structural instability of capitalism-From capitalism to a Symbiotic Economy. *Futures*, *68*, 31–43.

Gartner, W. B., Shaver, K. G., Gatewood, E., & Katz, J. A. (1994). Finding the Entrepreneur in Entrepreneurship. *Entrepreneurship Theory and Practice*, *18*(3), 5–9.

Gehman, J., Glaser, V. L., Eisenhardt, K. M., Gioia, D., Langley, A., & Corley, K. G. (2018). Finding Theory-Method Fit: A Comparison of Three Qualitative Approaches to Theory Building. *Journal of Management Inquiry*, *27*(3), 284–300.

Gianiodis, P. T., Ettlie, J. E., & Urbina, J. J. (2014). Open service innovation in the global banking industry: Inside-out versus outside-in strategies. *Academy of Management Perspectives*, *28*(1), 76–91.

Gioia, D. A., & Chittipeddi, K. (1991). Sensemaking and Sensegiving in Strategic Change Initiation. *Strategic Management Joumal*, *12*(6), 433–448.

Gioia, D. A., Corley, K. G., & Hamilton, A. L. (2012). Seeking Qualitative Rigor in Inductive Research : Notes on the Gioia Methodology. *Organizational Research Methods*, *16*(1), 15–31.

Goffin, K., Åhlström, P., Bianchi, M., & Richtnér, A. (2019). Perspective: State-of-the-Art: The Quality of Case Study Research in Innovation Management. *Journal of Product Innovation Management*, *36*(5), 586–615.

Gomes, L. A. de V., Facin, A. L. F., Salerno, M. S., & Ikenami, R. K. (2018). Unpacking the innovation ecosystem construct: Evolution, gaps and trends. *Technological Forecasting and Social Change*, *136*, 30–48. Retrieved August 8, 2017, from

Gómez, I. P., Otegi Olaso, J. R., & Zabala-Iturriagagoitia, J. M. (2016). Trust builders as open Innovation intermediaries. *Innovation: Management, Policy & Practice*, *9338*(November), 1–19.

Greenwood, R., & Suddaby, R. (2006). Institutional Entrepreneurship in Mature Fields: The Big Five Accounting Firms. *Academy of Management Journal*, *49*(1), 27–48.

Gruber, M., & Macmillan, I. C. (2017). Entrepreneurial Behavior : A Reconceptualization and Extension Based on Identity Theory. *Strategic Entrepreneurship Journal*, *11*(September), 271–286.

Guba, E. G., & Lincoln, Y. S. (1994). Competing paradigms in qualitative research. In N. K. Denzin & Y. S. Lincoln (Eds.), *Handbook of qualitative research* (pp. 105–117). Sage Publications.

Gulati, R. (1998). Alliances and networks. *Strategic Management Joumal*, *19*, 293–317.

Gulati, R., Wohlgezogen, F., & Zhelyazkov, P. (2012). The Two Facets of Collaboration: Cooperation and Coordination in Strategic Alliances. *Academy of Management Annals*, *6*(1), 531–583.

Guo, B., Pang, X., & Li, W. (2018). The role of top management team diversity in shaping the performance of business model innovation: a threshold effect. *Technology Analysis and Strategic Management*, *30*(2), 241–253.

H

Haas, A. (2015). Crowding at the frontier: Boundary spanners, gatekeepers and knowledge brokers. *Journal of Knowledge Management*, *19*(5), 1029–1047.

Hägerstrand, T. (1952). The propagation of innovation waves. *Lund Studies in Human Geography*, *Serie B*(4), 3–19.

Hallée, Y., & Garneau, J. M. É. (2019). L'abduction comme mode d'inférence et méthode de recherche : de l'origine à aujourd'hui. *Recherches Qualitatives*, *38*(1), 124–140.

Hansen, T. (2015). Substitution or Overlap? The Relations between Geographical and Non-spatial Proximity Dimensions in Collaborative Innovation Projects. *Regional Studies*, *49*(10), 1672–1684.

Hargadon, A., & Sutton, R. I. (1997). Technology brokering and innovation in a product development firm. *Administrative Science Quarterly*, *42*, 718–749.

Harper, D. A. (2008). Towards a theory of entrepreneurial teams. *Journal of Business Venturing*, *23*, 613–626.

Hautz, J., Seidl, D., & Whittington, R. (2017). Open Strategy: Dimensions, Dilemmas, Dynamics. *Long Range Planning*, *50*(3), 298–309.

Heger, T., & Rohrbeck, R. (2012). Strategic foresight for collaborative exploration of new business fields. *Technological Forecasting and Social Change*, *79*(5), 819–831.

Helfat, C. E., Finkelstein, S., Mitchell, W., Peteraf, M. A., Singh, H., Teece, D. J., & Winter, S. G. (2007). *Dynamic capabilities: Understanding strategic change in organizations*. Blackwell Publishing Ltd, UK.

Helfat, C. E., & Peterhaf, M. A. (2009). Understanding dynamic capabilities: progress along a developmental path. *Strategic Organization*, *7*(1), 91–102.

Henkel, J., Rønde, T., & Wagner, M. (2015). And the winner is - Acquired. Entrepreneurship as a contest yielding radical innovations. *Research Policy*, *44*(2), 295–310.

Hill, S. A., & Birkinshaw, J. (2014). Ambidexterity and Survival in Corporate Venture Units. *Journal of Management*, *40*(7), 1899–1931.

Hogenhuis, B. N., Van Den Hende, E. A., & Hultink, E. J. (2016). When Should Large Firms Collaborate with Young Ventures? *Research-Technology Management*, *January*, 39–46.

Howells, J. (2006). Intermediation and the role of intermediaries in innovation. *Research Policy*, *35*(5), 715–728.

Huang, J., Baptista, J., & Newell, S. (2015). Communicational ambidexterity as a new capability to manage social media communication within organizations. *Journal of Strategic Information Systems*, *24*(2), 49–64.

Huber, F. (2012). On the Role and Interrelationship of Spatial , Social and Cognitive Proximity: Personal Knowledge Relationships of R & D Workers in the Cambridge Information Technology Cluster. *Regional Studies*, *46*(9), 1169–1182.

Huber, G. P., & Power, D. J. (1985). Retrospective Reports of Strategic-level Managers: Guidelines for Increasing their Accuracy. *Strategic Management Journal*, *6*(April/June), 171–180.

Huizingh, E. K. R. E. (2011). Open innovation: State of the art and future perspectives. *Technovation*, *31*(1), 2–9.

Jin, L., Kraiczy, N. D., Kellermanns, F. W., Crook, T. R., & Xi, J. (2017). Entrepreneurial team composition characteristics and new venture performance: A meta-analysis. *Entrepreneurship: Theory & Practice*, *41*(5), 743–771.

