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Fostering open innovation relationships between large corporations and startups. Implementation in the French ecosystem

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**STIMULER LES RELATIONS D'INNOVATION OUVERTE ENTRE
LES GRANDES ENTREPRISES ET LES STARTUPS. APPLICATION
À L'ÉCOSYSTÈME FRANÇAIS**

**FOSTERING OPEN INNOVATION RELATIONSHIPS BETWEEN
LARGE CORPORATIONS AND STARTUPS. IMPLEMENTATION
IN THE FRENCH ECOSYSTEM**

Mention : « Génie des systèmes industriels »

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le 18 décembre 2020

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à Jérôme

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Résumé en français

STIMULER LES RELATIONS D'INNOVATION OUVERTE ENTRE LES GRANDES ENTREPRISES ET LES STARTUPS. APPLICATION A L'ECOSYSTEME FRANÇAIS

« La baleine n'a rien à apprendre du plancton », voilà comment on pourrait résumer la démarche des grands groupes face aux startups au cours du 20ème siècle. Le rythme rapide de l'évolution des entreprises met à rude épreuve les stratégies typiques des grands groupes. Les grandes entreprises doivent donc chercher à adopter une approche agile, empruntée à l'approche de la startup. Plutôt que de modifier leur propre mode de fonctionnement, les grands groupes cherchent à adopter l'innovation ouverte comme moyen d'évoluer et de répondre à tout nouveau contexte commercial. En fait, les startups et les grandes entreprises ont des stratégies opposées : les startups cherchent à s'adapter au marché des produits et à connaître une croissance exponentielle, tandis que les grandes entreprises se concentrent sur l'optimisation et le développement de la rentabilité. Dans cette thèse, nous proposons une analyse des pratiques actuelles pour évaluer ce paradoxe apparent. Ainsi, notre question de recherche centrale est la suivante : Comment montrer l'adéquation entre les besoins d'une startup et le dispositif d'innovation ouverte d'une grande entreprise en proposant un cadre pour une analyse systématique et exhaustive des relations entre les grandes entreprises et les startups ?

-Quels sont les besoins des startups ? Évoluent-ils au fur et à mesure que l'entreprise en démarrage gagne en maturité ?

- Comment concevoir des outils pour une compréhension systématique et exhaustive des dispositifs d'innovation ouverte et du soutien fourni ?

- Existe-t-il une approche permettant d'identifier l'adéquation entre les besoins de l'entreprise en démarrage et le soutien apporté par les grandes entreprises ?

Nous proposons un cadre basé sur une grille de maturité pour analyser la valeur ajoutée attendue des mesures d'innovation ouverte proposées par les grandes entreprises. Nous construisons notre grille sur deux échelles :

1) sur le type d'engagement et les relations entre les grandes entreprises et les startups ;

2) sur les domaines que le développement d'une startup devrait considérer sous l'angle des nouvelles normes ISO sur la gestion de l'innovation série ISO56000.

Nous mettons en œuvre ce cadre pour l'écosystème français (entreprises du CAC 40) avec une enquête sur les startups françaises et des interviews de grandes entreprises du groupe CAC 40. Enfin, nous validons notre approche et nos conclusions avec des parties prenantes externes à notre recherche. Un des principaux résultats de cette analyse est que le succès de l'innovation ouverte n'est pas lié à l'organisation elle-même, mais au plan de gestion de l'innovation. Nous avons esquissé plusieurs aspects des interactions entre les grandes entreprises et les startups. Ces interactions vont se multiplier dans un avenir proche, conduisant à de nouveaux modes de coopération, notamment après la crise de la COVID-19.

Mots-clés : innovation ouverte, startup, grande entreprise, écosystème d'innovation, ISO 56000, norme de management de l'innovation

FOSTERING OPEN INNOVATION RELATIONSHIPS BETWEEN LARGE CORPORATIONS AND STARTUPS. IMPLEMENTATION IN THE FRENCH ECOSYSTEM

"The whale has nothing to learn from plankton", this is how one could summarize the approach of the large groups vis-a-vis startups during the 20th century... However, following the 2008 crisis, the innovation policy of large groups integrates an approach to startups.

The rapid pace of business evolution is stretching typical large corporation strategies. Hence, large corporations must seek to adopt an agile approach; borrowed from the startup approach. Rather than changing their own playbook; large groups aim to embrace open innovation as a way to evolve and meet any new business context. As a matter of fact, startups and large corporations have opposed strategies: startups are looking for product-market fit and exponential growth whereas large corporations are focused on optimization and profitability development. Yet, large corporations propose more and more open innovation plans targeting startups.

In this thesis, we propose an analysis of the current practices in the corporate world to assess this apparent paradox. Thus, our central research question is:

How to show the adequation between the needs of a startup and an open innovation plan of a large corporation by proposing a framework for a systematic and exhaustive analysis of the relationships between large corporations and startups?

- What are the startups' needs? Are they evolving as the startup becomes more mature?
- How to design tools for a systematic and exhaustive understanding of the open innovation plans and the support provided?
- Is there an approach to identify the adequation between startup's needs and large corporation supports?

We propose a maturity-grid-based framework to analyze the expected added value of open innovation measures proposed by large corporations. We build our grid on two scales:

- 1) on the type of engagement and relationships between large corporations and startups;
- 2) on the domains that the development of a startup should consider under the lens of the new ISO standards on innovation management ISO56000 series.

We implement this framework for the French ecosystem (CAC 40 companies) with French startups survey and interviews of large corporations out of CAC 40 group. Finally, we validate our approach and findings with external stakeholders to our research. We have sketched several aspects of the large companies and startups interactions. Such interactions will increase in the near future, leading to new modes of cooperation especially after COVID-19 crisis. This work could serve as a basis for their future study.

Keywords : open innovation, startup, large corporation, innovation ecosystem, ISO56000 series

INTRODUCTION

In the 20th century, corporations were concerned about increasing their market share, profit margins, return on investment, and return on net assets. They mainly focused on protecting their existing markets from other competitors with equivalent business models. As barriers to entry, whether financial, legal, or regulatory, were extremely high, they rarely feared disruption caused by newcomers [1]. Paradoxically, once these companies found themselves locked in their commercial strongholds, it became difficult for them to operate in the market by challenging these same laws or by dismantling their existing relationships with distributors. Moreover, unlike startups that could play upon the grey areas of legislation, established firms are more playing close attention to local, state, and federal laws and regulations¹ to protect their branding. Furthermore, trends such as outsourcing, agility, and flexibility had already forced large corporations to reconsider their strategies and processes, and to become network organizations. [2] show that startups have an edge over large corporations regarding agility in terms of business and organization, whereas large corporations have assets such as resources, planning, a supply chain, and distribution channels, which startups cannot afford. A mix of entrepreneurial ability and corporate capabilities, therefore, seems like a successful combination, which might be why large corporations look for innovations from startups rather than for incremental innovations.

Through incremental innovations, large corporations focus on cost or feature improvements in existing products or services. This type of innovation is typical of large corporations optimizing their business. It is different from disruptive innovations transforming existing markets or industries, or even creating new ones, as it requires a new business model but not necessarily a technological breakthrough [3]. On the other hand, in radical innovation, a technical shift is created. Thus, the challenge is purely technological. Both types of innovation are challenging for large corporations, as they could threaten the organizational routines and competencies [1].

Moreover, as a consequence of the 2008 financial crisis, the trivialization of certain products (3D printed parts, electronic...) and services (international transport, digitalization...), trade wars and other regulation changes, innovation strategy of large corporations had to shift to openness and agility [4]. Openness is represented by a set of modalities such as collaboration between the customers and a company (in B2C relationships) all types of organizations (public, private companies, research centers, NGO...), including collaboration with startups [5].

The current 2019 COVID crisis makes urgent the need for large corporations to rapidly become more efficient in the “new normal”[6], to invent new business models, leverage existing assets and competencies into new revenue, become flexible in their employment schemes, develop their capacity for teleworking, at the same time as they are reducing manpower to adapt their operational cost to the demand. Then, it is precisely the opportunity to map out the steps large corporations can take together with startups as an alternative to relying only on their internal resources.

¹ Indeed, established firms have developed/are supported by legal departments to respect the law and regulations to preserve their branding, as startups have no branding to protect, they can more easily challenge the law (Uber, Heetch and taxi regulations and labor laws, Airbnb and the Local Urban Planning...)

A crisis can sometimes be indicative of pre-existing weaknesses poorly evaluated, in particular regarding changes in the environment (legislation, geopolitical context), changes in market structure (new entrants), or business sustainability (ability to deliver). Any company then can adapt its strategy to the new demands, circumstances that will be particularly solicited. The crisis then becomes an accelerator of change.

Beyond its ability to withstand the shock, the company must be capable of imagining new solutions, rethinking the existing activities, developing a new experiment. It is the entrepreneurial capacity of the company mobilized. Currently, startups embody the entrepreneurial mindset, whereas business resilience is somehow personified by large corporations. We see more and more collaboration between, these two types of companies. Nevertheless, startups and large corporations have opposed strategies: startups are looking for product-market fit and exponential growth whereas large corporations are focused on optimization and profitability development. Then what is the interest for large corporations to target startups as a springboard for innovation?

Corporations-Startups relationships within the era of Open innovation

Before defining in depth, the relationships between a large corporation and a startup, it is mandatory to define the terms we are going to use thereafter. As we are involved in the development of Innovation management standards ISO 56000:2020 [7], taking into consideration ISO definitions for our work sounds appropriate. These definitions are developed with a group of experts coming from various horizons: academic, industry, practitioners, policymakers... We will consider them in the same way that the definitions proposed by reputed researchers in this area (for example Chesbrough in open innovation).

So, open innovation describes how companies combine internal and external streams to generate and develop new ideas. Through open innovation, organizations target an optimized path for filling their innovation pipeline. Ideas could come from any type of organization (i.e., large corporations, small companies, startups, universities, research centers, suppliers, or customers...).

We propose to define the core concept of innovation. It is defined by ISO 56000:2020 [7] published earlier this year. [7] has defined innovation as a changed entity creating or distributing value. This value has also been defined by ISO 56000:2020 [7] where value is gained from satisfying needs and expectations, with the resources used.

In other to illustrate our remarks, we propose to refer to the research of [8] who present clearly for us the evolution on how to consider innovation through the concept of internal innovation (closed innovation) to external innovation (from the open innovation to the external ecosystem) as represented by the figure 1.



Figure 1 « Innovation moving out of the lab » [8]

Figure 1 proposes a presentation of the evolution of the innovation from the closed innovation developed between the walls of a laboratory to the notion of ecosystem. Since its introduction by Chesbrough in the earliest 2000, the Open Innovation approach has been employed as one of the most attractive topics in the last decades corresponding to the knowledge-based economy [9]. Chesbrough proposed different definitions of open innovation taking into consideration, the knowledge, the information, and the competencies in the stream established between the stakeholders of open innovation relationships. To fix this concept ISO 56000:2020 [7] proposed a definition of open innovation as a “*process for the management of information and knowledge sharing and flows across the boundaries of the organization with regard to innovation.*”

At its core, Open Innovation is based on an innovation ecosystem gathering different stakeholders (academics, large corporations, private or public incubators, corporate ventures, SMEs, startups...).

Innovation ecosystem

As introduced above innovation is the outcome of many interactions between multiple stakeholders. The term “Ecosystems” is systematically referred to when certain characteristics are identified: several interdependent actors from different fields of activity sharing a “common” strategic vision around a leader who succeeds in imposing his technology.

When we mention innovation ecosystems, we obvious the metaphor on the field of biology. The term ecosystem is based on the analogy with the natural world: in biology, it is synonymous with a system formed by an environment and all the species that live there. Imported into business vocabulary and applied to innovation, it generally refers to a set of actors developing innovations such as organizations, companies, startups, universities, investors, resource persons. In business as in nature, no species can survive without adaptation, i.e., innovation. If resources are abundant and the environment does not exert strong selection pressure, species can remain unchanged for long periods. Innovative mutations may occur, but the resulting new individuals are not favored over those of the

existing species, and they disappear. The result is an inability to diversify and become more complex, which can be fatal as soon as resources declining or new competitors emerging.

In biological organisms subjected to Darwinian competition, innovation occurs through the complex pathways of random mutation affecting specific parts of the reproductive genome. In rare cases, forms of organisms appear that are better adapted than parents to new environmental conditions. These new organisms, if they can form new lines, then by definition have different characteristics from those of their predecessors. We could say that these are innovations, in the sense that they are new species that did not exist before. But these innovations are not of interest in themselves, they are only of interest if they promote the survival and competitive success of the beneficiary species.

If we consider social organisms as biological organisms struggling for survival, we see that in the same way innovation is essential for them to adapt to changing environments and the emergence of competitors, so it is a question of encouraging innovation to help organizations evolve. But successful innovation cannot be ordered in advance. It is, therefore, necessary to admit the use of as many innovative processes as possible, in the hope that from this set will emerge as many changes as possible that will benefit the survival of the organism. The aim will, therefore, be to create a permanent climate for evaluating and criticizing existing processes to identify innovations that will make the entire organization and, more generally, the territory in which it operates more effectively. The term ecosystem will mean that innovation, concerns all actors in this system. Similarly, in tropical forests, different species mutate spontaneously at an accelerated rate given the richness and variations of the environment.

So, the concept of ecosystem designates a dynamic set of actors who interact with each other. Its mission is to "drive, encourage and support the complex process of innovation" [10]. [11] showed that the development of all types of innovations is not solely dependent on involvement and collaboration between different external actors. It is also dependent on the level of differences between the organizations (size, activity domain, business model...). [12] proposed a disruptive approach of Ecosystems 4.0, which is based on more integrated collaboration based on co-creation (with virtual or real prototyping), in a fast-paced environment where the stakeholders live up to the value of Trust.

The ecosystems can be considered from a geographical point of view or a business area point of view. It will depend on the boundaries of the considered ecosystem. What matters is the type of relationships and their impact on the whole ecosystem.

An ISO standard is also defining the concept of the innovation ecosystem, in ISO 37106:2018 [13] as a *complex system of interdependent components from the public and private sectors that work together to enable innovation within a city or community*.

This definition refers to city or community because it has been developed by the Technical Committee ISO/TC 268, Sustainable cities and communities addressing the development of standards related to the achievement of sustainable development considering smartness and resilience, to help all Cities and Communities. So, they target the local ecosystem of innovation, are there any types of ecosystems. We propose a deep dive into this concept.

We propose to focus on a specific type of relationship in the innovation ecosystem: large corporations/startups relationships.

Large corporations looking for any type of innovation can deploy an open innovation strategy within an innovation ecosystem to rejuvenate, stimulate their business [14]. For example, one way to stimulate this entrepreneurial environment within large corporations can be achieved through incubation. [15] showed that incubation of organizations by corporate incubators can compensate for weak internal innovation climate: close relationships with startups impact corporate employees' mindsets in creating an innovation climate and innovative behavior, introducing new ways in which corporations can improve their innovativeness. Also, at a national scale, as stated by [16], public and governmental institutions have a growing interest to support startups to further develop the ecosystem of innovation. As a consequence, there are more and more open innovation measures targeting startups to meet the needs of large corporations for providing to them agility, flexibility, and innovation, whereas looking for support and opportunities supporting their development.

Startups have a pivot role in Open Innovation: they establish bridges between two types of organizations, such as academics and business [17], or finance and innovation [18]. Although startups could be considered as a catalyst to ignite innovation, under the classical startup model the deployment of new innovative approaches might be slowed down by the limited access to financial and human resources [18]. Existing research indicates that forming relationships with external partners is a necessity for the success of startups [19], [20], in particular, to overcome the uncertainties of newness and the scarce resources [21]. As mentioned by a report made by the Research French Agency (ANRT) [22] it is important to identify a systematic approach in the startup/large corporation relationship.

This leads us to the issue: how can we define the initiatives done by large corporations to work with startups in an open innovation context? How do we measure the engagement of large corporations as a springboard for innovation by startups?

Measuring the engagement with open innovation may focus on the maturity of the organization [23], on the open innovation practices in business activities [24], on the quality of the relationships themselves, with the cultural dimensions [25]. Nevertheless, as stated by [26], we have to consider the polymorphism of open innovation relationships, and also the transactional costs of collaborations [27], which can be high, especially if both companies are not at the same level in terms of qualified personnel, available capital, and equipment. The cost of the opening is not yet well defined and further studies are needed to understand all the mechanisms [28], [29]. [30] shows that there is a strong relationship between the degree of support and performance. We understand that open innovation is often studied from a macro level and rarely from an operational level to assess the impacts and maturity of the different open innovation measures. The few papers are focusing on the operational aspects of open innovation; [31] identifies the organizational factors favoring collaboration but does not cover the other aspects of innovation management.

The innovation ecosystem exists and includes startups and large corporations. If the relationships between large corporations and startups are boosted with a systematic and operational approach, then it may improve the value creation of the global innovation

ecosystem. Consequently, in our research, we propose to define a systematic open innovation approach to the relationships of large corporations and startups. The approach is detailed in the articulated table of content in this introductory paragraph.

Innovation is mandatory for societal and business sustainability (French use case).

Large corporations are key players in business, as they are managing the main economical streams and have optimized their business processes and have, generally established strong relationships with institutions. For a startup, connected with a large corporation first brings credibility and visibility, but can also provide marketing and communication support, or even the possibility of accessing customers and business partners. Large companies are becoming more and more aware of the need to change their processes and modes of innovation and to adopt new organizational models.

According to a report called *L'observatoire des startups, françaises* in April 2017 from Ernst and Young and French Tech mission of French minister of the economy [32], the number of created startups increased by 30% between 2012 and 2015 in France, versus 3% for French companies in general. The startups represent a mutation of the business. The explosion of innovations driven by startups to the evolution of living species. New companies can innovate in highly uncertain contexts, to make radical changes in their organizations in this "new" information age. And then the ecosystem is the soil, to accompany these mutations. In particular, the biodiversity of the actors and the quality of their relationship become essential for the sustainability of the adaptations.

The quality of the innovation ecosystem is characterized first and foremost by the people, their skills and talents to do what has never been done before, but also by its diversity (connectors, disruptors, facilitators, archivists, critics...), its density, its ability to concentrate wealth, to create relevant meetings, to capitalize on feedback and to accelerate. Thus, a fertile innovation ecosystem allows large corporations to meet the right startups to interact with the relevant resources in organizations, mentors to follow the right project, and entrepreneurs to be in contact with users in particular through the large corporations quickly to design and test their Minimal Viable Product.

Innovations shape the world's major changes and progressive innovations continuously fuel economic change. From a macroeconomic perspective, innovation is recognized as the dominant factor in countries' economic growth and trade specialization [33]. In particular, it is considered essential for the sustainability of the Western industry [34]. Current events regularly show us the efforts made at the economic and political levels to promote innovation. This is evidenced, for example in France, on February 2015, with the adoption of an amendment introducing the Principle of Innovation into French legislation, following the governmental report of the Innovation 2030 Commission [35], the hearings of the Parliamentary Office for the Evaluation of Scientific and Technological Choices [36] or the Beylat & Tambourin report [37].

Innovation has positive impacts on companies implementing it. Innovative companies have significantly better economic performance than non-innovative companies [38]. Performance gaps between these two types of companies are highest when innovation is

both product and process-oriented: the market share growth of innovative companies is 5.4 percentage points higher than the market share growth of non-innovative companies. While the differences are less pronounced for innovations dedicated only on products or processes, they are still significant (product innovations ensure a 3.4 % increase in market share).