Johannessen, J.-A., & Olsen, B. (2010). The future of value creation and innovations: Aspects of a theory of value creation and innovation in a global knowledge economy. *International Journal of Information Management*, *30*(6), 502–511.

John Hagedoorn. (1993). Understanding the rationale of strategic technology partnering: interorganizational modes of cooperation and sectoral differences. *Strategic Management Joumal*, *14*(January), 371–385.

K

Keenan, M. (2003). Identifying emerging generic technologies at the national level: the UK experience. *Journal of Forecasting*, *22*(2), 129–160.

Kelly, M. J., Schaan, J.-L., & Joncas, H. (2000). Collaboration between technology entrepreneurs and large corporations: key design and management issues. *Journal of Small Business Strategy*, *11*(2), 60–76.

Kessler, E. H. (Ed.). (2013). *Encyclopedia of Management Theory* (Vol. 53, Issue 9).

King, N. (2004). Using interviews in qualitative research. In C. Cassell & G. Symon (Eds.), *Essential guide to qualitative methods in organizational research* (pp. 11–22). Sage Publications.

Kirat, T., & Lung, Y. (1999). Innovation and Proximity. Territories as loci of collective learning processes. *European Urban and Regional Studies*, *6*(1), 27–38.

Kiron, D., Kruschwitz, N., & Reeves, M. (2013). The Benefits of Sustainability-Driven Innovation. *MIT Sloan Management Review*, *54*(2), 69–73.

Kivimaa, P., Boon, W., Hyysalo, S., & Klerkx, L. (2019). Towards a typology of intermediaries in sustainability transitions: A systematic review and a research agenda. *Research Policy*, *48*(4), 1062–1075.

Kohler, T. (2016). Corporate accelerators: Building bridges between corporations and startups. *Business Horizons*, *59*(3), 347–357.

Kokshagina, O., Le Masson, P., & Bories, F. (2017). Fast-connecting search practices: On the role of open innovation intermediary to accelerate the

absorptive capacity. *Technological Forecasting and Social Change*, *120*, 232–239. Retrieved August 3, 2017, from

Kvale, S. (1983). The qualitative research interview: A phenomenological and a hermeneutical mode of understanding. *Journal of Phenomenological Psychology*, *14*, 171–196.

L

Langley, A., Smallman, C., Tsoukas, H., & Van De Ven, A. H. (2013). Process studies of change in organization and management: Unveiling temporality, activity, and flow. *Academy of Management Journal*, *56*(1), 1–13.

Lebraty, J.-F., & Lobre-Lebraty, K. (2013). *Crowdsourcing - One step beyond*. ISTE London, UK & Wiley Hoboken, USA.

Leckel, A., Veilleux, S., & Dana, L. P. (2020). Local Open Innovation: A means for public policy to increase collaboration for innovation in SMEs. *Technological Forecasting and Social Change*, *153*(October 2018).

Lee, S., Park, G., Yoon, B., & Park, J. (2010). Open innovation in SMEs-An intermediated network model. *Research Policy*, *39*(2), 290–300.

Leigh, E. G. (2010). The evolution of mutualism. *Journal of Evolutionary Biology*, *23*(12), 2507–2528.

Leonard-Barton, D. (1988). Implementation characteristics of organizational innovations. Limits and opportunities for management strategies. *Communication Research*, *15*(5), 603–631.

Leonard-Barton, D. (1992). Core capabilities and core rigidities: a paradox in managing new product development. *Strategic Management Joumal*, *13*(Summer), 111–125.

Lhuillery, S., & Pfister, E. (2009). R&D cooperation and failures in innovation projects: Empirical evidence from French CIS data. *Research Policy*, *38*(1), 45–57.

Li, C. R. (2014). Top management team diversity in fostering organizational ambidexterity: Examining TMT integration mechanisms. *Innovation: Management, Policy and Practice*, *16*(3), 303–322.

Lichtenthaler, U. (2011). Open Innovation: Past Research, Current Debates, and Future Directions. *Academy of Management Perspectives*, *25*(1), 75–93.

Lichtenthaler, U., & Lichtenthaler, E. (2009). A capability-based framework for open innovation: Complementing absorptive capacity. *Journal of Management Studies*, *46*(8), 1315–1338.

Loilier, T. (2010). Innovation et territoire. Le rôle de la proximité géographique ne doit pas être surestimé. *Revue Française de Gestion*, *1*(200), 15–35.

Loilier, T., & Tellier, A. (2001). La configuration des réseaux d'innovation: une approche par la proximité des acteurs. *Revue d'Économie Régionale & Urbaine*, *4*, 559–580.

M

Maine, E., & Garnsey, E. (2006). Commercializing generic technology: The case of advanced materials ventures. *Research Policy*, *35*(3), 375–393.

MarketLine. (2015). *Retail Savings & Investments in France* (Issue December, 0164-0916). MarketLine.

Martovoy, A., Mention, A., & Torkkeli, M. (2015). Inbound Open Innovation in Financial Services. *Journal of Technology Management & Innovation*, *10*(1), 117–132.

Marvel, M. R., Davis, J. L., & Sproul, C. R. (2014). Human Capital and Entrepreneurship Research : A Critical Review and Future Directions. *Entrepreneurship Theory & Practice*, *40*(3), 599–626.

Mention, A.-L., Pinto Ferreira, J. J., & Torkkeli, M. (2020). Coronavirus: a catalyst for change and innovation. *Journal of Innovation Management*, *8*(1), 1–5.

Miles, R. E., Snow, C. C., Fjeldstad, Øy. D., Miles, G., & Lettl, C. (2010). Designing organizations to meet 21st-century opportunities and challenges. *Organizational Dynamics*, *39*(2), 93–103.

Mina, A., Bascavusoglu-Moreau, E., & Hughes, A. (2014). Open service innovation and the firm's search for external knowledge. *Research Policy*, *43*(5), 853–866.

Minshall, T., Mortara, L., Valli, R., & Probert, D. (2010). Making asymmetric partnerships work. *Research-Technology Management*, *53*(3), 53–63.

Molina-Morales, F. X., García-Villaverde, P. M., & Parra-Requena, G. (2014). Geographical and cognitive proximity effects on innovation performance in SMEs: A way through knowledge acquisition. *International Entrepreneurship and Management Journal*, *10*, 231–251.

Moore, J. F. (1993). Predators and Prey. A new ecology of competition. *Harvard Business Review*, *71*(3), 75–86.

N

Nahapiet, J., & Ghoshal, S. (1998). Social Capital, Intellectual Capital, and the Organizational Advantage. *Academy of Management Review*, *23*(2), 242–266.

Nambisan, S. (2017). Digital Entrepreneurship: Toward a Digital Technology Perspective of Entrepreneurship. *Entrepreneurship: Theory and Practice*, *41*(6), 1029–1055.