The same advantage can be found in terms of value-added growth: "combined" innovation allows value-added growth to be 5.2 % higher for the benefit of innovative companies.

Innovation is one of the few consensual notions relating to business [34]: it is recognized as a key factor in the competitiveness of the industry, in meeting customer expectations, in creating skilled jobs, and in motivating employees. Only innovation seems to be able to reconcile social and economic approaches to growth [39].

A study published in early 2016 by Arnaud Bonzom and Serguei Netessine of INSEAD even shows that large French companies are the most involved in the world in open innovation [40]. The study analyses the top 500 companies in the Forbes Global 2000 ranking. The countries developing collaboration between startups and large corporations are in descending order: France, Germany, Switzerland, Japan, and the United Kingdom. That's the reason why we will focus on the French ecosystem to test our research.

Articulated Table of Content

To present our research, this manuscript will be structured into four parts as follows:

PART I contextualizes the practical research context, with four chapters:

PART I CHAPTER 1 defines the concept of startups based on the state of the art. It analyses the issues of relationships between large corporations and startups and the importance of these relationships in innovation dynamics of a geographic area. In this way, we want to show the motivation and rationale of this work.

PART I CHAPTER 2 focuses more particularly on the place of the startup in the open innovation strategy of a large corporation. In reviewing the strategy of the large corporations, we understand the expectations of an open innovation policy and the interest of large corporations to target startups in their open innovation policy.

PART I CHAPTER 3 allows us to deepen this notion of innovation ecosystem by looking at the French ecosystem, namely the support of public authorities and the weight of the CAC 40 in the open innovation approach. This chapter justifies the interest in using the French ecosystem.

CHAPTER 4 details the four core concepts which are the pillars of the research methodology: the open innovation plans as a classification to describe the large corporations' approaches targeting startups, the startups maturity stages describing startups needs with their evolution, the open innovation domains as criteria to understand the interactions of these entities and the maturity grids as a support tool to structure our methodological approach.

CHAPTER 5 concludes this first part with an overview and directions for the research and detailing the stakes of this work, the precise de scope of the research, and our scientific research question

Part I presents the concepts of our work and justifies the interest of looking at open innovation relationships between large corporations and startups in the French ecosystem. It needs therefore a framework to analyze open innovation relationships between large corporations and startups with a systematic and exhaustive approach.

PART II sets the research methodology and its deployment in our research context.

CHAPTER 6 presents our 4-steps methodology: Define, Design, Implement, Validate. It details how we build our framework to analyze open innovation relationships.

CHAPTER 7 proposes an instantiation of this methodology in our research context: the startup the large corporations' open innovation relationships. The originality of our approach is to use the AFNOR and ISO standards on innovation management as a collection of good practices. They help us to build maturity grids to obtain our framework supporting the analysis the relationships between large corporations and startups

Part II allows us to address our research methodology and builds the framework

PART III focuses on the implementation of our framework in the context of the French context.

CHAPTER 8 implements the framework to analyze large corporation's plans through interviews of CAC 40 heads of open innovation and we propose a deep dive in each open innovation plan based on what we captured during the interviews.

CHAPTER 9 implements the framework grid for startups through interviews of startups with a questionnaire sent to online communities of startups. Unfortunately, because of the COVID-19 crisis in 2020, we have not been able to capture enough data to get all the expected conclusions.

Part III provides an implementation of our framework within the French ecosystem and presents the results of this implementations

PART IV seeks to validate our tools and proposes new avenues for research.

PART IVCHAPTER 10 presents how to validate the tools in presenting our tools to representatives of companies (a French public limited company for mailing service and the other is a large German group), we collected their feedback on the relevancy of our approach and results as well as propositions to pursue this research axis

PART IVCHAPTER 11 analyses all of our results and their robustness.

PART V concludes our work in presenting the results of our research and discuss the avenues for future research in this area.

PART I STATE OF THE ART

« If you want to be the barnacle that sticks, you need to know your whales. »
Ezra Roizen

CHAPTER 1 The Current understanding of the startup concept

The first part of this chapter will be dedicated to defining startup concepts and defining the stages of startup evolution. Then we will see to which extent startups and large corporations are different, even opposed, and how their interactions are not obvious.

1.1 Discussion on the startup understanding

1.1.1 The first occurrence of the term

The word "startup" is not a new trendy meaning to just say "young startup company" or "technology company". On the one hand, we have a structure where one of the challenges is to have efficient processes, allowing us to deliver the best possible service with optimal operation. On the other hand, we have a structure that explores, experiments, to capture what has value for the customer, how to deliver this value to him, and how to earn money while doing it (this difference explains why many companies have difficulty innovating because the processes that have made them successful are obstacles to innovation).

As cited in the 1989 Oxford English Dictionary the entry "startup", taken in the business sense, is first recorded in 1976 Forbes 15 Aug. 6/2 "The unfashionable business of investing in startups in the electronic data processing field." The term "startup company" is mentioned one year later in 1977 Business Week "An incubator for startup companies, especially in the fast-growth, high-technology fields." [41]

In 1930, Professor Frederic Terman, appointed head of the electronics department in Stanford, is frustrated to see his students crossing the country due to a lack of opportunities in the West. Professor Terman considered that Stanford University was destined to become a real incubator for electronics companies [42]. He systematically encouraged its students to create their own business in the region to benefit from the expertise and network of partner companies, rather than to join the major groups on the East Coast, which have been hit hard by the economic crisis. This intention plan seduced many of his students, starting with David Packard and William Hewlett. In 1939, pushed by Professor Terman, they created in Palo Alto the company that still bears their name today and whose flagship product is a precision audio oscillator. Other companies, such as HP, started in their founders' garage, and later became world leaders: Apple, Intel, Sun Microsystems, etc. This is how the famous "myth of American startups", those small companies that started in their garage and then became world leaders in electronics and new technologies, was built up over the years. [43]

1.1.2 Current understanding of startup concept

The concept of "startup" has been made popular by [44] who is proposing the following definition: an organization "formed to search for a repeatable and scalable business model". Steve Blank created the methodology of customer development, which in turn generated the Lean startup movement.

We are dealing with two types of structures that do not work the same way, that do not have the same dynamics or the same objectives.

Bipfrance [46] defines a startup with the following criteria:

- a young company under 8 years old
- innovative and fast-growing
- proposing new technologies or services that are out of step with the market
- financed from its own or through a fund
- with at least 25% of its turnover in R&D
- labeled or referenced by incubators.

The fundamental difference is that an established large corporation is organized to execute and optimize a successful business model, while a startup is organized to find one.

The concept of “startup” has been widespread by Blank [47]. He is proposing the following definition: an organization “formed to search for a repeatable and scalable business model”. Based on this concept, Steve Blank created the methodology of customer development [44]. Then, Eric Reis developed a lean startup methodology based on Steve Blank’s work. He proposed to define a startup as “a human institution designed to create something new under conditions of extreme uncertainty” [43]. Apart from its legal status, a startup differs in many ways from a traditional company.

Finally, Autissier [48] addressed the concept from a business history point of view. It is neither age, size nor sector of activity that makes a company a startup, but the following three conditions: 1) the prospect of strong growth, 2) the use of new technology, and 3) the need for massive financing, through fundraising.

Discussion about startups vs SME concepts

Is a startup a company like no other? What is the difference with an SME: an innovative SME or a traditional SME?

Apart from its legal status, a startup differs in many ways from a traditional company. We are dealing with two types of structures that do not work the same way, that do not have the same dynamics or the same objectives.

Here are the different characteristics of a startup:

- *Temporary*: a startup is not intended to remain so for the rest of its life. Being a startup is not an objective in itself. A startup is a particular phase, and the main objective is to get out of it. Thiel [49] shows how transforming an idea into a business, finding a new way to provide a service, creating value. Then being a startup is a state that does not last, it is a state of transition. Thiel shows that the first possibility is a failure because if the business model is not good and the expenses exceed the profits for a very long time, the startup can disappear. The second possibility is success, it can be absorbed or become a more traditional company with big profits. It is during the maturation phase that the future of the startup is decided.
- *Business Model Research*: Being a startup means bringing value to customers with a product or service that no one has ever done before. And the challenge for a startup is to find and build the right business model. A Business Model that is not based on an existing structure, and that is not necessarily obvious when the structure is launched. [50].

The Business Model is defined as the whole model, the mechanisms, which allow the company to generate revenue whereas the Business Plan is a written document

that formalizes a business project from a financial point of view. The startup evolves on a market in creation or unstable. Indeed, this type of company is in constant economic uncertainty. The startup must create strong traction. That is, it must attract a lot of users and it must be talked about, hence its presence on many social networks.

- *Industrialisable/Reproducible*: the startup is looking for a model that, once it runs (i.e., you make money and you know how you make it), can be done on a larger scale, in other places, or be done by others. The most known examples are Airbnb [51] or Uber, which are deployed city by city based on a recipe that works (although it must of course sometimes be adapted to local contexts). Although operating in an extremely difficult market, the growth of startups has strong potential. The particular business model forces startups to maintain high profitability despite an increase in expenses.
- *Scalable (for exponential growth)*: The other characteristic of a startup is its scalability. Having a model where the more customers there are, the larger the margins. The first customers are more expensive than the next ones, and so on. It is this scalability, and the fact that the model is reproducible, that allows startups to grow so fast and so far, in a short time to a more traditional company.
- *Relationship to financing/support*: Due to its particular business model, the startup has a massive financing need. As a general rule, a startup needs capital funding to develop. It is not an end in itself but a means to create a scalable product and to launch its commercialization upstream of revenue sources. Few global startups have developed without capital. In traditional non-startup models, revenues arrive more quickly with a moderate cost structure, often supported by proven salaries and production tools. This is the case for service models such as web agencies, communication agencies, or IT service companies. These companies are not startups unless a significant proportion of their growth drivers are "non-human" and more technical, especially software.

The higher the risk, the more capitalized the financing. The lower it is, the more it can be classified as traditional bank debt. Indeed, banks lend money if they consider that they will be repaid in more than 95% of cases. In this case, the risk must be very low. Yet, risk-free innovation is rare. On the other hand, the high risk of capital investment impacts the company ownership after a few years, via resale to an industrialist or investment funds or, more rarely, an initial public offering.

The startup is the status of the company at the time of its creation and in the early stages of its life. It is young and can evolve very quickly, in a more or less, structured environment. A growth hypothesis is therefore raised, i.e., that the startup has the objective of growing very quickly but may also never grow and disappear. The startup status is therefore temporary and may become an SME or even a large corporation later on. SMEs have the opportunity to grow, but this is not an end in itself. SMEs are specific by executing an already established business model. In knowing its products and/or services, its market, its suppliers, and its distributors, SMEs understand exactly the daily activities that the different departments must carry out to run their business with mastered risks. Innovation concerns most of the time the means of production (to improve competitiveness), innovation can also concern the product or the service with an ambition of diversification or performance/competitiveness.

In a startup, the product, customers, and distributors are not necessarily yet well-defined and significant changes may be made. Innovation means risk-taking, therefore, a particular company that seeks to discover its business model and they are more able to recreate a dynamism in changing the innovation ecosystem.

We summarized in the table below the main differences between startups and SMEs.

Domain	Differences	Startup	Innovating SME	Regular SME
Marketing & sales	Main Business model	Scalable Business	A traditional and scalable business model	A traditional business model
	Expected growth	Exponential	Rapid	Slow
	Revenue timing	Delayed	Immediate	Established
Finance	Funding	Capitalistic	Debt	Debt
	Financial risk	High	Average	Weak
Tech	Tech uncertainty	Low to high	Low to high	Low
Organizational	Type of organization	Temporary	Established	Established

Table 1 comparisons between startups, innovative SME and regular SME (our research)

We do not address the medium-sized companies (less than 250 employees) specifically in our work: they are too diverse in term of strategies, market approaches, financial or even organizations.

In this work, we will define a startup as an SME, with a scalable business model, with potential exponential growth looking for a business model and benefiting from external support (tangible such as incubator premises or intangible such as Intellectual property).

1.2 Differences between large corporations and startups

In the following paragraphs, we compare startups and the large corporations from organizational operational, cultural points of views to understand the gap between these two types of organizations.

1.2.1 Organizational approaches are different

The complexity and slow transformation inherent in large companies have little to do with the lean and agility of a startup, a difference that is even confirmed in terms: for example, a startup is said to pivot when it changes the model, whereas for a large corporation it is more about retargeting its strategy. The pivot is fast, flexible, and light, while retargeting is heavier and less agile.

The notion of time is different between startups and large corporations. A startup is flexible and reactive, it lives in an urgency. Within a large corporation, reactions and changes are slow because the large corporation is driven by a global strategy, approved by the shareholders [52].

It is quite common to contrast the notions of large corporations and startups: large organizations that are too heavy and slower when it comes to innovation, the latter to be faster and more creative. But both are well integrated into the same innovation ecosystem and the number of projects that bring them together has increased steadily in recent years. With the digital revolution and the exponential development of innovations that follow, large corporations have no choice: if they want to be fast, not lose track and meet this new challenge, they must collaborate with these new partners that are startups [53]. This collaboration can take different forms and allow the acculturation of both actors.

There is also a difference in decision-making ability between the employees of the two structures. A startup that wants to interact with a large corporation faces a complex organization. It must find the right entry point and the right timing. It identifies the right decision-makers whereas in a startup each employee is relatively autonomous and capable of making decisions.

Large corporations often believe that they are invincible "too big to fail". A startup knows that it is more likely to die than to succeed, it has nothing to lose. This paradigm impacts the cultures of these companies, in particular risk acceptance. [54]

1.2.2 Innovation culture differences are creating a gap

If we define the culture of a social group by all its values, intellectual references and behaviors that it shares. Corporate culture refers to behavior and values that determine how employees and their management interact and handle outside business transactions. This concept of corporate or organizational culture in businesses emerged in the 1960s [55] and became widely used in the 1990s. Corporate culture is used to describe the character of a company including belief, behaviors, company-wide value systems, and also management strategies, employee communication, and relations, work environment, and attitude.

The corporate culture gap between a large corporation and startup is first embodied at the team level. When startups recruit personalities attracted by the promise of an entrepreneurial adventure and ability to challenge the status quo; large corporations generally attract profiles looking for stability and career. This decision is not linked to professional value, but to the personality and ability to take risks.

"Startup culture" is having a way of working that stimulates innovation, strengthens team spirit, and makes companies more responsive. Schmidt [56] shows how Google is a good example of this, with its famous policy of 20% of working time devoted to a personal project. Even if we can recognize that attempt, the definition of a large corporation and its differences with a startup is clearly expressed in the article 1832 of the French Civil Code [57]: "a company may be defined as a legal act by which two or more persons agree by contract to allocate to a joint venture property (sums of money, cars, buildings) or their industry (skills...) to share the profit or benefit from the economy that may result."

Furthermore, a French large corporation is a company with its headquarter based in France. It meets at least one of the following two conditions: to have at least 5,000 employees, to have a turnover of more than 1.5 billion euros, and a balance sheet total of more than 2 billion euros.

Then, this culture impacts the decision-making processes: startups are characterized by their flexibility, with flat management and short decision-making circuits. On the other hand, large corporations, constrained by their size, spread responsibilities and cumbersome validation processes to assess the risks and limit the risk-taking, consequently, they often have difficulty deciding. And when the management of startups, initially guided by the desire to move ever faster, the communication mode of the teams of large corporations will be much more political to consider the susceptibility of employees.

Values of companies are also a core element of the culture and they are embodied by management. There is a motivation gap between startups' CEOs and large corporations' CEOs.

1.2.3 Operational Difficulties of relationships from large corporations' point of view

If this acculturation is bypassed, many operational issues can emerge during the collaboration.

Some of them have been identified in reports such as [32]. A report established by the French Tech interviewing large corporations on their relationships with startups and [58] with the barometer of open innovation from the largest federation of French employers. This study investigated four dimensions in the large corporations/startups' relationships:

Market & Sales

Business model robustness: the corollary of the startup's agility is its versatility. It can be difficult for a large corporation to understand where it is going, what its business model is, precisely because the startup is looking for itself and is by nature opportunistic. A startup has the ability and the duty to modify its business model in a few weeks if necessary.

Finance

Financial stability: a startup is considered financially fragile, which is often a reality compared to a large corporation. And the finance department (or the purchasing department) is often reluctant to work with an actor who does not have a credit rating, a profitability history, or a reassuring capitalization.

Legal/regulations

Reliability: a startup's reputation is to be unreliable in its commitments because of the two previous points. There are also cultural differences and differences in approach to business that may explain this perception. Reliability does not have quite the same definition on both sides. The large corporation would tend to favor the achievement of predefined contractual objectives, while the startup values successful collaboration and joint development more, even if there are gaps with the terms of the initial contract.

Intellectual Property Management (IPR) management: The protection afforded by the various intellectual property rights represents significant benefits for startups seeking to establish themselves in sectors and gain market share. Generally, large corporations have a strict policy regarding intellectual property rights ownership, whenever they fund a research program, they want to own the results. For example, Air

Liquide R&D director during an event in Bercy declared in 2016 [59]: "*Today, there are lots of big companies that say, I pay - even if it's almost nothing - it's mine. This attitude is just no longer possible. I know it's very easy to say and it's not easy to do, it's an internal mutation, but it's inevitable. In large corporations, we make a Lab, we innovate, it's nice, but when we get to the question of intellectual property, everything stops.*"

Organizational

Inexperience: a startup is also accused of being understaffed or lacking in previous work that can be directly exploited. This is not always the case, the best startups bringing together experts, achievers, and high potentials in the form of a dream team (small team, but with strong complementarities between its members). The profiles of this type can be founded in large corporations, but rarely with such a high density. The difficulty of the startup is to hire profiles with the same quality (technical skills, mindset, commitment...).

1.2.4 Operational Difficulties of relationships from a startup point of view

On the startup side, the difficulties of working with a large corporation are collected in reports such as [60] collecting interviews, pools of startups founders involved in open innovation approaches of large corporations. We summarize them, using the same items shown in the previous section:

Market & Sales

Conservatism: for a startup, a large corporation can only be conservative, if not "has been" by default, since entrepreneurs base their business on the idea of revolutionizing the market, or at least to make a place for themselves, and thus to push established players. The large corporation is the one that is already in the area and may not want to share its territory with the newcomer.

Finance

Black box for decision process: decision circuits are complex and take time. They are difficult for the startup to control, as it has only one contact person and cannot interact directly with the various links in the decision-making chain, particularly top management, as large corporations usually do between themselves.

Legal/regulations

Hegemonic position: whether in terms of intellectual property, contractual conditions, or labor relations, startups often lend large corporations' hegemonic temptations (rightly or wrongly). Asymmetry in size and resources can be a source of tension at all stages of collaboration.

Organizational

Complex Organization: the large corporation looks like a leviathan, a sprawling monster with many ramifications. A project involves many actors and directions whose functioning and interactions from the outside are difficult to understand.

1.2.5 Startups and large corporations in the same innovation ecosystem

As we have seen symmetry in terms of size and negotiating power is a barrier. It is therefore difficult to make contact. When the relationship is finally established, the administrative procedures and processes often seem insurmountable to startups who do not know the same organizational constraints. Nevertheless, employees of large companies and entrepreneurs have one thing in common: they are the cornerstone of their organization and enable it to succeed economically. They are the ones who are at the heart of the engine and who define, execute and implement the strategies daily. These employees must own the relevant culture to succeed.