Nambisan, S., Lyytinen, K., Majchrzak, A., & Song, M. (2017). Digital Innovation Management: Reinventing Innovation Management in a Digital World. *MIS Quarterly*, *41*(1), 223–238.

Nelson, R. R., & Winter, S. G. (1982). *An evolutionary theory of economic change*. Harvard University Press, Cambridge, Massachussets.

Nooteboom, B. (2000). Learning by Interaction: Absorptive Capacity, Cognitive Distance and Governance. *Journal of Management and Governance*, *4*, 69–92.

Nooteboom, B. (2004). *Inter-Firm Collaboration, Learning & Networks: an Integrated Approach*. Routledge.

Nooteboom, B., Van Haverbeke, W., Duysters, G., Gilsing, V., & van den Oord, A. (2007). Optimal cognitive distance and absorptive capacity. *Research Policy*, *36*(7), 1016–1034.

O

OECD. (2015). *OECD Digital Economy Outlook 2015*. OECD Publishing, Paris.

Oliveira, P., & Von Hippel, E. (2011). Users as service innovators: The case of banking services. *Research Policy*, *40*(6), 806–818.

Oliver, R. W. (1999). The Coming Biotech Age. The Business of Bio-Materials. In *McGraw-Hill, New York*.

O'Reilly, C. A., & Tushman, M. L. (2008). Ambidexterity as a dynamic capability: Resolving the innovator's dilemma. *Research in Organizational Behavior*, *28*, 185–206.

Oumlil, R., & Juiz, C. (2016). An Up-to-date Survey in Barriers to Open Innovation. *Journal of Technology Management & Innovation*, *11*(3), 137–152.

P

Pecqueur, B., & Zimmermann, J.-B. (2002). Les fondements d'une économie de proximités. In *Groupement de Recherche en Economie Quantitative d'Aix-Marseille*.

Pénin, J., Hussler, C., & Burger-Helmchen, T. (2011). New shapes and new stakes: a portrait of open innovation as a promising phenomenon. *Journal of Innovation Economics*, *7*(1), 11–29.

Peris-Ortiz, M., & Sahut, J.-M. (Eds). (2015). New Challenges in Entrepreneurship and Finance. In *Springer-Verlag*. Springer Cham Heidelberg New York Dordrecht London.

Plihon, D. (2016). La troisième révolution industrielle. In D. Plihon (Ed.), *Le nouveau capitalisme* (pp. 5–22). Paris : La Découverte.

Powell, W. W. (1998). Learning from collaboration: Knowledge and networks in the biotechnology and pharmaceutical industries. *California Management Review*, *40*(3), 228–240.

R

Raisch, S., & Birkinshaw, J. (2008). Organizational ambidexterity: Antecedents, outcomes, and moderators. *Journal of Management*, *34*(3), 375–409.

Randhawa, K., Wilden, R., & Gudergan, S. (2018). Open service innovation: The role of intermediary capabilities. *Journal of Product Innovation Management*, *35*(5), 808–838.

Rangus, K., & Slavec, A. (2017). The interplay of decentralization, employee involvement and absorptive capacity on firms' innovation and business performance. *Technological Forecasting & Social Change*, *120*, 195–203.

Ries, E. (2011). *The lean startup*. Crown Business.

Ries, E., & Euchner, J. (2013). Conversations: What Large Companies Can Learn from Start-ups: An Interview with Eric Ries. *Research-Technology Management*, *56*(4), 12–16.

Ring, P. S., & van de Ven, A. H. (1992). Structuring cooperative relationships between organizations. *Strategic Management Journal*, *13*(7), 483–498.

Rivkin, J. W. (2000). Imitation of Complex Strategies. *Management Science*, *46*(6), 824–844.

Robinson, C. V., & Simmons, J. E. L. (2018). Organising environmental scanning: Exploring information source, mode and the impact of firm size. *Long Range Planning*, *51*(4), 526–539.

Rogers, E. M. (1962). *Diffusion of Innovations*. The Free Press.

Rohrbeck, R., Hölzle, K., & Gemünden, H. G. (2009). Opening up for competitive advantage - How Deutsche Telekom creates an open innovation ecosystem. *R&D Management*, *39*(4), 420–430.

Rosa, H., & Scheuerman, W. E. (Eds.). (2009). *High-speed society. Social acceleration, power, and modernity*. The Pennsylvania State University Press.

Rothaermel, F. T. (2015). *Strategic Management* (2nd ed.). McGraw-Hill Education, New York.

S

Saebi, T., Lien, L., & Foss, N. J. (2017). What Drives Business Model Adaptation? The Impact of Opportunities, Threats and Strategic Orientation. *Long Range Planning*, *50*(5), 567–581.

Sapp, J. (1994). Evolution by Association. A History of Symbiosis. In *Oxford University Press, New York, Oxford*.

Sarasvathy, S. D. (2008). *Effectuation. Elements of entrepreneurial expertise*. Edward Elgar Publishing Ltd.

Sarasvathy, S. D. (2001). Causation and Effectuation: Toward a Theoretical Shift from Economic Inevitability to Entrepreneurial Contingency. *Academy of Management Review*, *26*(2), 243–263.

Sarrazin, J. (2017). Que doivent faire les grands groupes pour survivre aux start-ups, de manière générale, et aux « licornes », en particulier ? *Annales Des Mines-Gérer et Comprendre. ESKA*, *4*(130), 98–100.

Scaringella, L., & Radziwon, A. (2018). Innovation, entrepreneurial, knowledge, and business ecosystems: Old wine in new bottles? *Technological Forecasting & Social Change*, *136*, 59–87.

Schaeffer, V. (2015). Corporate entrepreneurship and creativity in large firms: the practice of start-up contests. *Journal of Innovation Economics & Management*, *3*(18), 25–51.

Schäfer, M., & Ternès, A. (2016). *Start-ups international : Gründergeschichten rund um den Globus*. Springer.

Schlegelmilch, B. B., Diamantopoulos, A., & Kreuz, P. (2003). Strategic innovation : the construct, its drivers and its strategic outcomes. *Journal of Strategic Marketing*, *11*(2), 117–132.

Schreyögg, G., & Kliesch-Eberl, M. (2007). How Dynamic Can Organizational Capabilities Be? Towards a Dual-Process Model of Capability Dynamization. *Strategic Management Joumal*, *28*(9), 913–933.

Schumpeter, J. A. (1934). *The Theory of Economic Development: An Inquiry into Profits, Capital, Credit, Interest, and the Business Cycle*.

Seidel, M., & Liebertrau, A. (Eds.). (2015). *Banking & Innovation 2015. Ideen und Erfolgskonzepte von Experten für die Praxis* (FOM Ed.). Springer, Wiesbaden.

Shane, S., & Venkataraman, S. (2000). The promise of entrepreneurship as a field of research. *Academy of Management Review*, *25*(1), 217–226.