1.3 Innovation dynamics of a geographic area

In the previous sections, we have shown a startup is a specific organization in an accelerated timing dynamic, and in dynamism in a given geographic area. In this section, we discuss how it is a booster to attract large corporations?

In today's innovation ecosystem, startups emerge for at least four reasons: the barrier cost to create a product/service has decreased; a suitable risk financing industry has emerged; the speed of dissemination of products/services by more and more educated users has decreased and the support structures for entrepreneurs have emerged during the last decades. Oliveria [61] suggests that some of the determinants factors and conditions for Open Innovation implementation are: a close relationship with universities and research Institutions; the existence of a governance system to facilitate relationships; mechanisms of relationship network and provision of public support (e.g., incentives, funding, infrastructure).

1.3.1 Example of Montpellier innovation geographic area

This dynamism benefits the local area. Let's take for example a very well know use case showing how an efficient innovation local ecosystem helped to manage different crises and maintain competencies. We propose a zoom in a city of the South of France: Montpellier, fueled by a declining farming economy (vineyards producing low-quality wines), tourisms, universities (medicine, law, and agronomy).

Opened at the end of June 1965, the IBM Montpellier site covers one of the American's three areas of intervention: Europe (excluding Eastern countries), the Middle, East, and Africa (excluding South Africa). For three decades, IBM Montpellier was the European showcase for IBM's expertise in mainframe computers. Things changed seriously in the mid-1990s. when IBM started concentrating on the manufacturing of its mainframe computers on a single site in Singapore. Business is declining in Montpellier and the company is focusing on cloud computing and employs only 1000 people in the 2000s [62].

In 1987, local officials wanted to promote existing skills. They opened the BIC, Business & Innovation Center, to promote the creation, development, and sustainability of emerging nuggets in the agglomeration to market employment on the territory. BIC was created, with the label "CEEI" (European Center for Enterprise and Innovation) by the European Union. This dynamism has made it possible to maintain digital skills in this region and thus attract other major groups such as Dell. In 1992, the American company Dell producing computer systems sought to establish itself in Southern Europe, to cope with the growth of the activity. A call for tenders was launched: Montpellier, Barcelona, Genoa, and Marseille were candidates. It is finally in the *Millénaire* district of Montpellier that the

company will set up with its 50 employees. In 2017, the company has more than 900 employees of 36 different nationalities. Dell became the first private employer in the Montpellier metropole.

Thirty years later, the Metropole boasts an effective entrepreneurial dynamism: 1360 digital companies operating in the region for 1500 jobs, but also more than 120 startups created per year, 80 million euros invested in innovative digital companies. The Business Innovation Center (Cap Alpha, Cap Omega, Cap Gamma) has become a startup production machine: 1001Pharmacies (an online pharmacy), Tellmeplus (artificial intelligence), Care Labs (Health Check), Matooma (Sim cards for connected objects), HTTPCS (cybersecurity).

While one of the city's main employers was reducing its workforce, today Montpellier has been enjoying a 30% increase in employment in the last 10 years, much higher than cities of comparable size (+18% on average over 10 years).

So, the dynamism of a local ecosystem can develop a strong network of startups. It helps to maintain the talents and the competencies in a given area and then attract major players of the industry. It is a good use case of the impact of the relationship between large corporations and startups and how the large corporations can be a springboard for the startups.

1.3.2 The concept of startups ecosystem

Innovation in an existing local ecosystem can come from different actors: the company's employees, the company's customers (via communication and feedback systems), partners and suppliers, collaboration with competitors or, innovating to adapt to the new features of its ecosystem. The dynamism is imputed to startups and not necessary to local SMEs.

The startup ecosystem gathers people, companies in their various stages, and different types of organizations in a given location interacting as a system to create new startups. We can identify different categories of organizations: universities, research organizations, funding organizations, support service organizations (such as incubators, accelerators...), service provider organizations (such as legal, coaching ...) and large corporations.

Steve Blank propose the following model for the startup ecosystem focused on a given startup [44]:

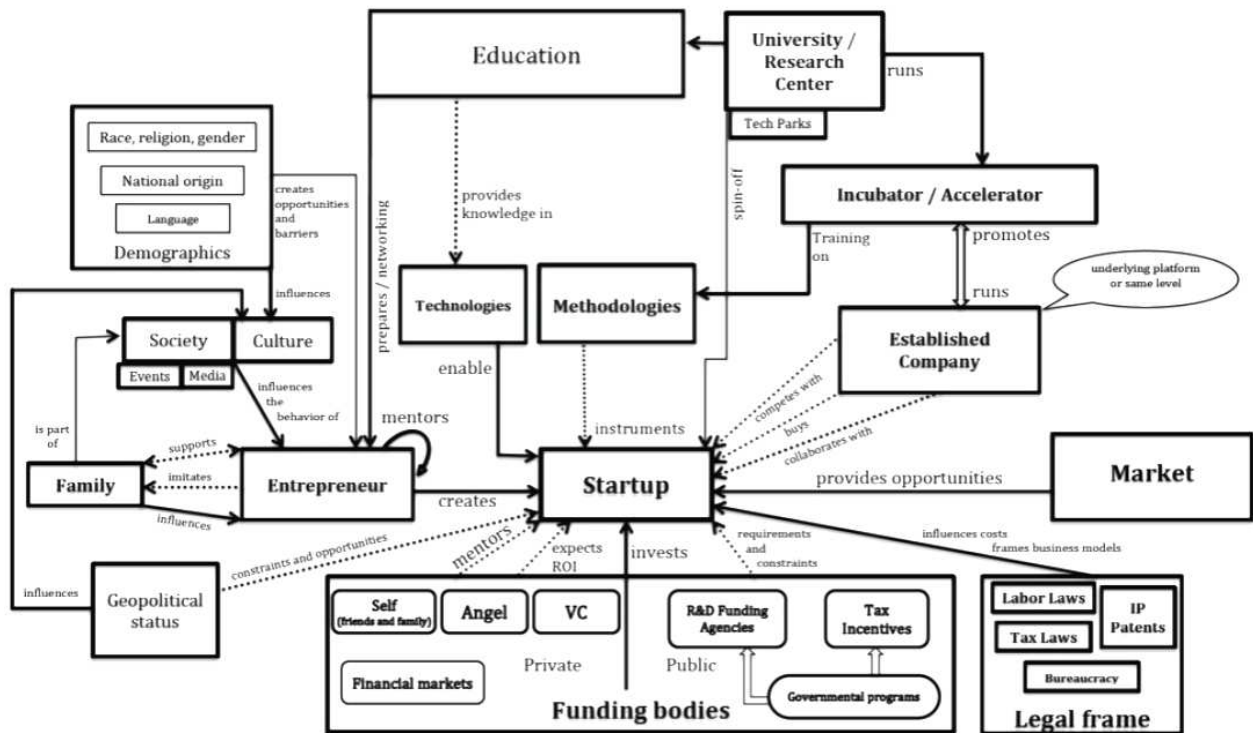


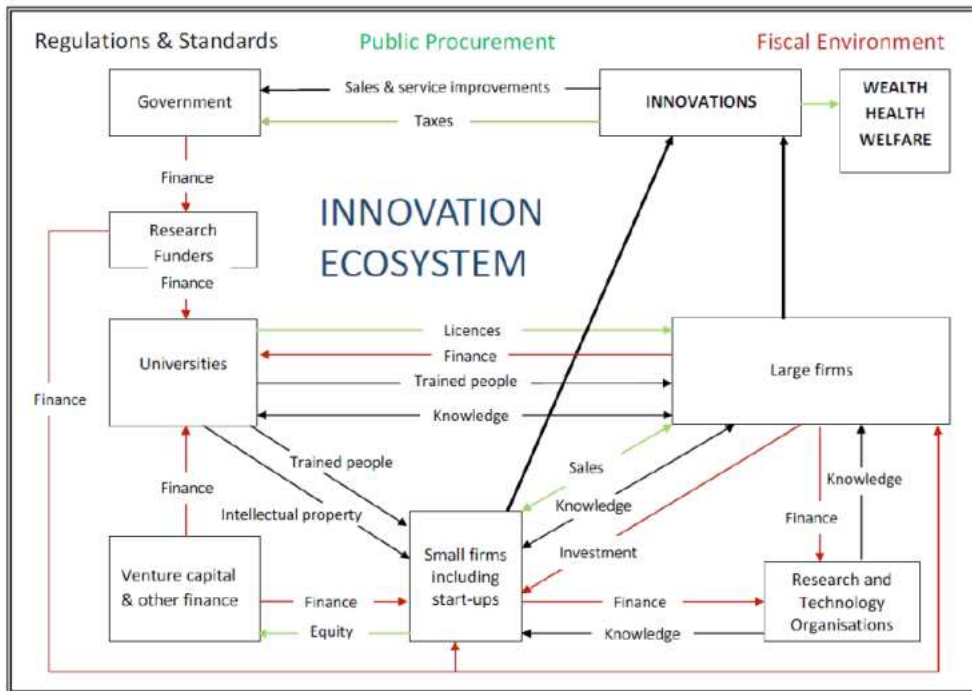
Figure 2 Startup ecosystem designed by Steve Blank [44]

This model is startup centered and shows how the startup is nurtured by different stakeholders, it even shows how the entrepreneur is inspired and supported by his environment.

The stakeholders surrounding the startups have represented a type of interaction as well. These interactions are not knowledge, competencies as described in the open innovation definitions, they can be business opportunities, financial investments, mentoring, ...

This model is well adapted for the USA ecosystem with some specificities due to cultural influence, legal and tax framework. The American culture is favorable for this venture approach as the recent history of the USA is based on the venture of the West conquest, on a community-based development and a non-existing state. The State is only represented as a funding body like any other ones.

We propose another view where geography is the entry point for the representation of the ecosystem and with a much more European point of view: the welfare state.



Source: [Improving the Framework Conditions for R&D](#), Luke Georgiou, June 2015.

Figure 3 Representation of the innovation ecosystem on [63]

In the figure, the government is represented and plays a key role to develop new knowledge and ensure financial support.

The European parliament proposed another model in a report [63] and shows that the relationships are not only focused on knowledge but cover also sales, investment activities. The other types of interactions represented by the Blank model are absent (business opportunities, businesses, mentoring...).

In our research we focus on the relationships between large firms and startups, this representation shows that the relationships between the two stakeholders are made of sales activities, knowledge sharing and investment. We propose to focus on one direction of relationships: from the large corporation to the startups. We call these interactions: open innovation plans and define them as the initiatives launched by large corporations and targeting startups.

1.4 Conclusion of the chapter 1

In our research, we propose to focus on the relationships between large firms and startups, more precisely on a specific approach: the open innovation plans. In the chapter below we analyze the rationale of these open innovation plans and their meaning in the innovation strategy of a large corporation.

CHAPTER 2 will help us to understand the role and the value of the startup in the open innovation strategy of a large corporation. And then CHAPTER 3 will propose a deep dive into the French innovation ecosystem, which is our cluster to test our research results.

CHAPTER 2 Which status for startups in the open innovation strategy of the large corporations?

In this chapter, we propose to analyze to which extent startups fulfill the specific needs of large corporations' open innovation strategy. To reach this goal, this chapter proposes first, a deep dive into external influencing factors of innovation strategies of large corporations (2.1). Then, in section 2.1 we investigate the typologies of innovation strategies and make a focus in section 2.3. on their effectiveness for the case of the French ecosystem. Based on these considerations we analyze the role of open innovation in these strategies in 2.4 and in particular the role of the startups in 2.5. We can then justify what motivates this type of relationships from the point of view of a large corporation in 2.6.

2.1 Influencing factors on large corporations' strategies for innovation

Suantae Kim [64] shows that large corporations have succeeded in achieving a level of excellence and optimization in the organization of work/processes, the product-market fit, the business model. To do so, they have segmented and optimized all the steps of the value chain.

Nevertheless, as the business context changes more and more rapidly, the large corporations have to revisit their strategy and their ability to get an optimized value chain. The key idea in strategy is to use the past and anticipate the future in order to make strategic decisions today. This makes possible to generate different possibilities for futures in order to anticipate possible strategic options for managing the challenges and possible risks that will arise. All this, therefore, contributes to building the capacity to think in the long term in order to provide proactive responses to current changes. Foresight is a 4-dimensional (4D) concept because it adds temporal elements to the present ecosystem, including the past and especially the future. Its goal is to move from anticipation to action.

Overall, the prospective strategy involves 3 steps in which several methodologies or tools can be used. These 3 steps are: Analyze the environment, anticipate risks, and Develop scenarios. The forward-looking strategy is perfectly compatible with innovation.

Even if large corporations obtained optimized industrial systems, they face new societal and global challenges. These global challenges are macroeconomic and geostrategic forces that are shaping deeply and globally our future. They are called megatrends. PwC report [65] presents these megatrends, we list them in the following sections.

Shift in global economic power

The dominance of the Western economy may lose influence and capital and may become less attractive for talent and business. The competition generated from new geographies and sources may create different competitor profiles than those historically faced. In

other words, there could be gradual strengthening in some emerging economies such as China and India.

Demographic shifts

There are global demographic shifts such as an aging population. Half of the CEOs are planning to increase headcount in the coming year, according to PwC's 17th Annual Global CEO Survey, and 93% recognize the need to change or are already changing their strategies for attracting and retaining talent. The lack of key skills could threaten growth prospects.

Accelerating urbanization

In the 1950s, less than 30% of the world's population lived in cities. Currently, that proportion has risen to 50% and, by 2030, the UN projects that some 4.9 billion people will be urban dwellers [66]. By 2015, the United Nations [66] estimated that there would be 22 mega-cities—those with populations of 10 million or more—with 17 located in developing economies. By 2050, the world's urban population will have increased by 44%. This megatrend will impact markets' topology and capacity to deliver service.

Rise of technology

Digital transformation consists of integrating digital technologies into all areas of a business, in other words changing how large corporations operate and deliver value to customers. Verdino [67] presents "Digital transformation as closing the gap between what digital customers already expect and what analogue businesses actually deliver." Organizations also must face a cultural change requiring them to continuously challenge the status quo, experiment, and get comfortable with failure.

Climate change and resource scarcity In 2019, the word "climate emergency" has been chosen as the word of the year by the Oxford dictionary [68].

Public opinion In January 2020, AFP shares that [69], "about twenty associations and communities, including Bayonne, Grenoble, Nanterre, and the NGO Sherpa, sued the oil giant Total for climate "inaction" on Tuesday". They consider that they are suffering from global warming.

Social consideration. There are global demographic shifts such as an aging population and urbanization [70]. This megatrend will impact markets' topology and capacity to deliver service. There is also the transition from a property economy to a sharing economy. Following the example of Blablacar (French startup for carpooling) practices are evolving. They affect professionals and students today, but seniors will also be affected tomorrow.

Coming scarcity of resources: Scarcity of rare earths, phosphorus, and soft water will force an ecological transition. Large corporations exploiting natural resources or contributing to carbon dioxide emissions will have to revise their business model. For example, the oil and gas company Total has revised its ambition in "becoming the responsible energy major, providing reliable and clean energy to as many people as

possible". And Airbus left the "we make it fly" ambition for "we pioneer sustainable aerospace for a safe and united world".

So, given that we are more populous, urbanized and prosperous, the demand for energy, food, and water will rise. But the Earth has finite natural resources, we have to revise our business models to get a sustainable balance.

Shareholders are using these megatrends to impact the strategy of large corporations, operating model and resources planning of large corporations for the coming years. For example, every year, Blackrock publishes in [71], their vision of the investment through these megatrends. This document is communicated to also CEOs of large corporations where Blackrock has an investment. Blackrock CEO [72] declared " *As a fiduciary to our clients [the majority of whom have decades-long horizons and are planning for retirement], who are the owners of your company, we advocate for practices that we believe will drive sustainable, long-term growth and profitability. [...] Profits are in no way inconsistent with purpose – in fact, profits and purpose are inextricably linked. As wealth shifts and investing preferences change, environmental, social, and governance issues will be increasingly material to corporate valuations. [...] This is one of the reasons why BlackRock devotes considerable resources to improving the data and analytics for measuring these factors, integrates them across our entire investment platform, and engages with the companies in which we invest on behalf of our clients to better understand your approach to them.*"

Obviously, they are not exhaustive, typically the pandemic risk has not been mentioned in the different reports. Nevertheless these megatrends are forcing the large corporations to innovate to get adapted to their future business environment [73]. They are not only innovating for their products or service lines but also in the way they operate, are organized, and do business.

So large corporations must have an innovation strategy capable of addressing the different types of innovation necessary for its evolution.

2.2 Topology of innovation strategies of large corporations

In the introduction, we presented product innovation which is based on two components: invention and market. In companies, technical novelty is generated by R&T, most of the time in collaboration with external research partners. This technical novelty is valued in patents and knowledge. New products or services with technical uncertainties are developed by the R&D department, which is funded by customers' orders. In other words, R&T is supported by large corporation funds to generate knowledge, and R&D is transforming this knowledge into new products and services when the market has been identified.

We can model the role of R&T, R&D, and innovation with the following triangle from our research and experience:

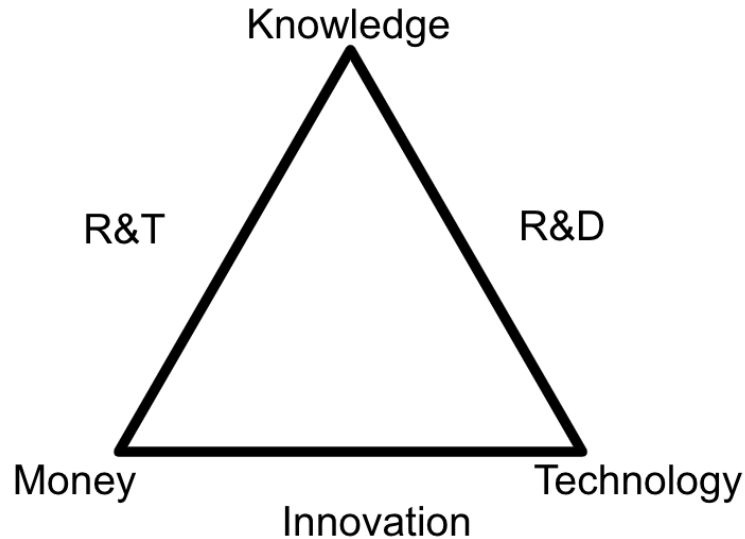


Figure 4 R&T, R&D, innovation interrelated Triangle (our research)

With money, a large corporation creates knowledge through Research and Technology activities (R&T). From a knowledge (developed internally or externally), the research and development function are able to transform it into technology. The innovation team is in charge to transform the technology into innovation.

The technology is one of the entries considered by the innovation team, other elements such as customers' needs, market context are influencing the innovation approaches. So, there are different types of approaches to innovation strategies. In the following section, we analyze the different topologies of innovation strategies.

Vian [74] describes 2 approaches for innovation strategies: "causal" and "effectual". The causal strategy consists in beginning with a specific goal and a given set of means for reaching it. Whereas effectual strategy, consists in starting with only a set of means; in the process of deploying them, goals gradually emerge. This approach addresses innovators approaches and is too project oriented to be used to describe large corporation strategy.

Pisano [3] shows the importance of having an innovation strategy without detailing it as "*an innovation strategy involves continual experimentation, learning, and adaptation.*"

Dodgson [75] proposed a model of innovation strategies based on the engagement of the large corporation regarding the innovation approaches: Proactive, Active, Reactive.