Shearmur, R., Carrincazeaux, C., & Doloreux, D. (2016). *Handbook on the Geographies of Innovation*. Edward Elgar Publishing Ltd.

Shi, Z., Lee, G. M., & Whinston, A. B. (2016). Toward a better measure of business proximity: Topic modeling for industry intelligence. *MIS Quarterly*, *40*(4), 1035–1056.

Shrivastava, P. (2015). Organizational sustainability under degrowth. *Management Research Review*, *38*(6), 578–581.

Shrivastava, P., & Berger, S. (2010). Sustainability principles: A review and directions. *Organization Management Journal*, *7*(4), 246–261.

Shrivastava, P., Stafford Smith, M., O'Brien, K., & Zsolnai, L. (2020). Transforming Sustainability Science to Generate Positive Social and Environmental Change Globally. *One Earth*, *2*(4), 329–340.

Snow, C. C. (2015). Organizing in the Age of Competition, Cooperation, and Collaboration. *Journal of Leadership & Organizational Studies*, *22*(4), 433–442.

Solucom (Wavestone), & OpinionWay. (2014). *Les Français et leur banque : bouleversements en vue !*

Spender, J.-C., Corvello, V., Grimaldi, M., & Rippa, P. (2017). Startups and open innovation: a review of the literature. *European Journal of Innovation Management*, *20*(1), 4–30.

Stake, R. E. (1998). Case studies. In N. K. Denzin & Y. . Lincoln (Eds.), *Strategies of Qualitative Inquiry* (pp. 86–109). Sage Publications.

Stevenson, H. H., & Jarillo, J. C. (1990). A paradigm of entrepreneurship: Entrepreneurial management. *Strategic Management Journal*, *11*(Special issue: Corporate Entrepreneurship), 17–27.

Stewart, J., & Hyysalo, S. (2008). Intermediaries, users and social learning in technological innovation. In *International Journal of Innovation Management* (Vol. 12, Issue 3).

T

Talbot, D. (2009). L'approche par la proximité : quelques hypothèses et éléments de définition. *XVIIIème Conférence de l'AIMS*, *June*.

Tech, R. P. G. (2018). *Financing High-Tech Startups. Using Productive Signaling to Efficiently Overcome the Liability of Complexity*. Springer.

Teece, D. J. (2010). Business models, business strategy and innovation. *Long Range Planning*, *43*(2–3), 172–194.

Teece, D. J. (2009). *Dynamic capabilities and strategic management*. Oxford University Press.

Teece, D. J. (2007). Explicating dynamic capabilities: The nature and micro foundations of (sustainable) enterprise performance. *Strategic Management Joumal*, *28*(13), 1319–1350.

Teece, D. J. (2018). Business models and dynamic capabilities. *Long Range Planning*, *51*(1), 40–49.

Teece, D. J. (2020). Hand in Glove: Open Innovation and the Dynamic Capabilities Framework. *Strategic Management Review*, *1*(2), 233–253.

Teece, D. J. (2011). Achieving integration of the business school curriculum using the dynamic capabilities framework. *Journal of Management Development*, *30*(5), 499–518.

Teece, D. J. (1998). Capturing value from knowledge assets: The new economy, markets for know-how, and intangible assets. *California Management Review*, *40*(3), 55–79.

Teece, D. J., Pisano, G., & Shuen, A. (1997). Dynamic capabilities and strategic management. *Strategic Management Journal*, *18*(7), 509–533.

Torre, A., & Rallet, A. (2005). Proximity and localization. *Regional Studies*, *39*(1), 47–59.

Torre, A., & Wallet, F. (2014). Introduction: the role of proximity relations in regional and territorial development processes. In A. Torre & F. Wallet (Eds.), *Regional Development and Proximity Relations* (p. 390). Edward Elgar Publishing Ltd.

Tucci, C. L., Chesbrough, H., Piller, F., & West, J. (2016). When do firms undertake open, collaborative activities? Introduction to the special section on open innovation and open business models. *Industrial and Corporate Change*, *25*(2), 283–288.

Tushman, M. L., & O'Reilly, C. A. I. (1996). Ambidextrous organizations: Managing evolutionary and revolutionary change. *California Management Review*, *38*(4), 8–30.

Tushman, M. L., Lakhani, K. R., & Lifshitz-Assaf, H. (2012). Open Innovation and Organization Design. *Journal of Organization Design*, *1*(1), 24–27.

U

Unger, J. M., Rauch, A., Frese, M., & Rosenbusch, N. (2011). Human capital and entrepreneurial success : A meta-analytical review. *Journal of Business Venturing*, *26*(3), 341–358.

Usman, M., Roijakkers, N., Vanhaverbeke, W., & Frattini, F. (2018). A systematic review of the literature on Open Innovation in SMEs. In *Researching Open Innovation in SMEs* (pp. 3–36).

Usman, M., & Vanhaverbeke, W. (2017). How start-ups successfully organize and manage open innovation with large companies. *European Journal of Innovation Management*, *20*(1), 171–186.

V

van de Vrande, V., de Jong, J. P. J., Vanhaverbeke, W., & de Rochemont, M. (2009). Open innovation in SMEs: Trends, motives and management challenges. *Technovation*, *29*(6–7), 423–437.

Vanaelst, I., Clarysse, B., Wright, M., Lockett, A., Moray, N., & S'Jegers, R. (2006). Entrepreneurial team development in academic spinouts: An examination of team heterogeneity. *Entrepreneurship: Theory and Practice*, *30*(2), 249–271.

W

Wacheux, F. (1996). *Méthodes qualitatives et recherche en gestion* (Economica).

Wagner, P. A. (2013). *Open Innovation and Organizational Alignment - A contingency analysis of external search strategies for innovation performance* [Fakultät für Wirtschaftswissenschaften der Rheinisch-Westfälischen Technischen Hochschule Aachen].

Walrave, B., Talmar, M., Podoynitsyna, K. S., Romme, A. G. L., & Verbong, G. P. J. (2017). A multi-level perspective on innovation ecosystems for path-breaking innovation. *Technological Forecasting & Social Change*, *April*, In press.

Wasieleski, David M. Waddock, S., & Shrivastava, P. (2020). *Management and the Sustainability Paradox*. New York: Routledge.

Wasieleski, D. M., & Weber, J. (Eds.). (2020). *Sustainability (Business and Society 360)*. Emerald Publishing Limited.

Weiblen, T., & Chesbrough, H. W. (2015). Engaging with startups to enhance corporate innovation. *California Management Review*, *57*(2), 66–90.

West III, G. P. (2007). Collective cognition: When entrepreneurial teams, not individuals, make decisions. *Entrepreneurship Theory and Practice*, *31*(336), 77–102.

West, J., Salter, A., Vanhaverbeke, W., & Chesbrough, H. (2014). Open innovation: The next decade. *Research Policy*, *43*(5), 805–811.

Winter, S. G. (2003). Understanding Dynamic Capabilities. *Strategic Management Joumal*, *24*(10), 991–995.

Wood, D. J., & Gray, B. (1991). Toward a Comprehensive Theory of Collaboration. *The Journal of Applied Behavioral Science*, *27*(2), 139–162.

Wooldridge, B., & Floyd, S. W. (1990). The strategy process, middle management involvement, and organizational performance. *Strategic Management Joumal*, *11*, 231–241.

Y

Yan, J., & Yan, L. (2016). Individual entrepreneurship, collective entrepreneurship and innovation in small business : an empirical study. *International Entrepreneurship and Management Journal*, *12*, 1053–1077.

Yin, R. K. (1994). *Case study research: design and methods*. Sage Publications.

Yin, R. K. (2003). *Case study research: Design and methods (3rd ed.)*. Sage Publications.

Yin, R. K. (2013). Validity and generalization in future case study evaluations. *Evaluation*, *19*(3), 321–332.

Yoon, E., & Hughes, S. (2016). Big Companies Should Collaborate with Startups. *Harvard Business Review*, 2–4.

Z

Zahra, S. A., & Nambisan, S. (2012). Entrepreneurship and strategic thinking in business ecosystems. *Business Horizons*, *55*(3), 219–229.

APPENDICES

Appendix 1 – Estimation of the personal contribution to the articles

Articles	Authors	Field	Research design	Literature review	Methodology	Results	Discus-sion	Writing
Chapter 3, Article 1	C. BERTIN	100%	100%	100%	100%	100%	100%	100%
Chapter 4, Article 2	C. BERTIN	100%	100%	100%	100%	100%	100%	100%
Chapter 5, Article 3	C. BERTIN, V. SCHAEFFER	100%	100%	100%	100%	80%	80%	90%
Chapter 6, Article 4	C. BERTIN, V. SCHAEFFER	100%	100%	80%	100%	90%	100%	90%

Appendix 2 - Survey dedicated to startup founders (Article 2)

This questionnaire is part of a research project on the skills of the founders of startup teams and the determinants of the success of their collaborations with large firms.

The data collected will be processed anonymously. If you are interested in the results of this survey, I would be happy to provide you with them.

Thank you for your contribution to this research project!

Clarice Bertin, clarice.bertin@icn-artem.com

1_GENERALITIES

How old are the members of your startup's management team?

Founder 1 (yourself)	
Founder 2	
Founder 3	
Founder 4	
Founder 5	

What is the gender of the members of your startup's management team?

	Man	Woman
Founder 1 (yourself)	❍	❍
Founder 2	❍	❍
Founder 3	❍	❍
Founder 4	❍	❍
Founder 5	❍	❍

2_TRAINING OF THE MANAGEMENT TEAM

What is the education level of your startup's management team?

	None (Self-taught)	BEP or CAP	A-Level	Bac+2 (BTS, DUT, DEUG, etc.)	Bac+3 (Bachelor)	Bac+4 (Master Year1)	Bac+5 (Master2, MBA, etc.)	Doctorate
Founder 1 (yourself)	❍	❍	❍	❍	❍	❍	❍	❍
Founder 2	❍	❍	❍	❍	❍	❍	❍	❍
Founder 3	❍	❍	❍	❍	❍	❍	❍	❍
Founder 4	❍	❍	❍	❍	❍	❍	❍	❍
Founder 5	❍	❍	❍	❍	❍	❍	❍	❍

What fields do these degrees cover? (several possible answers)

		Engineering	Life Sciences	Management	Arts
Founder (yourself)	1	❍	❍	❍	❍
Founder 2		❍	❍	❍	❍
Founder 3		❍	❍	❍	❍
Founder 4		❍	❍	❍	❍
Founder 5		❍	❍	❍	❍

Other potential fields (concerning the entire management team)

3_TRAINING IN ENTREPRENEURSHIP

During your initial training course, did you have any specific courses on entrepreneurship?

❍ Yes ❍ No

Has another manager (or more) of your startup taken specific entrepreneurship courses during his or her training course?

❍ Yes ❍ No

If "yes", as far as you are concerned, how many hours did these courses represent?

❍ 1 to 25 hours ❍ 26 to 50 hours ❍ 50 to 100 hours ❍ 100 to 200 hours ❍ More than 200 hours ❍ Other

If 'Other' precise:

Did you take these courses before creating your startup?

❍ Yes ❍ No

During your studies, did you work on a business creation project?

❍ Yes ❍ No

If so, is this project related to your current project?

❍ Yes ❍ No

4_ACCOMPANIMENT AND SUPPORT

Have you been accompanied by third parties in your project? (several possible answers)

❑ Yes for the current project ❑ Yes for a previous project ❑ No, never

If so, in what context? (several possible answers)

Incubator ❑ Accelerator ❑ Shared workspace ❑ Business incubator ❑ Competitiveness cluster ❑ Expert in intellectual property ❑ Other ❑

If 'Other' please precise:

In which way were these third parties useful to your project (networking, expertise, access to opportunities, etc.)?

5_PROFESSIONAL BACKGROUND

How many different positions have the managers of your startup held so far?

Founder 1 (yourself)	
Founder 2	
Founder 3	
Founder 4	
Founder 5	

These positions were...

	In different firms	Within the same firm
Founder 1 (yourself)	❍	❍
Founder 2	❍	❍
Founder 3	❍	❍
Founder 4	❍	❍
Founder 5	❍	❍

In which business sector(s) have the managers of your startup worked so far?

Founder 1 (yourself)	
Founder 2	
Founder 3	
Founder 4	
Founder 5	

What position(s) have the managers of your startup held so far?

	Craftman	Merchant	Business(wo)man (10 employees or more)	Liberal profession	Corporate executive	Public service executive	Intermediate profession in firms	Intermediate profession in public service	Technician	Skilled worker
Founder 1 (yourself)	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
Founder 2	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
Founder 3	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
Founder 4	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
Founder 5	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍

In which type(s) of company have the managers of your startup worked so far?

	VSE (<10 employees)	SME (10 to 249 employees)	Mid-sized company (250 à 4999 salariés)	Large company (>5000 employees)
Founder 1 (yourself)	❍	❍	❍	❍
Founder 2	❍	❍	❍	❍
Founder 3	❍	❍	❍	❍
Founder 4	❍	❍	❍	❍
Founder 5	❍	❍	❍	❍

For how long (cumulative experience, expressed in years) have you and/or the other managers of your startup worked in one or more large companies?