Proactive innovation strategies tend to have strong research orientation and first mover advantage and be a technology market leader. Active innovation strategies involve defending existing technologies and markets while being prepared to respond quickly once markets and technologies are proven. A reactive innovation strategy is used by companies which are followers, have a focus on operations, adopt a status quo approach for a low-risk approach. Passive innovation strategies waits until customers ask for a change in their products or services. This approach mixes technology and market approaches and for our research we need to distinguish these two dimensions.

Jaruzelski [76] proposes three main innovation strategies provide significantly different answers to these problems: Technology driver, Market reader, and Need seeker strategy. As presented in figure 5.

Three Focus Strategies

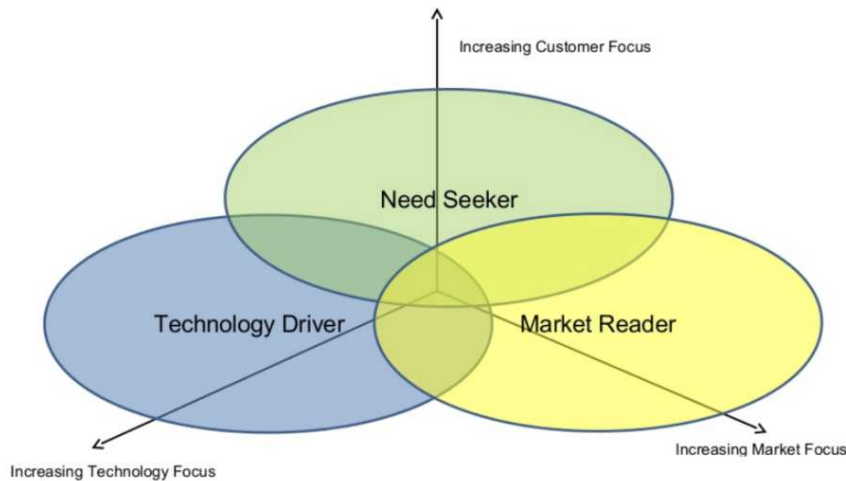


Figure 5 The three main innovation strategies: Technology Driver, Market Reader and Need Seeker ²

Technology Driver strategy consists in developing products with high technological added value. The innovation process relies on intensive R&T (Research and Technology) and R&D (Research and Development) with the aim of bringing as many new technologies and inventions as possible to market and thus leading to successful innovations and products. As it is mainly based on R&D activity, this strategy is conducive to radical innovation. Thales, Sanofi or Safran are examples of companies that have adopted this strategy.

Some patents subsequently become innovations when they reach the market: to do so, they must result in a product that is marketed, distributed to users or adopted in social practice. The success of innovation will depend on how it responds to market needs. Then the role of the innovation department is to transform new products and services into commercial success.

The Market Reader strategy is symmetrical to the previous one. It consists in creating value through incremental innovation and product customization. This strategy is based on listening closely to the demands and needs expressed by customers, so as to orient R&D according to these demands and leads to successful innovations. This strategy is relevant for incremental innovation, but it is likely to block radical innovation. This phenomenon is known as the "innovator's dilemma" by Christensen [1]: when the innovation process is user-centric, companies tend to miss disruptive innovation opportunities. In France, L'Oréal and Danone have adopted this kind of strategy. Obviously, these organizations are regularly asked to become hyper agile in the twinkling of an eye. Then they have to challenge everything, to break down all the silos that have

² Source:OVO & BCG : <https://www.slideshare.net/jdpuva/three-innovation-strategies>

been put in place between the different parts of their organization (finance, marketing, IT, etc...).

The Need Seeker strategy is positioned on the market side, like the Market Reader strategy. However, it is not based on listening to the needs and demands as expressed by clients. It consists in anticipating future needs, future uses, aiming to be the first to produce a product that meets these as yet unstated needs [76]. This is conducive to the generation of breakthrough innovations focused on the uses and functional qualities of products or services such as in Vinci (with their innovation plan LEONARD is creating the vision of a resilient city, advanced ways of working...), or Orange (with for example “connected home” a service to develop the adoption of the smart home).

2.3 Innovation Strategy effectiveness

The Global Innovation 1000 study PwC report [65] analyses the innovation strategy of the world's 1,000 most innovative companies every year. In 2014, the authors proposed a review of the effectiveness of the three innovation strategies with ten years of experience (2004-2014). While each of the three strategies has its own success stories, it is clear that the most successful strategy is the Need Seeker strategy [76]. Figure 6 shows the percentage of companies in each strategy that are leaders in their market. The Need Seeker strategy is also more advantageous in terms of return on investment. It is less expensive than the Technology Driver strategy, which requires heavy R&D investments, and generates more profits than the Market Reader strategy, which is often limited to incremental innovation

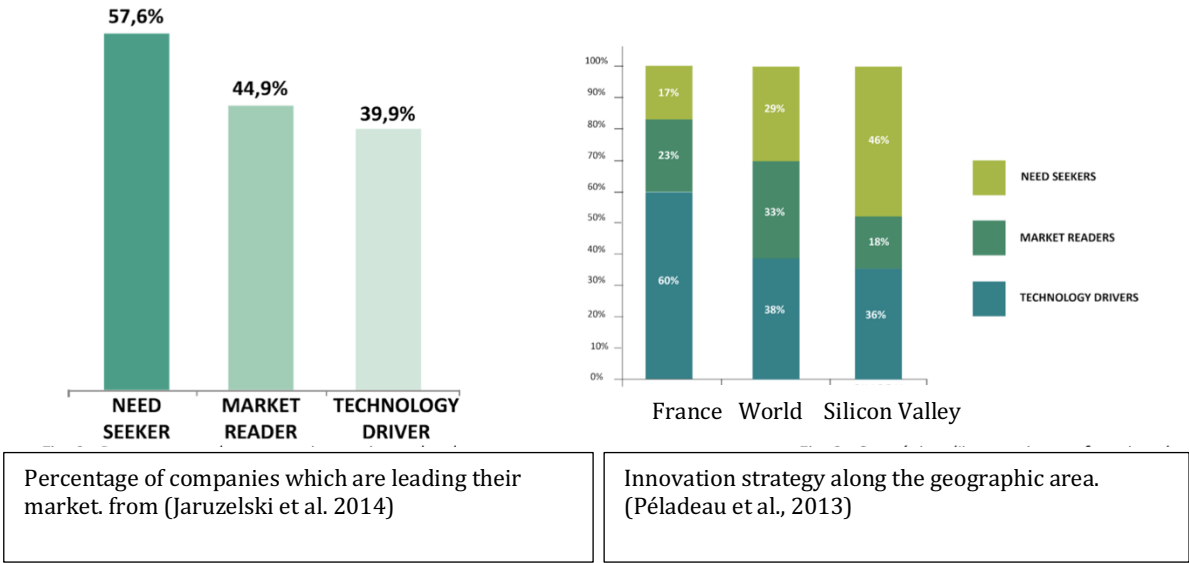


Figure 6 Innovation strategies according to the geographical area.

From a geography perspective, the Silicon Valley which is the cradle of the Startups as presented in I.1 adopted this seeker needs years ago. Whereas France has adopted a technology driver approach which is mainly due historical choices. During the second end of the XX century, French governments used economic planning through the “Commissariat Général au Plan” (the General Commissioner to the French plan) to

modernize France. Technology development has been reinforced with the deployment of telecommunication capabilities, speed train (TGV), nuclear plants, etc.

Whereas at the same time in the Silicon Valley an interesting mix of population between the Military forces from the East coast testing new technologies in the Californian desert met the hippie's movement established in San Francisco. The meeting of technology-oriented people and the artistic, self-development people created a user-centric approach.[77]

2.3.1 Focus on effectiveness Strategies of French companies

According to the data from the Global Innovation 1000 study by PwC [65], the frequency of observation of the three strategies is roughly balanced within the sample of innovative companies analyzed. That said, there are real differences between geographical areas. For example, in France, the dominant strategy is clearly the Technology Driver, adopted by about 60% of companies. The Need Seeker strategy, which is now known to be the most effective, appears to be in deficit, with only 17% adoption. On the other hand, Silicon Valley and its particularly innovative ecosystem favors the Need Seeker strategy (46%). These differences can certainly be explained by cultural, education/training and political factors.

Indeed, it is likely that tax policy in France, through the Crédit Impôt Recherche, has encouraged companies in the region to adopt a Technology Driver strategy focused on R&D over the past ten years. A report from DGE (French ministry of the economy), (DGE, 2016) [78], assesses the innovation potential of French companies to compare national capabilities with other countries in Europe and the US. This report is based on the analysis of 6 groups of indicators:

- Human Resources (rate of scientific profiles in the workforce)
- Investments in higher education, R&D and innovation
- Cooperation within the research and innovation system
- Production of scientific and technical knowledge
- Results of the innovation process
- Dissemination of innovations in companies

None of these indicators takes into account a customer-centric approach or need seeker approach. So, it would be interesting to investigate the relationships between open innovation and the ability to adopt a need seeker approach.

2.3.2 The impact of open innovation on companies' strategy

Some companies have to be opened to their ecosystem to seek needs. For example, in [79], Brégier, French CEO of Palantir and former Head of Airbus commercial aircraft declared "*I no longer believe in the innovation that comes from R&D offices.*". Indeed, when he was leading Airbus, he signed an agreement with the digital startup Palantir to develop Skywise, an open data platform. This digital platform gathers data from disparate sources suppliers to elaborate digital twins of aircraft already operated by airlines. In analyzing data, simplifying their visualization, airlines get insights to optimize maintenance, engineering, flight operations, and then costs. Airbus worked on improving their customers' experience. Selling a platform (an aircraft) does not mean any more the end of the relationship with the customer (the airline), another story begins thanks to this new

service. This innovation is the fruit of co-development with Palantir startup and open innovation approach with suppliers.

The large companies' managers deal with a system (the company) that lasts over time. Whereas through their work, the founders of the startup build their assets, they start the operation mode of the company. The startups feel less concerned about regulatory constraints (safety, financial system, etc.) than large corporations as they have no branding to maintain. They are built in a cultural way around an innovation designed to satisfy the customer. On the other hand, the regulatory obligations of large corporations are so heavy that they sometimes prevent them from going in the direction of their customers.

Consequently, the large corporations should work in Need seekers mode, and that startups are better equipped to do so, but on the other hand, the relationship is complicated. Then, we should address the question of how to identify how to be better manage this relationship.

2.4 Open innovation strategy of large corporations

Open innovation was popularized in 2003 by Henry Chesbrough [9] and it refers to an innovation process by which the "company opens up to a diversity of other external actors (researchers, partner companies, customers, students, etc.) or internal (employees not belonging to the R&D department)". Open innovation is a cultural shift for the company: no more isolation, we open up to modernity and, consequently, to the world. While innovation has long been a secret, with R&D departments, it is now understood that large companies have much to gain by connecting to their ecosystem.

Consequently, open innovation allows the company to outsource risk-taking when:

- developing new business models
- developing new products and services
- optimizing or transform processes
- improving company culture in being more agile and customer centric.

For the launch of *The startupper magazine* in Toulouse in September 2016 [80], a roundtable was organized in Toulouse by *La tribune* newspaper. Cédric Giorgi, director of special projects at Sigfox, explained that collaboration consists in having the right contact person: "*If you talk to the Innovation Director of the large corporation, you have lost. You will be involved in co-innovation projects and nothing will come out. We need to talk to the business manager. You have to sell, make business partnerships. It should not be forgotten that large corporations want to buy technologies or startups and they have a long-term vision. Their goal is not to have a little extra app, but to become the leaders of tomorrow.*" This quote raises three gaps between startups and large corporations: growth strategy, development timing, and cultural differences.

So, the open innovation partners selection is crucial.

The categories of partners according to areas of activity are academic, large corporations (customers, suppliers, competitors, others), SMEs, or startups. A reasoned choice of the target will be made by seeking to align the stakes of each on a platform of common objectives: TTM (Time to Market), target markets, and technical or functional complementarity, for example. The agility of a startup will thus be sought to reduce TTM,

whereas academic partners will generally be more attractive to access advanced skills or know-how [81].

In addition to cultural and organizational differences, startups enable responsiveness, flexibility, and improved time-to-market.

To maintain a sustainable business, and increase competitiveness, large corporations must identify new uses and needs to innovate even faster. By opening an innovation strategy, they intend to gain agility and capitalize on the know-how of their partners.

Markets/ Offering strategy

Vancil [82] shows that large corporations set their strategies in using a time horizon of several years, company leaders revisit their strategy by looking for internal strengths and weaknesses, as well as external opportunities and threats in the environment. Startups are part of these external opportunities and threats. For example, a large corporation facing a morose market, or having issues in its distribution channels, may want to diversify its offering or target market. Then, the partnerships with startups will help the large corporation to revitalize its business models and understand the changes in the market [83]. In particular, Fintech is helping legacy banks to shift their business model in developing a more digital business strategy [84].

Customers relationships create the disruption

Many companies want to disrupt a simple misconception that upsets the market and destroys the competition. Increased spending on innovation is not a guarantee of success, only a few of them ever achieve this status. A customer strategy is mandatory to disrupt a market. Companies may focus exclusively on their products or internal processes, instead of focus on what [85] calls "Jobs To Be Done": *what do customers expect to get when they use services or products?* For example, the best breweries do not just sell drinks either: they sell an experience the customer will never forget [86]. Beverages only work as a catalyst for a social experience where people come together and make connections, so the "Jobs To Be Done" theory provides companies with a powerful tool to stay ahead of the competition. Identifying the "Job To Be Done" is not easy.

In the age of Data, many marketers and product developers tend to focus only on customer profiles and the correlations between them, and not enough on what customers are trying to achieve in specific circumstances [87]. The problem is not that there is not enough data available - far from it - but that it is not of sufficient quality. This means that companies need to talk to their customers, but also to their non-customers, to identify specific needs in their market that are not being met today.

In large corporations, customer relationships are managed by KAM, Key Account Managers. They are responsible for establishing long term relationships with customers [88]. KAM's role requires a demanding customer-first approach. This system may create the illusion that the large corporation nails its market, and at the same time, the company misses a coming market disruption with another growing market segment.

Effectuation approach

Sarasvathy with the theory of Effectuation [89] describes an approach to make decisions and perform actions in entrepreneurship processes. In this theory, the leader identifies the next, best step by assessing the resources available to achieve his or her goals, while continuously balancing these goals with his or her resources. Hence the challenge for them to learn how to be flexible while leaving autonomy to the startup, at each stage of the collaboration, from contact to deployment. For example, paying at sixty days is a habit to lose, as it is very perilous for the young company, which needs cash to move forward. According to the 2019 barometer of the Village by CA's (incubator of Credit Agricole; a French bank)[90] a startup/major group relationship with Capgemini, unveiled in April, 84% of startups with revenues of less than €100,000 find that payment terms are rather slow or very slow. Generally speaking, newcomers are increasingly demanding about the responsiveness of large corporations.

"We are not on the same time scale. The life cycle of a startup corresponds to the decision-making time of a large corporation. It's a question of understanding this scale to play with it, to be in the right tempo," confirms David Keribin, CEO and co-founder of Cenareo, a startup specialized in content management for digital signage, which works with Microsoft, CGI, HP or Sharp.

Given the shorter time to reach break-even due to capital limitation, startups need to operate faster than large corporations to survive. Working with startups can inspire a corporation to execute faster.

Open Innovation for branding and employment marketing

Large corporations discover startups in sponsoring or organizing events, such as startups weekends or hackathons. These events develop their employment marketing and to reach a younger target audience, identify talent to recruit later, and identify emerging needs and usages.

Relationships with startups serve also marketing or communication strategies. In the first case, the large corporation hopes to gain notoriety in remaining for consumers as a dynamic company, in tune with the requirements of the times, and able to recognize innovation wherever it is found. For example, L'Oréal has invested in Coloright, a startup specializing in hair fiber reading, with the ambition of entering in this field [91].

Large corporations, especially among new generations, are perceived as proposing less exciting career opportunities. They are more interested in joining a startup or encourage them to launch their venture during their curriculum. So, in actively partnering with startups in the public place, corporations can enhance their brand image to future employees.

2.5 Abilities to develop agile business models

What is important now is not only to innovate internally but also to create a platform on which external actors can be added. But this also implies a whole organization of relations between startups and large companies.

Large corporations have also to face new digital competitors that move fast. These competitors are typically startups that implement new types of organizations, which build

their success on new business models and which do not have to worry about any technical or operational legacy that could block them. [92] identifies how to identify sectors easy to disrupt:

- a weak customer experience (Taxi service has been disrupted by Uber or Lyft startup)
- high margins, (established telecom operators have been disrupted in France by Free who reduced margins)
- easily reproducible assets (Airbnb identified how to rapidly develop and offer for hospitality service)
- traditional players with low agility (low-cost airlines (such as Easy jet, South West) challenging established airlines on their organizations to reduce costs).

So large corporations are forced to innovate if they do not want to be disrupted by their competitor or by newcomers disrupting the whole sector.

In the 20th century, corporations were concerned about increasing their market share, profit margins, return on investment and return on net assets. They protected their existing markets from other competitors with equivalent business models. As high barriers to entry such as financial, legal, regulatory were extremely high, they rarely feared disruption caused by newcomers.

Trends such as outsourcing, agility, and flexibility had already forced large corporations to reconsider their strategies and processes, and to become network organizations[93]. We propose a highlight on relationships between startups and large corporations in an open innovation approach an analysis of all the public or private supports offered to facilitate this type of open innovation.

By adopting such an approach, large corporations can accelerate the development of new products and services in breaking internal silos. And then they can be in a position to increase their revenues and market share in shortening the time required to bring new products and services to market while accelerating the return on investment. Large corporations can reduce direct research expenses (for technical, market, usage analysis research) thanks to the share between the various stakeholders of open innovation in the innovation project.

Weiblen and Chesbrough, [2] show that startups have an edge over large corporations regarding agility in terms of business and organization, whereas large corporations have assets such as resources, planning, supply chain, distribution channels which startups cannot afford. So, a mix of entrepreneurial ability with corporate capabilities seems like a successful combination that is why large corporations look for radical innovation from startups more than incremental innovations.

Through incremental innovations, large corporations focus on cost or feature improvements in existing products or services. This type of innovation is typical of large corporations optimizing their business. It is different from disruptive innovations transforming existing markets or industries, or even creating new ones, as it requires a new business model but not necessarily a technological breakthrough [3]. On the other hand, in a radical innovation a technical shift is created. Thus, in this type, the challenge is purely technological. Both types of innovation are challenging for large corporations, as they could threaten the organizational routines and competencies [1].

Lassen and Laugen [11] show that the development of radical and/or disruptive innovation is not solely dependent on involvement and collaboration between different external actors. It is also dependent on the level of differences between the organizations

(size, activity domain, or business model...). Therefore, large corporations looking for radical or disruptive innovation can deploy an entrepreneurial approach to rejuvenate their business [94] and [95].

For example, one way to stimulate this entrepreneurial environment within large corporations can be achieved through incubation. Kruff et al [15] show that incubation of organizations by corporate incubators can compensate for a weak internal innovation climate: close relationships with startups impact corporate employees' mindsets in creating an innovation climate and innovative behavior, which introduces new ways in which corporations can improve their innovativeness. Also, on a national scale as stated by Mocker [16], public and governmental institutions have a growing interest to support startups to further develop the ecosystem. There are more and more open innovation policies targeting startups to meet the needs of large corporations for agility, flexibility, and innovation, whereas startups are looking for support and opportunities supporting their development.