	Less than 1 year	Between 1 and 2 years	Between 2 and 3 years	Between 3 and 5 years	Between 5 and 7 years	More than 7 years
Founder 1 (yourself)	❍	❍	❍	❍	❍	❍
Founder 2	❍	❍	❍	❍	❍	❍
Founder 3	❍	❍	❍	❍	❍	❍
Founder 4	❍	❍	❍	❍	❍	❍
Founder 5	❍	❍	❍	❍	❍	❍

6_EXPERIENCE AS AN ENTREPRENEUR

How many startups have you created so far?

For how long have the managers of your startup been active as entrepreneurs?

	Less than 1 year	Between 1 and 3 years	Between 3 and 5 years	Between 5 and 7 years	Between 7 and 10 years	More than 10 years
Founder 1 (yourself)	❍	❍	❍	❍	❍	❍
Founder 2	❍	❍	❍	❍	❍	❍
Founder 3	❍	❍	❍	❍	❍	❍
Founder 4	❍	❍	❍	❍	❍	❍
Founder 5	❍	❍	❍	❍	❍	❍

How often does your startup interact with other startups (at various events or more informally)?

❍ Never ❍ More than once a week ❍ More than once a month ❍ More than once a quarter ❍ More than once a year

If you are on social networks (LinkedIn, Viadeo, etc.), how many contacts do you have in total (about)?

Do you have any entrepreneurs or business leaders in your immediate surroundings? (several possible answers)

❑ Fellow classmates ❑ Friends ❑ Family ❑ Former colleagues

7_YOUR STARTUP

What is the business sector of your startup?

How many founding members does your startup have?

How many people do you employ?

When was your startup created?

Your direct customers are... (several possible answers)

❑ Businesses (BtoB) ❑ Customers (BtoC) ❑ Administrations (BtoA) ❑ Employees (BtoE)

What kind of innovation does your startup offer? (several possible answers)

- New product
- Improved product
- New service
- Improved service
- New production process
- New organisational process
- New distribution mode or channel
- Is there any specificity of your startup not mentioned above?

If yes, which one?

How did you and the other senior members of your startup meet?

What are the skills of your startup's management team? (several possible answers)

	Technology	Management	Marketing	Finance
Founder 1 (yourself)	❍	❍	❍	❍
Founder 2	❍	❍	❍	❍
Founder 3	❍	❍	❍	❍
Founder 4	❍	❍	❍	❍
Founder 5	❍	❍	❍	❍

What other expertise, if any, does your startup's management team have?

All the managers of your startup are located in the same place (office, co-working space, incubator, accelerator, etc.)

❍ Yes ❍ No

Who is involved in the decision-making process of your startup?

❑ Only one of the managers of the startup ❑ Some startup managers only ❑ All the managers of the startup together ❑ The whole team (managers and employees) ❑ Stakeholders external to the startup ❑ Other

If 'Other', please precise:

8_COLLABORATION WITH LARGE FIRMS

So far, how many collaborations with large firms have you engaged (successful or not)?

None ❍ 1 ❍ 2 ❍ 3 to 5 ❍ 6 to 10 ❍ 11 to 20 ❍ More than 20 ❍

Are you currently working with a large firm?

❍ Yes ❍ No

If so, for how long?

❍ Less than 6 months ❍ >6 to 12 months ❍ >12 to 18 months ❍ >18 to 24 months ❍ >24 to 36 months ❍ >36 months

What is the origin of the relationship between your startup and the large firm?

❑ Joint event organized ❑ Prospection by the large firm ❑ Other

❑ Networking, personal contact ❑ Prospection by your startup

If 'Other' please precise:

What is the nature of this collaboration?

Commercial agreement (customer/supplier relationship) ❍ R&D Alliance (co-development of the final solution) ❍ Patent license ❍ Buyout ❍ Other ❍

If 'Other' please precise:

Focus on the most representative (for you) of your current collaborations with a large company and indicate your level of agreement with the following statements (on a scale of 1 to 7, 1 being "strongly disagree" and 7 being "strongly agree")

	1	2	3	4	5	6	7
We carried out a watch on the large company before collaborating with it							
The needs of large firm are clearly defined							
We have drawn up a common roadmap							
We always understand each other very easily							
During the collaboration, my startup adapts to the reality of the large firm and demonstrates a certain empathy							
We have close technological knowledge							
We have complementary technological skills							
At the beginning of the collaboration, our interactions were mostly face-to-face							
We have strong, sometimes friendly social ties with one or more people in this large firm							
A person or team (from the large firm) skilled in innovation connects my startup with the players in the large firm							
My startup is relatively autonomous in carrying out the various activities related to the collaboration project with the large firm							
This large firm has an autonomous local or regional branch in its decision-making, with which my startup interacts							
This large firm is very accessible throughout the entire collaboration process							
The exchange of information and knowledge with this large firm is easy and simple							
We can easily go to this large firm, which is geographically close (in km/ travel time)							
We interact with this large firm via asynchronous online tools (such as email and/or platform)							
We interact with this large firm via synchronous online tools (such as instant messaging or web conferencing: Slack or Skype, for example)							

Would you say that this current collaboration is a success?

- ❍ Not at all
- ❍ Rather no
- ❍ It depends on
- ❍ Rather yes
- ❍ Definetely yes

Why?

If you are not currently working with a large company, could you describe the reasons?

Have you worked (or attempted to) with a large company in the past?

❍ Yes ❍ No

What was the origin of the relationship between your startup and the large firm for your first collaboration?

❑ Joint event organized ❑ Prospection by the large firm ❑ Other

❑ Networking, personal contact ❑ Prospection by your startup

If 'Other' please precise:

What was the nature of your first collaboration?

Commercial agreement (customer/supplier relationship) ❍ R&D Alliance (co-development of the final solution) ❍ Patent license ❍ Buyout ❍ Other ❍

If 'Other' please precise:

Has the large firm taken a stake in your startup?

❍ Yes ❍ No

Focus on your first collaboration with a large firm and indicate your level of agreement with the following statements (on a scale of 1 to 7, 1 being "strongly disagree" and 7 being "strongly agree")

	1	2	3	4	5	6	7
We carried out a watch on the large company before collaborating with it							
The needs of large firm were clearly defined from the start							
We had drawn up a common roadmap							
We always understood each other very easily							
During the collaboration, my startup adapted to the reality of the large firm and demonstrated a certain empathy							
We had close technological knowledge							
We had complementary technological skills							
At the beginning of the collaboration, our interactions were mostly face-to-face							
We had strong, sometimes friendly social ties with one or more people in this large firm							
A person or team (from the large firm) skilled in innovation connected my startup with the players in the large firm							
My startup was relatively autonomous in carrying out the various activities related to the collaboration project with the large firm							
This large firm had an autonomous local or regional branch in its decision-making, with which my startup interacted							
This large firm was very accessible throughout the entire collaboration process							
The exchange of information and knowledge with this large firm was easy and simple							
We could easily go to this large firm, which was geographically close (in km/ travel time)							
We interacted with this large firm via asynchronous online tools (such as email and/or platform)							
We interacted with this large firm via synchronous online tools (such as instant messaging or web conferencing: Slack or Skype, for example)							

Would you say that this first collaboration (or collaboration attempt) was a success?

❍ Not at all
❍ Rather no
❍ It depends on
❍ Rather yes
❍ Definetely yes

Why ?

9_INNOVATION PROCESS

Among the main skills usually required to carry out an innovation project, what do you think is the degree of mastery of your startup of the following elements?

	1	2	3	4	5	6	7
Creativity							
Technological know-how							
Problem-solving							
Project management							
Manufacturing							

What other skills do you consider necessary for an innovation project carried out in partnership with a large firm?

Since the creation of your startup, what do you think are the skills of your startup that have evolved the most (several possible answers, in order of preference, 1 being the skill that has evolved the most)?

- [ ] Creativity
- [ ] Project management
- [ ] Technological know-how
- [ ] Manufacturing
- [ ] Problem-solving

What lessons do you learn from your collaboration(s) with a large firm?

Comments you would like to share

Thank you very much for your valuable contribution to my research work!

If you are interested, I will make all the results of this survey available to you. To do this, please send me your email or business card.

All the best,

See you soon,Clarice Bertin, clarice.bertin@icn-artem.com

Appendix 3 - Descriptive statistics related to variables of Article 2

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation	Variance
Startup founders: Team vs Solo	31	1	2	1,71	,461	,213
Age of startup's founders (mean)	31	24,00	54,00	36,3161	8,46109	71,590
Know-how in management (nb of founders)	31	0	3	1,26	,815	,665
Know-how in marketing (nb of founders)	31	0	2	,84	,688	,473
Know-how in finance (nb of founders)	31	0	2	,68	,702	,492
Know-how in technology (nb of founders)	31	0	3	1,32	1,045	1,092
Know-how in design (nb of founders)	31	0	1	,03	,180	,032
Creativity level	31	2	7	6,00	1,265	1,600
Technological level	31	2	7	5,13	1,522	2,316
Problem-solving level	31	2	7	5,90	1,076	1,157
Distinctive Innovative Skills (mean)	31	2,00	7,00	5,6773	1,05943	1,122
Degree level (mean)	31	0	4	2,90	,700	,490
Engineering	31	0	3	1,29	1,160	1,346
Life sciences	31	0	2	,16	,523	,273
Management	31	0	3	1,10	,908	,824
Arts	31	0	2	,10	,396	,157
Number of fields known within the startup	31	1	3	1,58	,672	,452
Entrepreneurship courses (Y/N)	31	0	1	,45	,506	,256
Entrepreneurial education duration	31	0	4	,90	1,221	1,490
How many startups have you created so far?	31	1	3	1,35	,608	,370
How long have the managers of your startup been active as entrepreneurs? (mean by founder)	31	1,0	9,5	2,765	1,7345	3,008
Number of founders with professional experience in large firms	31	0	4	1,26	1,125	1,265
Duration of founders' previous professional experience with large firms (mean by founder)	31	,0	6,0	2,803	2,2858	5,225

Number of jobs held by founder(s) (mean)	31	,0	7,0	3,116	1,6002	2,561
Number of firms where founder(s) worked (combined)	31	0	9	3,71	2,224	4,946
Number of industries where founder(s) worked (combined)	31	0	6	2,45	1,588	2,523
Number of functions held by founder(s) (combined)	31	0	7	1,94	1,340	1,796
Third-parties (Y/N)	31	0	1	,90	,301	,090
Incubator	31	0	1	,55	,506	,256
Accelerator	31	0	1	,26	,445	,198
Business incubator	31	0	1	,16	,374	,140
Shared working space	31	0	1	,45	,506	,256
Competitive cluster	31	0	1	,16	,374	,140
Expert in Intellectual Property Rights	31	0	1	,26	,445	,198
Mentor	31	0	1	,10	,301	,090
Coaching after contest	31	0	1	,03	,180	,032
Networks for entrepreneurs and innovation	31	0	1	,10	,301	,090
Public authorities	31	0	1	,10	,301	,090
SATT	31	0	1	,03	,180	,032
Expert in seed capital raising or bank	31	0	1	,06	,250	,062
University	31	0	1	,06	,250	,062
Consultants	31	0	1	,06	,250	,062
Family	31	0	1	,03	,180	,032
Accountant expert	31	0	1	,06	,250	,062
Development	31	0	1	,03	,180	,032
LornTech Association	31	0	1	,03	,180	,032
Number of third-party support	31	0	7	2,55	1,748	3,056
Entrepreneur(s) among class mates	31	0	1	,45	,506	,256
Entrepreneur(s) in family	31	0	1	,61	,495	,245
Entrepreneur(s) among former colleagues	31	0	1	,35	,486	,237
Entrepreneur(s) among friends	31	0	1	,71	,461	,213
Number of close circle's categories being entrepreneurs	31	0	4	2,13	1,176	1,383
Interaction frequency with other startups (activation)	31	2	4	3,68	,599	,359
Interaction potential (stock)	31	1	7	3,16	2,002	4,006

Have you ever collaborated with a large firm (or attempted to)?	31	0	1	,81	,402	,161
Cognitive proximity (upstream watch) - first collaboration with a large firm	25	1	7	2,84	2,249	5,057
Cognitive proximity (common objectives) - first collaboration with a large firm	25	1	7	4,32	1,909	3,643
Cognitive proximity (common road map) - first collaboration with a large firm	25	1	7	3,20	1,803	3,250
Cognitive proximity (shared culture) - first collaboration with a large firm	25	3	7	4,76	1,451	2,107
Cognitive proximity (empathy) - first collaboration with a large firm	25	1	7	5,52	1,735	3,010
Cognitive proximity (close technological knowledge) - first collaboration with a large firm	25	1	7	3,88	1,900	3,610
Social proximity (informal exchanges) - first collaboration with a large firm	25	1	7	4,24	2,127	4,523
Social proximity (social ties) - first collaboration with a large firm	25	1	7	3,64	1,997	3,990
Success level of first collaboration	25	1	5	3,32	1,249	1,560
Nature of first collaboration: R&D alliance	25	0	1	,44	,507	,257
Nature of first collaboration: Business deal	25	0	1	,56	,507	,257
Cognitive and Social Proximity level to the large firm (mean)	25	2,00	6,14	4,2228	1,02478	1,050
Cognitive Proximity level to the large firm (mean)	26	2,17	6,17	4,0842	1,07433	1,154
Social Proximity level to the large firm (mean)	25	1,00	7,00	3,9400	1,72796	2,986
Personal Network as origin of first collaboration with large firm	25	0	1	,60	,500	,250
Solicitation from our startup as origin of first collaboration with large firm	25	0	1	,28	,458	,210