2.6 Motivations in these relationships

2.6.1 From a Large corporation's perspective

In large companies, resources to innovate are available: funding, skills and imaginative employees, excellent knowledge of the environment, and the market. However, we often see them calling on startups with only a lot of energy and a focused set of skills disrupting a market with breakthrough innovations.

Indeed, size and complexity are strong barriers to innovation in large corporations. The financial resources of large companies are allocated to specific functions and activities by the operating plan defined once a year, and it is not easy to redeploy them for use in another context. Its well-established functioning is based on rules, processes, and controls that are often cumbersome [96]. Executives and mid-managers are committed to the company's current business model, which they see as inseparable from its identity and culture, especially if it has been operating successfully for decades. They fear disorganization, loss of control, and reduced performance in the event of a radical change caused by innovation. Nevertheless, most executives believe that innovation is at the heart of any business: without innovation, companies could not be competitive in their sector of activity. Their spearhead is, therefore, innovation, which will make it possible to win new customers and capture new markets [97], but they lack the lever of action.

One of the causes behind these statements, which contrasts with the reality of the facts, is the association that people make between innovation and technology or innovation and novelty. Indeed, when people talk about innovation, the first elements that come to mind are strategy, technology but rarely organization, management. The observation is simple: although the tools have evolved at the management level, managerial paradigms have crystallized for more than 30 years [98].

So, as shown by [1], the company's dilemma consists of: Should we continue to do what we know how to do well, or should we look for a breakthrough innovation that will reveal new needs, at the risk of extinguishing the initial market?

Then startups can take risks, that large corporations do not dare to endorse, and large companies keep an eye on startups activities to identify incoming disruptions.

2.6.2 From a startup 's perspective

When the startup can quickly develop an innovative solution, the large corporation can provide a playground that is inaccessible to the startup: either internally, for example, its operational support, or externally, by opening part of its customer base to the startup. This is the model adopted by Orange and Deezer, the integration of Deezer into the Orange platform has accelerated the development of the service from 1,5 million subscribers in 2015 [99] to 14 millions subscribers in 2018 [100].

When a project is open to funding for innovation, the startup and the large corporation can come together to solve an asymmetric financing problem: the large corporation often has budgetary problems (establishing a yearly operation plan [96] while the startup has cash flow problems). An innovation project supported by public aid encourages the large corporation to collaborate with a small structure that will draw on public funding to achieve its ambitions in addition to the funds raised (funds raised all the more easily as the State has lent a moral guarantee to the company's project by granting aid to the R&D project).

2.6.3 What can trigger collaboration?

We can list the following objectives, extracted from Innovation Roundtable meetings, a yearly event in Copenhagen. One of the discussions was focused on the rationale of open innovation for a large corporation, during the November 2016 event [101], the main outcomes of the discussion are below:

- *Remain competitive*: this is the first reason that pushes companies to implement an Open Innovation strategy. For example, all large companies must now start the process of digital transformation to face evolutions in the markets, adopt new tools to increase competitiveness
- *Expand its offer*: Open Innovation will allow companies to propose new innovative offers to attract new customers.
- *Improve internal processes*: Open Innovation will improve speed and efficiency through the use of many tools available on the market, information sharing, and training.
- *Have a positive brand*: A brand can be eroded by time. It is therefore important to evolve as the company and its customers evolve. With Open Innovation, companies have to be vigilant about their reputation or brand adhesion.
- *Reduce R&D costs*: R&D costs are indeed reduced because startups are generally already advanced in terms of study, strategy, and technology. They often need organizational and financial support. This eliminates the need for R&D departments to research A to Z.
- *Conquer new markets*: Open Innovation will make it possible to conquer new markets with new technologies, but why not new relationships with foreign startups already established on a market.
- *Reduce time to market*: Working closely with startups as part of an Open Innovation strategy reduces the time to market for new products. Innovation and growth are faster within a startup, thanks in particular to the lean startup method.

During this event, some startups were present, and discussion around the main advantages of collaboration with a large corporation consists of:

- *The contribution of activity: large corporations will support the development of proof of concepts and other demonstrators.*
- *The gain of new markets: involvement with large corporations opens the doors of their value chain.*
- *The credibility for investors and customers.*

Peer-to-peer collaboration is the result of meeting opportunity and urgency. When there is an urgent need to propose projects, on a little-known terrain, the large corporation is more inclined to turn to actors who are already clearing the ground and are willing to take the risk. The large corporation benefits from collaboration if it can minimize its risks and discover a sector that is not yet essential for it, a source of opportunities or dangers.

Moreover, if there is no urgency, the startup may not be able to wait to build the collaboration. For example, the collaboration between PSA and Deways (car rental service) could not have been decided so quickly if there had not only been no urgency but also the fact that the partnership did not impact PSA's "business as usual" [102].

Collaboration is possible when individuals on both sides take the risk of working together and building a relationship of trust. For collaboration to be sustainable, this trust must be extended to a network of contacts and cross-fertilization between partners to prevent the departure of key people from compromising the projects launched.

2.7 Conclusion of the Chapter 2

In this chapter, we present the opportunity to develop open innovation approaches for a large corporation. Hence, we present the specific place of the startup in this open innovation strategy. Our research focuses on the Open Innovation relationships established by large corporations and targeting startups. We conclude with the respective motivations of startups and large corporations to trigger such a relationship. In the next chapter, we analyze the impact of these relationships on an ecosystem.

CHAPTER 3 The landscape of the various initiatives supporting innovation development for any kind of organization in France

In this chapter, the reasons why the French ecosystem is relevant as a geographical implementation area for our research will be presented. A study published in early 2016 from INSEAD [40], analyses the top 500 companies in the Forbes Global 2000 ranking and it shows that in the world the countries developing startups and major groups are in descending order: France, Germany, Switzerland, Japan, and the United Kingdom. That means that French companies are among the most involved in open innovation in the international context. This evidence and the arguments we will present in this chapter, aim to demonstrate why the French ecosystem has a special place in this research work in terms of startups dynamism.

3.1 Overview on the existing governmental and institutional supports

In this section, we show to which extent startups play a pivoting role in innovation dynamics and competitive strategy of an area. Many plans have been created to develop trust among the various stakeholders. This is why the public financing of innovation has always played an important role in France. Aid to Innovation has a long lineage with DATAR, ANVAR, Oseo, and then Bpifrance³.

Indeed, to support the development of Open Innovation approaches, the French government puts in place a financing and services toolbox for startups such as Bpifrance for financing, Ubifrance, and Coface for export, and INPI for intellectual property rights. Their mission is to boost services for startups development, even if this toolbox is not always dedicated only to startup and is not restricted to the Open Innovation approach.

As already exposed in chapter 2, collaborations between corporations and startups aim at accelerating innovation processes and at sharing costs. The French government seems to have understood this paradigm.

Several actions to support French startups were launched during the past years. They are organized around four main themes: simplifying the lives of startups, supporting their financing, facilitating the recruitment of talent, and better supporting them internationally in their hyper-growth phase.

Mounir Mahoujbi, in charge of the digital economy in Macron's government, declared during the opening of "HealthTech center" founded by Doctolib (French startup in Health business): *"This center, supported by the Public Investment Bank (Bpifrance), also stands out for its Open Innovation practice. And that is essential. Open Innovation consists of*

³ DATAR : Délégation interministérielle à l'aménagement du territoire et à l'attractivité régionale (Interministerial Delegation for Land Use Planning and Regional Attractiveness)

ANVAR : Agence nationale de valorisation de la recherche (National Agency for the Valorization of Research-

OSEO : private company with public service delegation, which finances French SMEs for employment and growth

Bpifrance : French Public Investment Bank

opening up your company to external ideas, thanks to hackathons or meet-ups, which allow enthusiasts to meet and discuss a subject.”[103]

Then if we look at these more deeply, we can assume that France has opted for a model of support based on indirect aid rather than on direct aid, which represents 70% of public support for R&D in 2013 as given by OECD [33]. This movement was accomplished in the 2000s with, in particular, the reform of the tax credit research in 2008, as a result of which it has acquired a prominent place in the aid for innovation (6.2 B€ in 2019).

Several measures have been taken in France to develop innovation and Open Innovation initiatives; the following sections will detail these governmental incentives.

3.1.1 Tax measures

The Crédit Impôt Recherche – CIR (Research Tax Credit (RTC)) is a tax refunding mechanism designed to support research and development (R&D) activities and to serve as a lever for innovation. It can benefit both newly created and older companies. The CIR rate varies according to the investments made. As a matter of fact, in 2014 large corporations represented 1% of beneficiaries of CIR benefiting from 38% of total expenses in France whereas companies under 9 employees represented 40% of the beneficiaries with 5% of total expenses in France (ANRT report, 2014) [104].

The Innovation Tax Credit “CCI” provides a tax credit of up to 20% on expenses related to "the design of prototypes and pilot installations of new products". These products must be new and innovative. In other words, they must not already be "made available on the market" and they must be distinguished from "existing or previous products by superior technical performance (eco-design, ergonomics or functionality)."

CIR completed by the Innovation Tax Credit (CII) and the status of Young Innovative Company (JEI), are essential in the development of many startups, in particular during their early stages, thanks to CIR and in later stages with CII.

The status of JEI (“Jeune Entreprise Innovante”: *young innovative company*) allows a reduction in their taxation to companies created less than eight years ago and that have research and development expenses. They must meet 4 conditions:

- Have research expenditures by incurring R&D expenditures equal to at least 15% of total expenditures per fiscal year.
- Be independent, i.e. more than 50% of the shares must be held by natural persons.
- Be an SME, i.e., with a workforce of fewer than 250 people and a turnover of less than or equal to 50 million euros.
- Be a truly new society (i.e., not have been created as part of a concentration, restructuring, extension of a pre-existing activity).

Consequently, this status may support startups, from incubation stages (during prototyping and testing phases to the scaling-up stages.

3.1.2 Bpifrance

Created at the end of 2012 on the model of the German public bank KfW, which provides funds for the Mittelstand, Bpifrance was created by merging three pre-existing financing structures: "Oseo", "Caisse des Dépôts Entreprises" and the "Fonds Stratégique d'Investissement". Its objective is simple: to support startups and to help SMEs grow. Bpifrance is now able to follow a startup from its launch to its international development, covering investment tickets (for a total value of 10M€). To assume its new prerogatives, the bank has at its disposal two flagship tools: support but above all financing, with 25 B€ in equity capital. In 2013, 1,500 startups were financed by Bpifrance. There were 4,000 in 2017. The financing methods are varied. In 2017, the bank injected 7.8 B€ loans into the French economy, 4 billion inflows into the capital directly or via partner funds, and finally 8.6 B€ private loan guarantees. Startups benefit from a continuum funding at each stage of their development. Subsidy at the time of ideation and feasibility studies, innovation assistance, R&D loan at the time of supply development, seed loan at the time of fundraising, or innovation loan at the time of industrial and commercial launch... no stage of the project is neglected. For example, Bpifrance has supported Doctolib (on-line service for appointments with physicians) since its creation in December 2013 until the last round of funding of 35 M€ in December 2017.

Bpifrance division dedicated to bringing together the traditional economy and innovation completes its offer by launching its Innovation Tinder on Wednesday 21 November 2017, a platform for connecting BtoB startups and major groups: "Le Hub"⁴. To appear on the platform, startups must be exclusively BtoB, offer a tool or service for large corporations, and have at least one customer. They must also either have raised at least 1 M€ or have achieved a turnover of at least 1 M€ on the last balance sheet.

The result of two years of internal work, the platform industrializes the process of connecting startups and large corporations, allowing them to more easily identify the startups with whom they could do business, and then contact them directly, 470 nuggets are now listed in 2018. Among them, 175 are startups at hyper-growth stage and have raised more than 15 M€ and have more than 20 employees.

Bpifrance became with the time an unmissable partner for startups, as it can support startups in early stages as well as the latest investment roundtable in startups.

3.1.3 Competitiveness Clusters

The Competitiveness Clusters (*pôles de compétitivité*) were created under the impetus of France's new industrial policy launched in 2004. A cluster is "a group of companies and institutions sharing the same field of competence, geographically close, interconnected and complementary" [105].

The "cluster" is, therefore, a group of companies and institutions belonging to the same sector of activity (same field of competence) and which are anchored in a territory or geographically located. This grouping allows the actors of a cluster to benefit from competitive advantages thanks in particular to the "externalities" they generate. They provide companies with opportunities for commercial or international development, but also partnership opportunities to carry out industrial projects.

⁴ <https://lehub.web.Bpifrance.fr>

They bring together companies, research centers, and training organizations, engaged in a partnership approach to implementing a common development strategy designed to generate synergies around innovative projects. Each cluster is specialized in a given sector of activity such as:

- *for industry:*
 - optic, photonic, light, consumer goods,
 - mechatronics, micro-technique mechanics, automotive, railway, aeronautics, navy
 - agri-food industry, supply chain, chemistry, materials

- *for the environment:*
 - Water, sustainability, development, bioresources
 - eco-technologies, eco-building, energy, and eco-energy

- *for technology for information and communication:*
 - telecommunication
 - internet of things
 - data science

- *for health:*
 - Health, biotechnologies, well being

- *for services:*
 - culture, tourism, sport and leisure, social and solidarity economy, personal service, service engineering, company services

- *for agriculture*
 - farming, winemaking, gardening

They are spread over several regions: Great East, New Aquitaine, Rhône-Alpes, Normandy, Burgundy-Franche-Comté, Brittany, Centre Val of Loire, Paris Area, Occitanie, Hauts de France, overseas, PACA, and Pays de Loire.

Poles make the French economy more competitive in developing growth and employment in key markets by:

- increasing companies' innovation efforts and supporting for high technology industry
- improving international visibility of France.
- spreading economic benefits from the dynamism of competitiveness clusters

Poles develop collaborative innovation projects in addressing two priorities:

- strengthen the economic benefits of R&D projects. They transform collaborative R&D efforts into innovative products, processes, and services.
- support the growth of SMEs by providing collective and individual services in the following areas: access to finance, international development, forecasting business skills needs, and individual support for SME development, including advice and mentoring.

These two measures are essential to create local networks of entrepreneurs and support the elaboration of multi stakeholders' projects (including startups and large corporations).

3.1.4 French Tech and how to develop entrepreneurship for innovation

FrenchTech is a label and brand that can be used by innovative French companies to facilitate their visibility in France and abroad. The FrenchTech plan was created at the end of 2013 to strengthen the coherence of public actions in favor of startups. It is managed by the Ministry of Economy, Industry and Digital Affairs, the Caisse des Dépôts, Bpifrance, and Business France. The FrenchTech mission aims to coordinate the actions of these partners in favor of the growth of startups, to bring out and detect projects, and to support project leaders in the construction of their project. It had a total budget of €200 million in funding to accelerate the development of startups and €15 million to increase their international attractiveness.

To achieve this goal, Mission French Tech has adopted an original approach: instead of setting up a new program or structure, it has chosen to rely directly on the plans of members of the entrepreneurial community to promote them by granting them a label, the "French Tech" label, and thus create a positive dynamic with a "snowball" effect through marketing companies with this label.

"It will be an index aimed at enhancing the value of the 40 French startups with the highest global potential, a little like the CAC 40 in the industry, but for the nuggets of digital technology. They will be evaluated and selected by an independent jury, which will regularly update the list of startups that are considered to have the greatest potential, both economically and internationally, but which also embody the values of European innovation, i.e., with a strong societal impact. Unlike a year ago, five years ago, today we have companies that are taking off, we have startups that become mid-sized companies (SMEs), we have startups that create subsidiaries around the world, and above all, we have startups that change people's lives" said Mounir Mahjoubi during CES 2019 in Las Vegas[106].

Other measures have been developed such as innovation challenges. For example, created in 1998, the i-Lab Innovation Challenge is organized by the Ministry of Higher Education, Research, and Innovation in partnership with Bpifrance to identify projects to create innovative technology companies and support the best of them with financial assistance and appropriate support. The competition is open to all project leaders, regardless of their nationality and situation (students, public or private employees, or job seekers) provided they meet the legal and regulatory conditions required for the creation of a company by French laws.

3.1.5 Academic incubators and accelerators

For a few years now, creating a startup and still being a student at school is no longer an eccentricity. Universities, Business Schools, and Engineering Schools encourage students and equip them with very complete approaches (courses, coaching, development, and prototyping techniques...). Awareness-raising courses start in the first year, but it is often in the second year of the engineering cycle that things start: presentation of the project to a jury, development of a business plan, and above all, selection of the real talents and personalities of future entrepreneurs.

Launched at the end of 2014, the “student-entrepreneur” status allows all young graduates to develop their entrepreneurial projects with a minimum of security. A status that is accompanied by a reassuring framework, the PEPITE system (Student Pole for Innovation, Transfer, and Entrepreneurship), to facilitate the transition to entrepreneurial activities.

Public incubators are linked to public research and are supported by the Ministry of Research, following the call for projects in March 1999 and the Innovation and Research Act of July 1999. But to these must be added the internal incubators of schools or institutes, those of research organizations, and incubators related to regional economic development.

3.1.6 SATT

Technology transfer acceleration companies (or SATT – Société d’Accélération de Transfert Technologique in French) act as a bridge between research laboratories and companies and finance the maturation of projects and proof of concept phases. These one-stop shops enhance the efficiency of the innovation system and the competitiveness of the industry. A technology transfer acceleration company is a subsidiary created by one or more institutions (universities and research organizations). They responsible for detecting and evaluating inventions from public research laboratories and to support them until they are transferred to companies. Its mission consists in transferring the discoveries and skills of public research into concrete applications and meet the needs of companies. Its activity is mainly focused on patent filings, proof of concept operations, startup creations, licensing, etc. The SATTs have been created thanks to the Future Investments program (*PIA*) and benefit from a fund of 856 million euros.

3.1.7 Synthetic table and limits of French state support for innovation

In 2016, the French government created the *CNEPI* National Commission for the Evaluation of Innovation Policies. Its first production was a report on “fifteen years of innovation policies in France” to analyze the impacts of these measures. (Commission nationale d’évaluation des politiques d’innovation, 2016) [107]

They classified these measures following the type of expected goals, such as:

- Increase R&D capabilities
- Develop an innovation ecosystem
- Develop entrepreneurship for innovation
- Support development of innovative companies

We considered these categories to classify the measures previously presented, and we use the 2017 French Public Finance Act (Loi de Finances 2017) [107] to highlight the budget for each.

Measure name	Measure goals	2017 budget
Research tax credit	Increase R&D capabilities	5.8 B€
Innovation Tax credit	Support development of innovative companies	180 M€
Jeunes Entreprises Innovantes	Support development of innovative companies	172 M€
Support for Innovation by Bpifrance	Support development of innovative companies	1.3 B€
Pôles de compétitivité	Develop innovation ecosystem	15.2 M€
Support for research partnership (FUI et PSPC)	Develop innovation ecosystem	104 M€
French Tech, I-lab, PEPITE	Develop entrepreneurship for innovation	74 M€
Bpifrance Loans (seed phase, grant)	Develop entrepreneurship for innovation	8 B€
Bpifrance Direct equity shares	Support development of innovative companies	4 B€
Bpifrance indirect equity shares	Support development of innovative companies	1 B€

Table 1 French government measures to support startups

The following table summarizes the amount dedicated to each category:

Measure goals	2017 budget (B€)
Develop entrepreneurship for innovation	8.075
Develop an innovation ecosystem	0.0152
Increase R&D capabilities	5.8
Support development of innovative companies	6.652

Table 2 French government measures budget

We see that the two main cost centers are to develop entrepreneurship for innovation and to support the development of innovative companies. These items are focused on startups' supports. The R&D capabilities development which is the third cost center concerns mainly established companies, and mainly large corporations by a scale effect. It is not surprising that ecosystem development is the lowest cost center, as these governmental actions aim at connecting various stakeholders and not very expensive, compare to the heavy research program.

The Commission's proposal for a European Research Tax Credit (ERTC), the financing of collaborative projects, various forms of employment aid, and the pooling of logistical resources, most often provided by the regions and other local authorities. Bpifrance must be added, which supplies more than a third of private venture capital and seed funds

through various fund-of-funds mechanisms. Bpifrance even funds certain accelerators within the framework of French Tech.

The report explains these unbalanced public policies by a lack of private investments in an early-stage of innovation projects: *“The schemes are increasingly justified by insufficient private investment or private financing mechanisms. The main reasons for these deficiencies should be identified and it should be examined whether they cannot be addressed directly at the source, rather than through multiplication of palliative mechanisms.”*

Many of the schemes mentioned in this second part of the startup Guide are either national or Ile-de-France-based. However, the startup ecosystem is also very active in the regions and even in the French Overseas Territories.

With the wave of entrepreneurship that started around 2012 and in particular the momentum created by the French Tech labeling of the regions, the entrepreneurial and startup ecosystem has become more and more dynamic of all regions has developed strongly.

It generally consists of the following components-:

- Institutions of higher education, in particular engineering and business schools their incubators and accelerators. They are complemented by private plans software development training such as the Wild Code School.
- Public research laboratories, such as Inria, CNRS, INSERM, INRAE, or others, including the teams often work in conjunction with laboratories in engineering schools, universities.
- Bpifrance's regional offices, which serve as a centralized point of contact to facilitate access to public funding for startups.
- Business support services in the regions, sometimes established as associations financed by the regions.

The weaknesses of the governmental support have allowed regional support close to the business and the local specificities.

The intervention of the State as well as of Local Authorities is omnipresent and partially compensates for the weakness of private means of financing innovation. Public funding includes grants, subsidies, repayable advances, loans, capital investment, and reductions in taxes and social security contributions.

Public funding has as many virtues as disadvantages, and one has to be discerning when it is used by startups. In particular, it is important to avoid spending too much time in the bureaucracy of some of the processes for allocating such funding.

Above all, it must be careful not to become an "aid hunter", an activity that is mechanically deployed to the detriment of the search for clients. As a first approach, we will, therefore, give priority to generic funding and aid (Bpifrance, CIR, JEL, .etc.) and we will be very cautious about funding collaborative projects, which can easily become time traps that distract startups from strategic priorities and their clients.

The lack of resources for the development of the innovation ecosystem leaves room for large corporations to deploy their Open Innovation plans, in proposing various approaches, that we investigate in the next section.

3.2 Focus on French CAC 40 corporations open innovation plans

French index CAC 40 is composed of 40 values that must meet certain criteria such as Market capitalization, Liquidity with a large float, Sectoral representativeness (Ahmadi, 2018). It is one of the leading indexes of one of the most active market operators in Europe: Euronext, which also includes the Brussels, Amsterdam, and Lisbon stock exchanges [108].

This leads to a ranking of 40 large corporations.

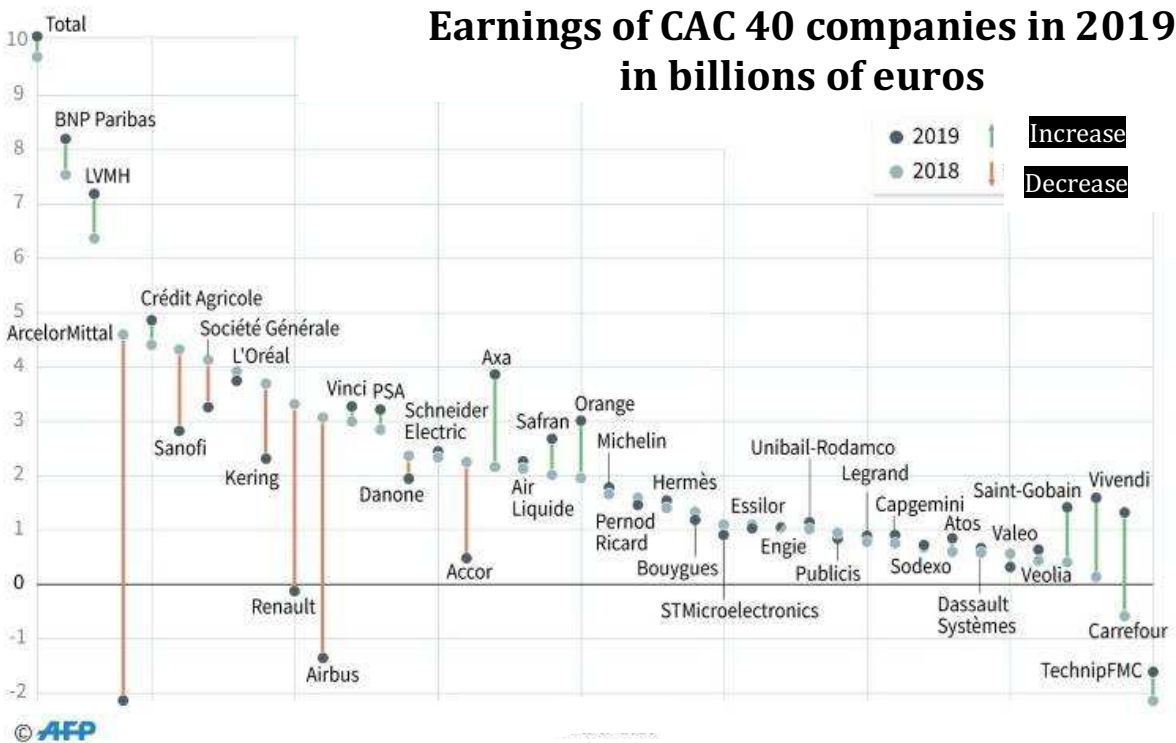


Figure 7 2019 CAC 40 earnings (Source AFP)

The evolution of the CAC 40 reflects the general trend in the performance of large French companies in the financial markets. It is the most popular stock market index in Paris. A drop in the CAC 40 is interpreted by stakeholders as a decrease in the health of the French economy.

We will focus on the rationale to limit our work on the French ecosystem with the voluntarist actions of the French government, the open innovation approaches of top French large corporations, the dynamic of startups. We also identify what motivates such a collaboration.

Historically, the French government has chosen to favor the development of national champions in the field of industries [109]: Engie for energy, Thales for high tech, Orange for telecommunication, etc. Since about 2008, it has also encouraged the emergence and growth of digital startups.

Innovation and partnership accelerate value creation. They are real sources of competitiveness and growth. To stay in the race for innovation, major groups have no choice but to collaborate with startups.

3.2.1 Cash resources of Large corporations

Large corporations have an interesting characteristic: they are single market, [110] and risk-averse. According to the Banque de France 2017 report [111], overall, in 2017, return on equity significantly exceeded the 10% threshold for the top 80 French companies. At the end of 2017, the cash position of major groups continued to consolidate and reached a record level over the period, at €203 billion. The cash position of the 80 main groups has increased by 30.1% since the end of 2013.

The accumulation of liquidity concerns three sectors (Industry - Energy and Environment, Transport - Accommodation and construction). It is mainly driven by the industrial sector, which benefits from favorable operating conditions and posted a €10 billion increase in cash and cash equivalents, an increase of 12.3% compared to 2016.

On the other hand, companies in the distribution and services, and technology, media, and telecommunications sectors had to draw on their cash resources (respectively -€2 billion and -€5 billion) to finance their increasing investments and remunerate their shareholders.

In 2019, the CAC 40 companies generated nearly 80 billion euros in cumulative net profits last year, Figure 7 slightly down in 2018. This represents a drop of 11.27% compared to the previous year's figure (€88.37 billion) and 17.65% compared to the peak reached in 2017 (€96.54 billion). The cumulative turnover of France's flagship companies thus reached €1,387 billion. This is 46 billion more than in 2018 (1,341 billion) and 95 billion more than in 2017 (€1,292 billion).

French large corporations are addressing a “very” single market. They rely on size, scale effects to counter competition rather than innovation; this was enough to control their sector. For example, Accor Hotels has captive customers and as the hotel park is very expensive, they did not need to innovate. Then, Airbnb arrived and disrupt the French market. Indeed, while Airbnb claims 5 million homes in more than 190 countries in barely 10 years. According to Accor website, the hotel group took 50 years to become the owner of 650,000 hotel rooms. In reaction to Airbnb competition, Accor started a digital transformation in acquiring startups often in sectors adjacent to the hotel industry.

In 2015, AccorHotels acquired Wipolo, a startup that developed a mobile application to assist travelers, or entered into a partnership with OnePark, another startup specializing in sharing unused private parking spaces. In 2018, the hotel group Accor has acquired an interest in two Internet platforms for the rental of high-end apartments and villas, including concierge services: Oasis Collections and Squarebreak.

As the French corporations are challenged by startups, we decided to focus our study on CAC40 large corporations' open innovation approach towards startups.

3.2.2 The growing influence of French startups

In 2017, EY/France Digital barometer on « *La performance économique et social des startups numériques en France* » [112] shown that the influence of startup accelerators

and incubators is constantly growing - to the point of becoming, and this is a recent trend, an almost necessary step. 55% of startups under 5 years old use incubators.

On the other hand, public support remains a major trend in the French ecosystem - and a real national specificity: in 2017 most startups use the various tax benefits set up by the French authorities. 72% of startups benefited in 2016 from the Tax Credit for Competitiveness and Employment (CICE), 56% from the Research Tax Credit (CIR), and 52% from the Young Innovative Company (JEI) status, which entitles them to tax exemptions.

Over the year 2017, 2.5B€ were invested in the first half of 2019, French startups raised a record 2.79B€, up 43% from the previous year, and the size of their fundraises is increasing. France is behind the UK, which raised 5.30B€ (+75%) but ahead of Germany, which raised 2.47B€ (+4 %).

There are now 13 unicorns (companies with a value of more than 1 B€) in France, according to Dealroom. co (<https://dealroom.co>), after funding rounds this year boosted the valuations of Doctolib (medical bookings), Meero (photography), and Ivalua (sourcing software). In Europe, France is now second to the UK in terms of potential future unicorns, defined as companies valued between 250M\$ and 1B\$, said the data provider.

“Over the year 2017, 2.5 billion euros were invested in our startups, these amounts had more than tripled in three years. (...) If Engie, LVMH, La Poste, Publicis, Orange, Sanofi have today developed investment in startups as much as they have in the past, it is because they have understood that innovation comes from there. Our attractiveness is the face we give, the reforms we carry, and the talents we have and want to succeed (...) I need you to attract the rest of the world and make the whole country succeed”⁵. This presidential elocution summarizes the goals of the current French policy towards innovation: how to benefit from the strong large corporations to create a soil of expertise, infrastructures, talents, and markets for the innovative startups.

In France, innovation is always associated with technology [113] and large corporations are targeting a single-market [114]. Large corporations rely on scale effects to counter competition rather than innovation. This was enough to control a sector, until the « uberization » of some parts of the economic domain. We note this very specific event is also a root cause for Open Innovation for large corporations [115]

This startups dynamism leads the French government to clearly state its goal is two-fold: to make Paris the leading tech destination in Europe (it is targeting 25 unicorns by 2025) and to raise Europe’s game on the global stage. *“We must move the French economy from a catch-up economy that was built after the second world war to an innovation economy,” he said. “We want to be able to make global technology leaders emerge from Europe in the coming years to compete with America and China. This is essential if we want to keep our sovereignty and our competitiveness but also create jobs.”* The French tech visa is designed to address a talent bottleneck, said Mr. O⁶. *“Brexit is an opportunity for us, but we want to make Paris a truly international place, to bring people from India, China, Africa, and the US.”* But not all government plans have won praise. In September 2020, France unveiled a list

⁵ Emmanuel Macron during the 2018 Vivatech fair.

⁶ Cédric O, France’s digital economy minister

of 40 tech companies it would give extra support and promotion, as potential successors to the companies in the benchmark CAC 40 index.

3.3 Conclusion of the chapter 3

So, we can conclude that the French startup ecosystem is dynamic with strong involvement of different stakeholders (institutional support, and traditional industries and services, financing system, etc.). The large corporations are very present and then there is a strong investment of the French state with various policies. This ecosystem which presents a certain maturity and success deserves to be studied in more depth.

CHAPTER 4 Core concepts supporting our research

This chapter presents the core concepts from the state of the art which will help us to build our research.

4.1 Open innovation plans offered by large corporations

From the point of view of Open Innovation, we focus on a kind of outside-in approach of the large corporations targeting startups having an inside-out strategy. Modulo the fact that most of the time, large corporations' intention is not to absorb the knowledge and the technology of the startups but to develop and boost their ecosystem.

The more relevant recent frameworks representing the degree of engagement of corporations with a startup will be described as follows:

- Weiblen, et al. [2], through an inductive analysis of a set of semi-directive interviews of executives and managers of large corporations, propose a typology of Corporate Engagement distinguishing between outside-in and inside-out approaches. Then, it presents a typology of corporate mechanisms to engage with startups balancing agility with strategic direction.
- Kohler [116] proposes a classification regarding the type of engagement approach of the large corporations to analyze how interactions between startups and large corporations can create value.
- The World Economic Forum issued a white paper [117] to improve the mutual understanding of the risks and challenges from both a large corporation and startup point of view.

Framework	Weiblen, Chesbrough 2015		Kohler,2016		WEF,2018		This research
Typology of engagement	Label	definition	Label	definition	Label	definition	retained definition
Supplier Customer	Not covered		Not covered		Direct sourcing	Startups and corporates interact as regular business partners without any internal channeling or intermediaries.	There is a direct contract between the startup and the large corporation. the procurement department is involved and may have most of the time adapted processes to suit startup specificities
Innovation Team	Not covered		Corporate Hackathon	The collaboration of diverse teams within a restricted time limit to solve a corporate innovation challenge	Internal innovation unit	Coordinating all corporate innovation activities and securing board-level sponsorship, and presenting a single contact point to guide the interactions of co-innovating startups with all other divisions of the corporation.	Large corporations set up a team dedicated to accelerating some innovation projects in co-developing with startups projects through proof of concepts, experimentation, etc.,
Startups Incubator/ Accelerator	"corporation incubator"	Corporate incubators provide the nascent venture with funding, co-location, expertise, and contacts	Business incubator	Company-supported flexible working space with additional value-added services such as centralized legal or marketing support	Corporate incubator	The incubator offers its resident startups various resources	Large corporations open incubators and accelerators to host startups relevant to their ecosystem.
Venture Builder	"startup program (platform)"	On making interesting startup products or technologies available to the sponsoring organization by enabling multiple startups to elaborate and deliver on their ideas.	Not covered		External subsidiary	The corporation establishes – and funds as a separate entity – a subsidiary dedicated to the development of innovative technologies.	Large corporations create external legal entities to develop new ventures, new startups with dedicated team crowdfunding. Projects can be external projects corporations or in-house projects.
					Entrepreneurship model	The corporation establishes – and funds as a separate entity – a subsidiary dedicated to the development of innovative technologies.	
Corporate Venture	Corporate venturing	A separate corporate venture entity that is exclusively funded by the sponsoring corporation.	Corporate venturing	Permitting organization to participate in the success of external innovation helps help in pain insights into non-core markets and access to capabilities	Not covered		Large corporations dedicated capital structure to investing startups with a much more flexible mechanism than the Merge and Acquisition department

Table 3 Definitions of the open innovation plans adopted in our work

4.1.1 Comparison of the different models Model adopted in this work

The studies described above focus on the maturity of the organization rather than on the operational dimensions of the open innovation plans themselves. That is the reason why we propose to structure the proposed methodology based on standards, as these capture the good practices, and to adopt a model from the World Economic Forum (WEF), whose mission is to support cooperation between private and public sectors. Indeed, during the first phase of our research, the model from the World Economic Forum [117] was identified as being the most complete. Then, during an exploratory phase of this study, the typology proposed by the WEF was submitted to a set of the heads of open innovation departments from large corporations. They challenged this typology on three aspects. However, the vocabulary used in this document is not that we can meet in large corporations. Therefore, the vocabulary to facilitate interactions with the business needs to be adapted.

First, two models (subsidiary model and entrepreneurial co-creation) present overlaps and were the same most of the time. Consequently, these two entities were merged under the umbrella of a “*venture builder*” category. In addition, the corporate venture capital based on the model of a venture capitalist is missing. Therefore, this model was added to our first typology that we introduce in the next sections.

4.1.2 Presentation of the Model adopted in this work

In the paragraphs below we detail the model adopted for this research.

Supplier/customer

In the case of a direct partnership, we consider that the startup supplies a product and/or service to the corporate and there is no risk-sharing during the collaboration. Sjödin [118] shows that the procurement department of large corporations has to adapt their processes, in coordination with startups.

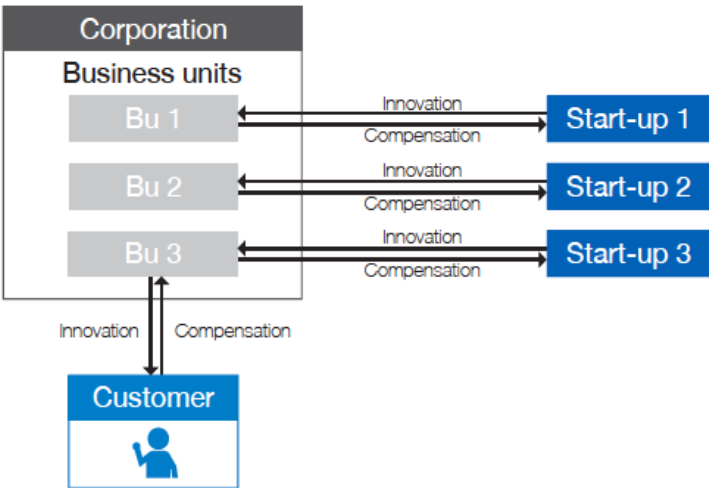


Figure 8 Supplier/customer approach (source WEF)

In this type of relationship, there is a direct contract between the startup and the large corporation. The procurement department is involved and may have most of the time

adapted processes to suit startup specificities (simplified contracts, no need for warranty, etc...).

Consequently, the procurement department is integrated into all aspects of partnerships and considers what can be achieved in terms of contract management and financing. Indeed, it will be important to adapt to the financial constraints of startups by setting up an appropriate operating framework for each party.

This customer/supplier relationship helps to develop a healthy dynamic for the startup. Below, we propose to take a deep dive into the innovation plans presented in the table above.

Innovation team for co-development

In this relationship, large corporations set up a team dedicated to accelerating some innovation projects in co-developing with startups projects through proof of concepts, experimentation, etc...