Joint event organized as origin of first collaboration with large firm	25	0	1	,12	,332	,110
Solicitation from the large firm as origin of first collaboration with large firm	25	0	1	,12	,332	,110
Contest as origin of first collaboration with large firm	25	0	1	,04	,200	,040
Exhibition as origin of first collaboration with large firm	25	0	1	,04	,200	,040
University network as origin of first collaboration with large firm	25	0	1	,04	,200	,040
Valid N (listwise)	25					

Clarice BERTIN

Driving factors for symbiotic collaborations between startups and large firms in open innovation ecosystems

SHORT ABSTRACT

Résumé en français

Titre : Déterminants de la collaboration symbiotique entre startups et grandes entreprises au sein des écosystèmes d'innovation ouverte

Résumé : La collaboration entre startups et grandes entreprises s'avère de plus en plus nécessaire dans le contexte actuel d'innovation ouverte, d'accélération de la demande du marché et donc de course de plus en plus rapide à l'innovation. Ces partenaires asymétriques présentent toutefois des différences notoires qui peuvent générer une distance entre eux, susceptible de mettre en péril le projet de collaboration. Au-delà de la dyade, d'autres acteurs de l'écosystème, en particulier les intermédiaires de l'innovation, participent également au projet de collaboration. L'objectif de cette thèse est de faire émerger les facteurs favorisant la collaboration symbiotique entre startups et grandes entreprises, basés sur une indépendance organisationnelle et financière des acteurs. Cette thèse vise également à montrer l'intérêt du recours à l'analogie avec la symbiose biologique entre symbiotes interagissant dans un écosystème donné. Il s'agit ainsi de mettre en exergue les facteurs d'équilibre de la relation, dans une optique gagnant-gagnant.

Partant des différences mises en lumière à travers la distance cognitive, cette recherche propose d'étudier le phénomène de la collaboration startup - grande entreprise selon une approche exploratoire et une méthode mixte, qualitative et quantitative, basée sur la méthode des cas. L'étude de 38 cas réalisée (ayant conduit à une collecte de données auprès de 53 répondants sous forme d'entretiens et de questionnaire) propose une approche temporelle, multi-perspectives et holistique, mobilisant le cadre théorique de la proximité (géographique, cognitive, sociale, organisationnelle) et celui des capacités dynamiques. Cette recherche a donné lieu à quatre articles conduisant à plusieurs contributions théoriques et managériales. En premier lieu, l'étude selon la perspective des startups a permis d'identifier les facteurs favorisant la proximité et la collaboration entre startups et grandes entreprises en fonction de quatre niveaux : intra-organisationnel de la grande entreprise, intra-organisationnel de la startup, inter-organisationnel et écosystémique. La poursuite de l'exploration a mis en lumière la complémentarité des compétences des équipes fondatrices de startups, en comparaison avec les

startupers solos, et qui est source de proximité avec les grandes entreprises. La suite de l'étude, selon la perspective des grandes entreprises, a mis en évidence l'importance d'un management fondé sur l'intelligence collective ainsi que de l'évolution du rôle des managers intermédiaires des grandes entreprises dans l'implémentation d'une stratégie d'innovation ouverte intégrant une variété d'acteurs, telles que les startups. Enfin, l'étude de la perspective des intermédiaires de l'innovation quant à leurs rôles dans le développement de la collaboration startup - grande entreprise a permis de faire émerger ces différents rôles selon trois phases de la construction de la collaboration, dont celui de constituer une ressource externe pour la grande entreprise pour la régénération de ses capacités dynamiques. Une contribution transversale est également l'identification et l'opérationnalisation des 2+1 phases de la collaboration suivant un axe chronologique : les phases *Amont*, de *Design* et de *Processus* de la collaboration.

Mots-clés : Capacité à collaborer, Théorie de la proximité, Capacités dynamiques, Asymétrie, Complémentarité, Facteurs organisationnels, Ambidextrie, Intelligence Collective, Diversité des connaissances, Capital humain, Capital social, Équipes d'entrepreneurs, Startup, Grande entreprise, Intermédiaires de l'innovation, Ecosystème, Innovation ouverte, Digitalisation.

Abstract in English

Title: Driving factors for symbiotic collaborations between startups and large firms in open innovation ecosystems

Abstract: Collaboration between startups and large firms is becoming increasingly necessary in the current context of open innovation, accelerating market demand and thus the increasingly rapid race to innovate. These asymmetrical partners, however, present significant differences that can generate a distance between them that can jeopardize the collaboration project. Beyond the dyad, other actors of the ecosystem, in particular innovation intermediaries, also participate in the collaborative project. The objective of this thesis is to bring out the factors fostering symbiotic collaboration between startups and large firms, based on an organizational and financial independence of the actors. This thesis also aims to show the interest of using the analogy with the biological symbiosis between symbionts interacting in a given ecosystem. The aim is thus to highlight the balance factors of the relationship, in a win-win perspective.

Starting from the differences brought to light through cognitive distance, this research proposes to study the phenomenon of startup - large firm collaboration according to an exploratory approach and a mixed qualitative and quantitative method, based on the case method. The study of 38 cases carried out (leading to a data collection from 53 respondents in the form of interviews and survey) proposes a time-based, multi-perspective and holistic approach, mobilizing the theoretical framework of proximity (geographical, cognitive, social, organizational) and that of dynamic capabilities. This research resulted in four articles leading to several theoretical and managerial contributions. Firstly, the study from the startup's perspective allowed to identify the

factors fostering proximity and collaboration between startups and large firms according to four levels: intra-organizational of the large firm, intra-organizational of the startup, inter-organizational and ecosystemic. Further exploration has then highlighted the complementary skills of startup founding teams, compared to solo startuppers, which is a source of proximity to large firms. The continuation of the study, from the perspective of large firms, brought to light the importance of a management based on collective intelligence as well as the evolving role of middle managers in large firms in the implementation of an open innovation strategy integrating a variety of actors, such as startups. Finally, the study of the perspective of innovation intermediaries regarding their roles in the development of startup - large firm collaboration has allowed these different roles to emerge according to three phases of the collaboration construction, including that of constituting an external resource for the large firm for the regeneration of its dynamic capabilities. A transversal contribution is also the identification and operationalization of the 2+1 phases of the collaboration along a chronological axis: the Upstream, Design and Process phases of the collaboration.

Keywords: Capability to collaborate, Theory of Proximity, Dynamic Capabilities, Asymmetry, Complementarity, Organizational Factors, Ambidexterity, Collective Intelligence, Knowledge Diversity, Human Capital, Social Capital, Entrepreneurial Teams, Startup, Large firm, Innovation Intermediaries, Ecosystem, Open Innovation, Digitalization.