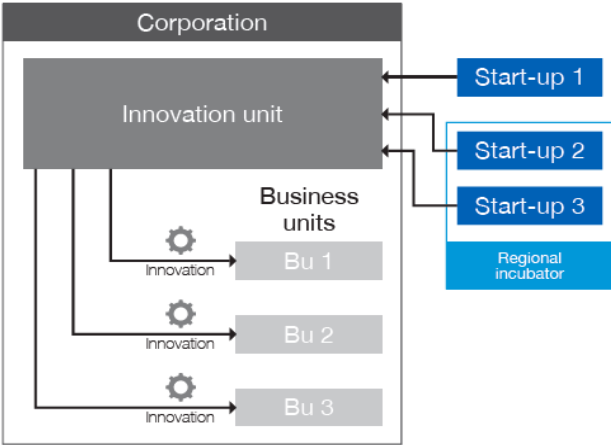


Figure 9 Innovation team (source WEF)

Like a platform, the role of these departments is mapped towards 3 main missions: to impulse, equip, and connect.

Impulse a startup culture in the broadest sense, gather and disseminate the best practices of the most advanced BUs and create a fertile and more startup-friendly environment for new internal actors.

Equip with tools propose "safeguards" methodologies in rationalize and better manage collaborations

Connect to be a matchmaking operator between the innovation strategy, the definition of use cases and the needs of BUs, startups qualified to meet them.

They are the main entity point for startups and they facilitate the relationships with other entities in the large corporation, nevertheless, they are also the bottleneck with their limited headcounts.

Corporate incubator

Large corporations open incubators and accelerators to host startups relevant to their ecosystem.

The objective of industrial groups is to encourage the emergence of startups that will make it possible to adapt the group's activities to the specific features of the new economy, to use new technologies, scientific or other discoveries, to promote the development of their activities or to diversify into related activities. Pettersen [119] shows that essentially business incubation provides startups with network resources.

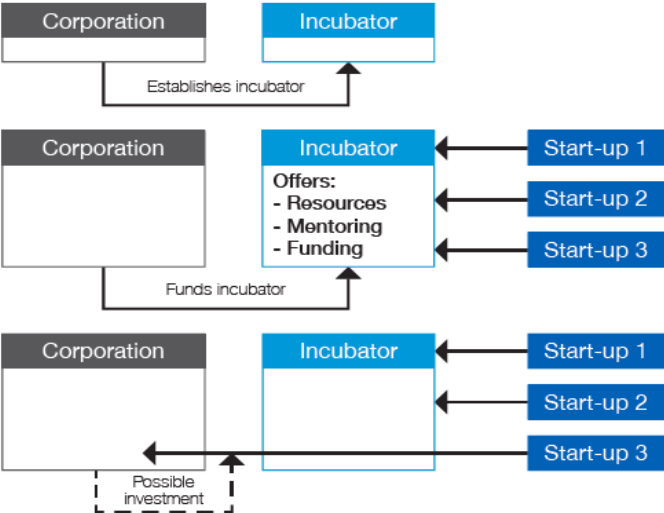


Figure 10 Startups Incubator/ accelerator (source WEF)

Corporate incubators offer tangible resources like office space, as well as intangible resources like consulting services. But their purpose is also to animate internal networking and cross-fertilization between startups [120]. Furthermore, business incubators help hosted startups to build networks with external organizations, [121]. In a nutshell, business incubators foster startups' access to information, knowledge, branding, and insights captured from a variety of sources such as customers, suppliers, competitors, R&D institutions, and governmental bodies [122].

For a startup, it is therefore essential to distinguish between a well-known incubator and a corporate incubator. In the first case, the startup is exposed to the risks of associating with a known brand, without significant support in its development. On the other hand, in the second case, a mutual interest will allow for equitable collaboration and a significant exchange of resources and business. Incubation will then probably be a powerful growth lever for the startup.

Venture Builder

The basic idea behind a startup studio, venture builder, or a venture studio is twofold [123]:

1. Do not create a single startup at a time and develop several companies in parallel.
2. Capitalize on the experience and shared resources to launch a startup with a better chance of success.

In a nutshell, a venture builder is a hybrid model located between the incubator, the investment fund, and the accelerator. Now large corporations have translated this concept into corporate venture builder. Large corporations create external legal entities

to develop a new venture: new startups with dedicated team and funding. Projects can be external projects to large corporations or in-house projects.

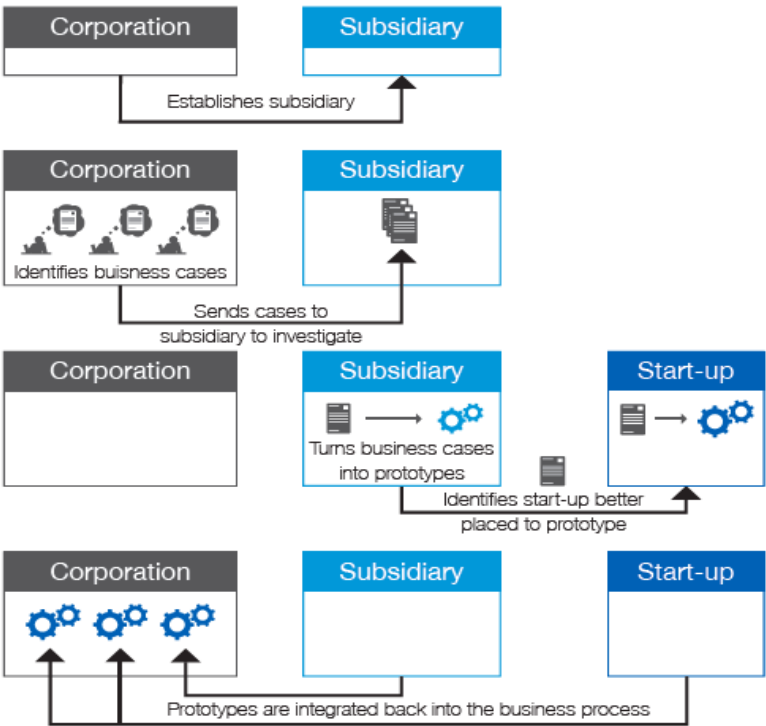


Figure 11 Venture builder (WEF and our research)

From a startup’s perspective, this hybrid model is interesting for an entrepreneur who wants to develop his entrepreneurial skills. The question of the return of investment from the large corporations can be Damocles sword for the venture, and the strategy of the startup strongly influences by the large corporations. As one of the main drivers of a startup is the disruption of a sector, some frictions may stop the venture development.

Corporate Venture Capital

Corporate venturing refers to the development of dedicated venture capital structures within large corporations, enabling them to acquire a direct stake in innovative small companies. Large corporations develop a dedicated capital structure to invest in startups with a much more flexible mechanism than the Merge and Acquisition department. Equity participation in early-stage companies is no longer restricted to traditional investment actors. This new trend also shows that venture investment is now seen as an integral part of the company's strategy.

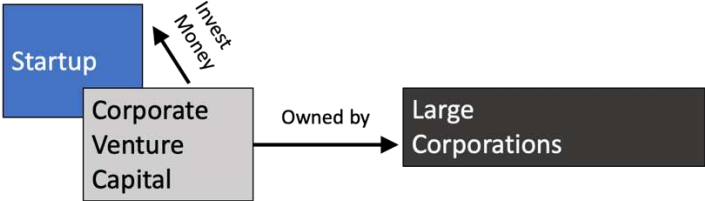


Figure 12 Corporate Venture (our research)

Large corporations propose one or several plans based on these models depending on their open innovation strategy and their capabilities. Once the large corporation has launched one or several plans, they have to source startups. We propose in chapter 1 a presentation of the concept of the startup and its objective to grow. It might be relevant to investigate the evolution of a startup and identify any maturity stages and the associated needs for each stage.

4.2 Startup maturity stages concept

As startups are looking for a profitable business model, they are seeking funding, the team (talents), and ground for development (data, competencies, sights, talents, prototyping means) [124]. But they are not able to seek everything in parallel, they have different maturity stages with different needs for each stage.

We present in the following subsections how we create the classification to get startups maturity stages. We propose a deep dive into the development stages of a startup.

4.2.1 State of the art on the articulation of the development stages of a startup

Steve Blank is a serial entrepreneur who proposed a scientific approach to entrepreneurship with a customer development method, the origin of the lean startup movement [125]. Blank [126] defined the main steps of a successful startup (defined as an organization searching for a repeatable and scalable business model) before being a large corporation. Blank proposed three phases: search, build and grow. He describes these three steps in using Marketing and sales, financial, and organizational angles. It means that it is possible to describe the different phases of a startup with the same domains. Nevertheless, Steve Blank addresses startup targeting growth to answer investors' requests.

One of the students of Steve Blank was Eric Ries in Blank's class on entrepreneurship at UC Berkeley. There, Eric Ries gleaned the "customer development" (method of fast customer feedback) and reused elements of Lean Software development to develop Lean Startup. His method is based on three main steps:

1. Understand the problem and define the solution.
2. Create a minimum viable product.
3. Run experiments and repeat.

This model is designed for digital startups, based on service, where the development of the minimum viable product can be done at low cost, and experiments and customer feedback can be rapidly processed. These steps are described in terms of actions to be performed and does not cover the small-scale-up deployment of the solutions. We propose in the paragraph below to analyze the failures of the startups to capture their needs and analyze if these needs may help to get a classification for the startup maturity levels.

4.2.1.1 Startups' needs a centric approach based on a Forensic analysis of failed startups

CB insights [127] proposes an analysis of 339 startup failure post-mortems by founders and investors. Startups' goodbye letters published on the internet were compiled from 2014 to 2020. All startups are US based and have a website on the internet.

Nevertheless, the identified origins of failures are universal and can be classified into 3 categories: the product/market, the organization, the finance.

The product/market

- The value proposition does not address a point of pain in the targeted customer segments.
- The team is not sufficiently attentive to its market and competition analysis was not sufficient.
- The selling price does not cover the costs. The price is not in line with the added value perceived by the customer.
- The product/service is not easy to use.
- The right time to enter a market is missed.

The Organization

- lack of competencies, diversity, and complementarity in the team to address business, technical, and organizational challenges.
- lack of focus because of the leadership.
- Discrepancies between investors and co-founders.
- Lack of networking to ask for assistance, a reflection on a project, a little time to challenge.
- Missed pivot at the right time in turning a decision too slowly or postponing a decision to a product, or a strategic decision.

The Finance

- Lack of cash.
- Inability to attract investors and raise funds.

This study helps us to understand that the market, the organization and the finance are key dimensions to consider for the success of startups. Nevertheless, they are not necessarily exhaustive, in the next paragraph, we investigate if innovation management standards can bring this exhaustivity.

4.2.1.2 Innovation stages in the ISO 56002 innovation management standards

ISO published ISO 56002:2019 from ISO 56000 series. It proposes guidance for an innovation management system. This standard is based on the structure of ISO 9001, articulated by ISO in High-Level Structure (a kind of standard table of contents for all management systems). As most of the large corporations are certified ISO 9001 and have developed a business management system or corporate management system, they will be able to easily integrate ISO 56002:2019 into their management system. This standard will play a major role in the systematic articulation of the innovation management system, especially for large corporations.

ISO 56002:2019 proposes a project management process with 5 steps:

Stage	Stage 0	Stage 1	Stage 2	Stage 3	Stage 4
ISO 56002:2019	Identify opportunities	Create concepts	Validate concepts	Develop solutions	Deploy solutions

Table 4 Presentation of startup stages based on ISO56002:2019 classification

As ISO standards are largely recognized, we use the above table as a basis to name the different maturity stages of the startups' development. As we use the terminology of ISO 56002:2019 to name the different stages, we propose to integrate the practices captured in the innovation management standards to design the maturity grid. We discuss in this section our rationale for the selection of the standard, and how we adapted a standard addressing all types of organizations to the specific context of large corporations.

In its preamble section, ISO 56002:2019 specifies that the standard is not appropriate for startups. Therefore, the vocabulary and the approach of each stage must be adapted from the perspective of the relationship between startups and corporations.

During the creation of ISO 56002:2019, French standards were considered as source documents (AFNOR, 2013) [128]. Unlike the former ISO 56002:2019, the French standard has been designed to address all types of organizations including the startups. The expected impact for the beneficiaries has therefore been analyzed following five main domains, as proposed by the AFNOR FDX 50-271:2013 French standard on innovation management.

So, we updated the terminology of AFNOR FDX 50-271:2013 with the terminology of ISO 56002:2019 for innovation stages, we adapted the vocabulary to startup environment, and added consideration captured in [129] which is a document with specific recommendations for startups from a consortium of public and private organizations supporting startups in France. This adaptation is available in the Appendix D - Startup development process.

4.3 Innovation management domains concept

We understood the specific context of open innovation in large corporations and startups, we need to create a bridge between these two partners for open innovation considerations.

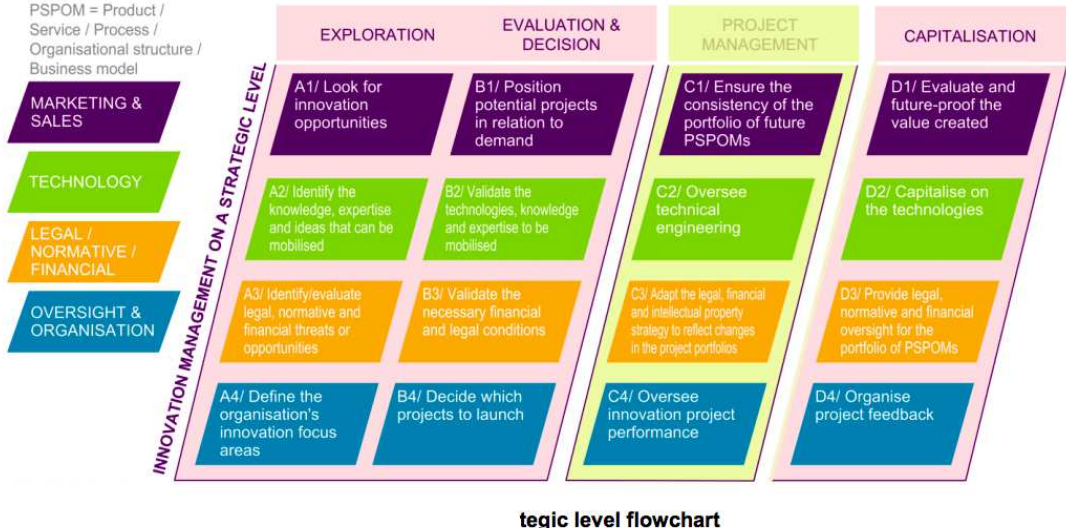
The first international standard on the subject has just been published in July 2019: ISO 56002:2019 "Innovation management - Innovation management system - Recommendations": It covers all aspects of innovation management, from the initial stages of reflection where ideas are generated to the marketing of a new product, taking into account many factors: the context in which the organization operates, culture, strategy, process, and impact. It covers a variety of creative activities related to products and services, business models, organizational innovations, and all types of organizations, regardless of their size and structure.

Our two maturity grids (from the startups and open innovation plans perspectives) need to have in common their domain of comparison. We propose to use the domains proposed

by the French standards in innovation management, as ISO 56002:2019 [130] is less detailed from an operational point of view.

AFNOR proposed the FD X50-271 guide to innovation management [131] which describes a complete process, including a strategic level and an operational level. The entire process and the two levels involve four areas of expertise, which can be found internally within the company or outsourced: the marketing and sales function; the technological function (technical expertise and methods); the legal, normative and, financial function; and management and organization. The guide proposed by AFNOR allows a step-by-step implementation of the approach, accompanied by sheets of good practices explaining for each step and each area of competence the why, how, with whom and, with what [131]. This guide can be used by all forms of organizations, especially SMEs, to enable them to set up real management of their innovation. It applies to all types of innovations.

From a strategic point of view:



From a project point of view (zoom on project management stages):



Figure 13 Synoptic diagram from NF FDX 50-271

4 innovation management domains are considered in this synoptic diagram.

Marketing and sales:

This domain encompasses everything related to the deployment and dissemination of innovation project results to customers or users.

The startup goal is to create a repeatable process with savings of scale. It doesn't always work at the first try and the offer needs adjustment, called product-market fit defined by [132] as “*being in a good market with a product that can satisfy that market*”. The first sales are experimental and managed by the founders. They make it possible to validate the product and make it evolve. Once the product and sales process are stabilized, this startup can start recruiting salespeople or even a sales manager

Technology:

In addition to the scientific and technical aspects of product and process innovation, this domain covers all the technologies and methods to be implemented for all types of innovation.

To be industrialized, an innovation project follows a development process. The more the technology is in a state of discovery, the more uncertain its applicability is and the riskier its operation. The risk is multifactorial. Different scales have therefore been defined to precisely grasp each factor and consolidate an overall assessment: one widely used scale is the Technology Readiness Level (TRL) developed by NASA [133].

Legal/normative & Finance:

The organization needs to manage intellectual property issues, factor in the normative framework. Protecting and enhancing company assets is often strategic for a startup in many stages of the life of the startup, including the corporate fundraising of venture capital, the protection of its growth against its competitors and, exit by acquisition. A clear intellectual property situation will also facilitate relationships with a large corporation.

The organization needs to manage intellectual property issues, factor in the normative framework and, manage all financial aspects. The funding of a startup serves as fuel for the creation of its supply and then to its growth when incomes are not yet where they are insufficient. The means of financing are numerous and to be mixed according to the structure, ambitions, needs, and level of maturity of the projects. A startup is generally financed in several stages to accompany the needs of the startup.

Organization:

This domain encompasses process control, resource management and, regular reporting on process progress. When startups are just getting started, no organization is necessary for the most part because the team is so small, and everyone is so connected. But as they grow the question of how to organize quickly becomes important. Once that happens, there is a right way for almost all startups to organize: a functional organization with cross-functional teams focused on particular areas.

4.4 Maturity grid concept

Can we consolidate the level of support of open innovation plans or the startup maturity level with a synthetic maturity scale?

To answer this question, we propose to understand the purpose of a maturity grid, then analyze some of the most used maturity grids in different areas, such as Quality, Software Engineering, System Engineering, Innovation Degrees, and an attempt at maturity grid for startups and large corporations' relationships.

In the following paragraphs, we go through the most well-known maturity grids to understand the mechanics to define those indicators and to design these maturity grids with the operational and systematic approaches of our research

4.4.1 Purpose of maturity grid

Andersen and Jessen, [134] studied maturity in organizations. They define it as the maximum degree of development, which means the optimal organizational framework to achieve objectives.

According to [135], maturity grids can be applied to all processes in all companies to retrieve higher performance. Maturity grids are structures exhibiting the necessary steps to reach the maximum level of a phenomenon to be measured.

For Dooley, et al. [136], process maturity is *"the degree to which a process is defined, managed, measured and, continuously improved. The different levels of maturity are therefore broken down."*

Maturity grids can be grouped into two families [137]: maturity and aptitude models represented by the Capability Maturity Model Integration (CMMI) model, and maturity grids.

The purpose of a maturity grid (also called maturity models) is to evaluate the practices in a given area within an organization that contributes to the dynamic of evolution of this area. The notion of evolution is implicitly included in this notion of maturity, which suggests that the organization may go through several intermediate stages on the road to maturity[137]. Maturity grids are frameworks that help to assess the maturity level in a specific domain. It is an assessment tool for evaluating an organization's level of progress towards a goal.

4.4.2 Maturity grid to measure organizational capabilities

The concept of maturity is understood as a measure to analyze organizational capabilities by observing operations, behaviors, attitudes, and competencies, [138]. This is usually represented by a set of cumulative stages, where higher stages build on the requirements of the lower ones.

4.4.2.1 Maturity grid design with a quality approach

Historically maturity models are derived from quality management and are based on the assumption that to improve the quality of a product, the quality of the processes supporting its development must be improved [139]. These models focus essentially on the processes considered as the integrating framework between the 3 possible levers to improve an organization, namely: human resources, tools, and procedures.

The Process Maturity Grid assesses the performance of an organization or process on five levels. It is of the following type:

Quality Management Maturity Grid (Crosby)		Assessor:			Department:	
Measurement Categories	Stage 1: <i>Uncertainty</i>	Stage 2: <i>Awakening</i>	Stage 3: <i>Enlightenment</i>	Stage 4: <i>Wisdom</i>	Stage 5: <i>Certainty</i>	
Management understanding and attitude	No comprehension of quality as a management tool. Tend to blame quality department for "quality problems".	Recognising that quality management may be of value but not willing to provide money or time to make it all happen.	While going through quality improvement programme learn more about quality management; becoming supportive and helpful.	Participating. Understand absolutes of quality management. Recognise their personal role in continuing emphasis.	Consider quality management as an essential part of company system.	
Quality organisation status	Quality is hidden in manufacturing or engineering departments. Inspection probably not part of organisation. Emphasis on appraisal and sorting.	A stronger quality leader is appointed but main emphasis is still on appraisal and moving the product. Still part of manufacturing or other.	Quality department reports to top management, all appraisal is incorporated and manager has role in management of company.	Quality manager is an officer of company; effective status reporting and preventive action. Involved with customer affairs and special assignments.	Quality manager on board of directors. Prevention is main concern. Quality is a thought leader.	
Problem handling	Problems are fought as they occur; no resolution; inadequate definition; lots of yelling and accusations.	Teams are set up to attack major problems. Long-range solutions are not solicited.	Corrective action communication established. Problems are faced openly and resolved in an orderly way.	Problems are identified early in their development. All functions are open to suggestion and improvement.	Except in the most unusual cases, problems are prevented.	
Cost of quality as % of sales	Reported: Unknown Actual: 20%	Reported: 3% Actual: 18%	Reported: 8% Actual: 12%	Reported: 6.5% Actual: 8%	Reported: 2.5% Actual: 2.5%	
Quality improvement actions	No organised activities. No understanding of such activities	Trying obvious "motivational" short-range efforts.	Implementation of a multi-step programme (e.g. Crosby's 14-step) with thorough understanding and establishment of each step.	Continuing the multi-step programme and starting other pro-active / preventive product quality initiatives.	Quality improvement is a normal and continued activity.	
Summary of company quality posture	"We don't know why we have problems with quality".	"Is it absolutely necessary to always have problems with quality?"	"Through management commitment and quality improvement we are identifying and resolving our problems."	"Defect prevention is a routine part of our operation."	"We know why we do not have problems with quality."	

Table 5 Quality management maturity grid (Crosby, 1979)

This maturity grid has been designed to improve the process performance of organizations against a static referential. It does not aim at developing relationships between different actors and its scope does not cover temporary organizations such as startups. Of course, this quality grid inspired the ISO 9001 standard. Nevertheless, ISO 9001 does not propose a progression, only requirement to be certified.

4.4.2.2 Maturity model in software engineering

The first CMMI (capability maturity model integration) model was developed for the field of software engineering in 1991 by the SEI (Software Engineering Institute). It was a request from the US Department of Defense to assess the ability of software suppliers to deliver a product matching the requirements on time, on cost, and quality. In 2006, SEI developed a model called CMMI standing for 'Capability Maturity Model Integration for Development'.

The vision of CMMI is that Systems and Software Engineering management are guided by models, data, and facts showing how to predict performance. The practice of managing engineering work is recognized beyond the responsibility of management, in other words at all levels and in every related activity.

The CMMI model proposes to evaluate process areas. For each process area, the objectives to be met and the practices to be applied by the organization to achieve these objectives are specified. The model proposes to apprehend the improvement of these processes according to two different representations: continuous or staged.

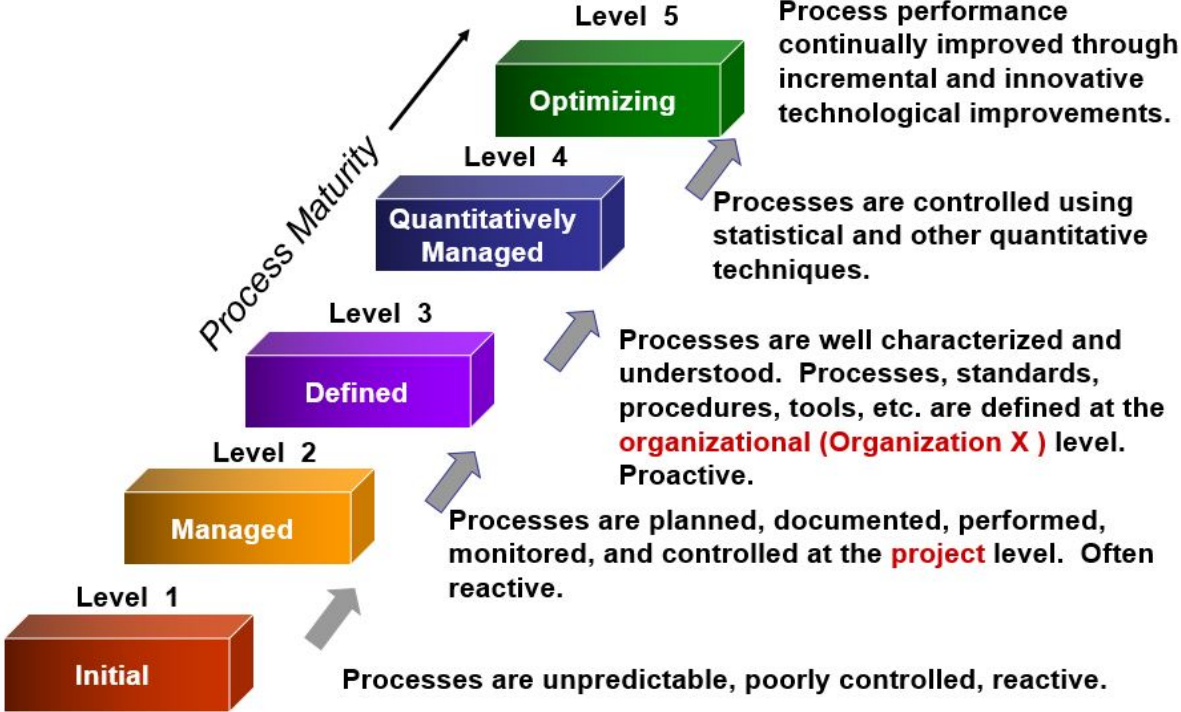


Figure 14 Process maturity levels from CMMI (source: CCMI)

The CMMI model associates two types of levels: level of aptitude (continuous representation) and level of maturity (tiered representation). Continuous representation gives an organization greater visibility of its acquired skills for each process area. Tiered representation provides an organization with visibility on its specific skills characterized by each level of maturity and thus allows it to improve in an incremental and predefined manner. CMMI model has become a method for assessing maturity in terms of product or service development with a view to improvement.

Since that date, other models - some of which are complementary or competing - have been developed, such as systems engineering, personnel development and management, and process and product development integration. We present them in the next section

4.4.2.3 Maturity level in System Engineering

Systems engineering covers all the activities involved in managing projects for the effective construction of a system based on its architectural decomposition. This process classically takes the form of a "V cycle" in an industrial environment which can be described as the succession of the following engineering phases:

- the needs analysis phase, i.e., the definition of the mission of the system.

- the system specification & design phase, in which the requirements that the system must satisfy to fulfill the mission, the subsystems into which it is recursively broken down and, the interactions that exist between these subsystems are defined.
- the development phase of the components that make up the system and all its subsystems.
- the system integration phase, i.e., the construction of the system by progressively assembling all the components of the system and testing the conformity of the system to the requirements initially defined (verification & validation).
- the operational qualification phase, i.e., testing the conformity of the system with the operational requirements.

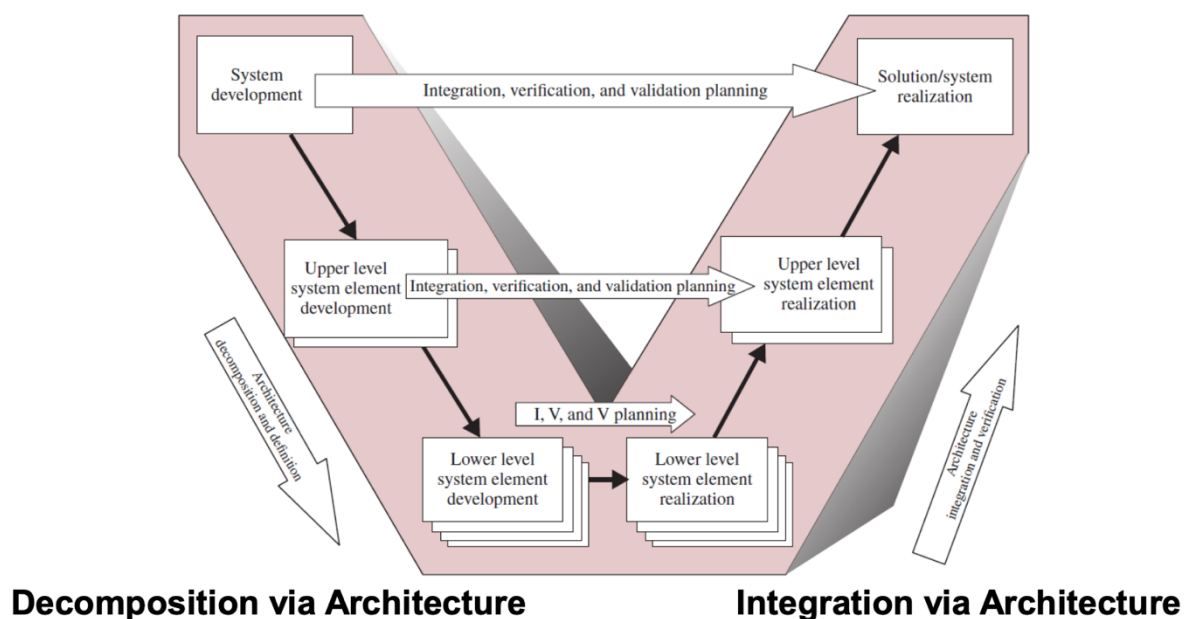


Figure 15 “V Model”, Systems Engineering Handbook, 4th Edition; INCOSE, Pg. 34

Note that the next two fundamental phases of the V cycle (which correspond to the two branches of the V) are naturally defined from the point of view of the recursive decomposition of a system:

- the engineering phase consists in defining the system decomposition tree from the root, starting from a high-level requirements analysis, and then specifying and defining the system more and more precisely,
- the integration phase consists in going through the decomposition tree of the leaf system to the root to interconnect the concrete elements corresponding to the previously established definitions while testing the system as it goes along.

System Engineering and System Integration phases are misaligned on the way of working. In particular of the System Engineering process, has been recognized as one of the causes of the difficulties of the relationships of organizations working on a common project [140]. This difficulty is due to the organization is characterized by different levels of

maturity of its businesses. About this, Carnegie Mellon University defined a model of application of the System Engineering process based on different “maturity levels”, like those defined for Software Development (the two models have been unified in a common Maturity Model, CMMI).

The model identifies specific core areas of the System Engineering process, at the center of the picture, and some others partly overlapped with adjacent processes. For each area, a set of activities and sub-activities are established, whose level of refinement depends on the aimed maturity level. The model allows each organization to establish measurable objectives parameters to verify its effectiveness to possibly plan improvement actions.

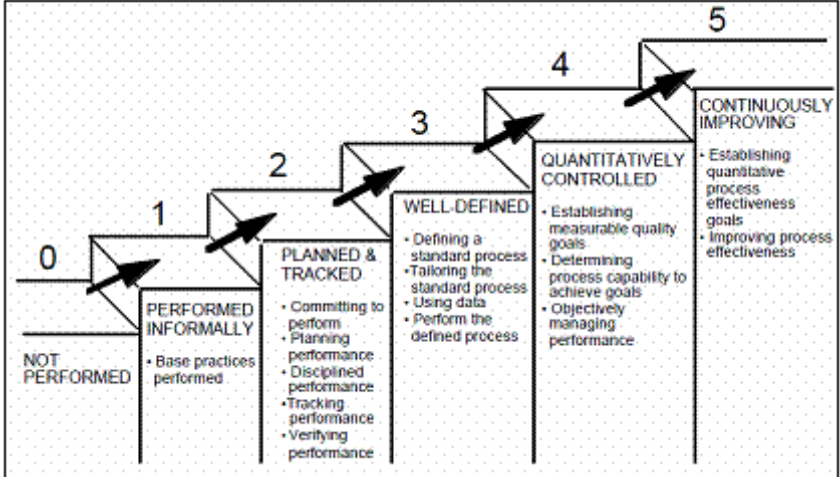


Figure 16 Maturity level representation of System Engineering (source: CMMI)

These methodologies target measurement of maturity at a project level. We propose to investigate in the next paragraph how the maturity level approach can be considered at give the enhanced level.

4.4.3 Maturity grid based on innovation degrees

Following the seminal research work of Chiesa et al. [141] recent studies have proposed adapted metrics related to the innovative processes within businesses. Maturity grids have played a role to develop this field of knowledge, opening a new path to understanding and seeking to master the complex nature of the innovation process as proposed by Boly [142].

Among the existing innovation metrics, the Potential Innovation Index (PII)[143], has been structured under the bases of maturity grids. It is based on a set of internal practices and observable facts, in line with the evolution path of innovation metrics outlined above. This index simultaneously incorporates two of the main characteristics that should provide indicators of innovation capability: first, it defines the measurement of processes related to innovation. Second, the index used must be structured as a multi-criteria approach because innovation involves different processes and practices[144]. Moreover, the PII is computed using a multi-criteria aggregation of a set of six internal practices, including Creativity, New Product Development (NPD), Human Resources Management (HRM), Strategy, Project Management (PM) and, Knowledge Management (KM)[145].

Since its first appearance, the PII has been used to measure the innovation potential of more than 400 businesses, both through direct interviews and a web-based self-assessment tool (<http://innovation-way.com/en/>) [146], [143], [147], [148].

Claire, et al. [149] present how maturity degrees can be understood as levels of sophistication, in taking into account both the degree of novelty and complexity. The aim is to determine the minimum threshold profile to develop optimally the project. The methodology is applied to two innovation projects with different degrees of novelty and complexity.

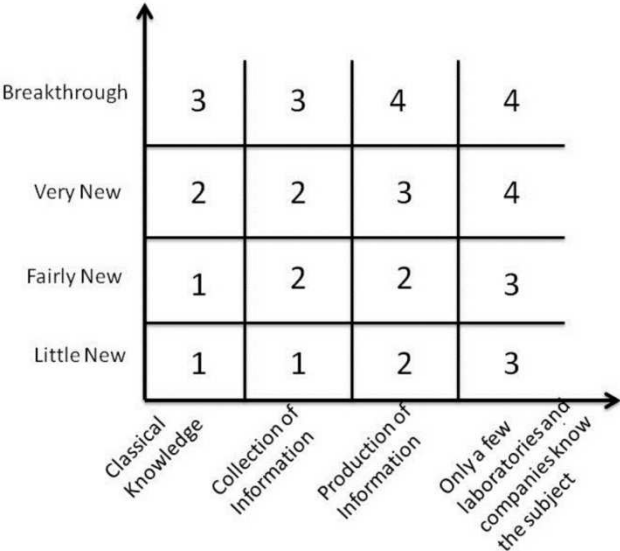


Figure 17 Matrix of the degree of novelty of an innovation [149]

They propose a methodology that provides an overview of the company's internal capabilities to manage a project. It is based on a multi-criteria vision that matches the multidimensional nature of an innovation project. Innovation capabilities of the company are also measured by multi-criteria methods [149]

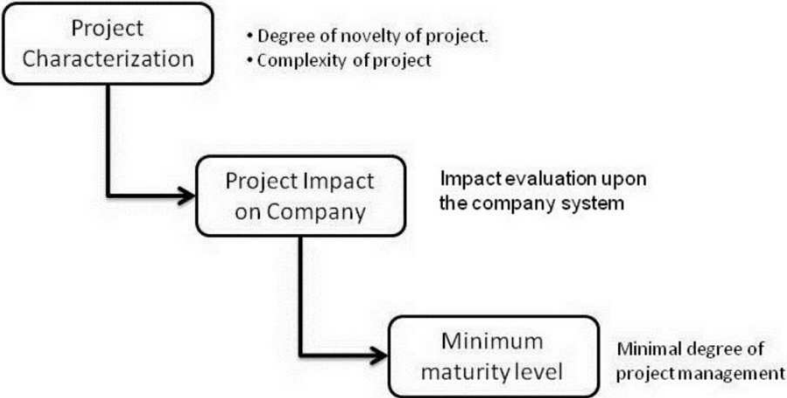


Figure 18 Matrix of the degree of novelty of an innovation [149]

4.4.4 Methodology to design a support degree grid

Since their original application to quality management [139], maturity grids have been applied to a wide range of areas, for example in information technology [150], construction [151], product design [152], communication [153], and innovation management among others fields. Maturity grids can be used as an assessment and

improvement tool; they also provide organizations with a better understanding of existing capabilities and enable benchmarking against a range of competitors.

During the last decade, maturity model research has focused on taking a more structured approach to the development of their models [154]. One of the first procedural models for the development of maturity models was introduced by De Bruin et al., 2005, who proposed 18 important design decisions within six phases of developing a maturity model [155]. Based on this, [153] has developed a roadmap, that is, a method for the development of maturity grids, with four phases and 13 decision points.

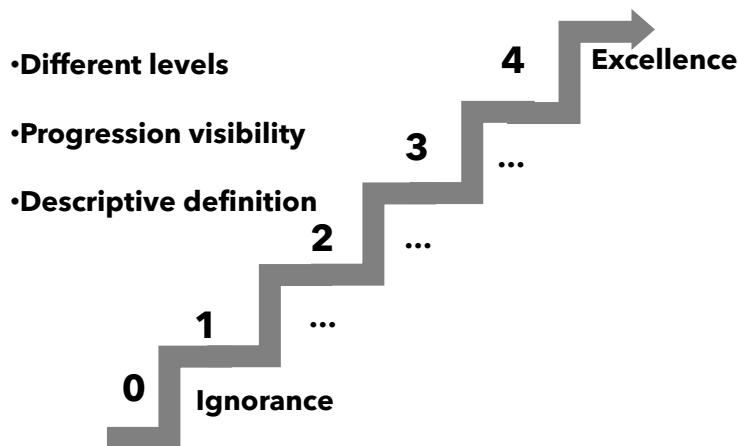


Figure 19 Design principles of a maturity grid

As presented in Figure 19, a review of these models allows us to derive high-level principles we will follow in defining our innovation maturity grids:

- *Several levels:* the maturity grid can be constructed according to different configurations and sizes to best suit the requirements of the features or the process to be measured. For example, Hammer [156] proposes an audit of the performance in terms of organization and management of companies based on 4 levels of maturity. Szakonyi [157] uses 6 levels of development to measure the coordination between R&D and marketing services within a company. The levels in the grid must follow a strictly ascending order that shows the path to maturity, which also makes it possible to associate an increasing numerical value to each level.
- *Descriptive definition:* the different levels are defined using text descriptions that facilitate understanding of the grid [153]. This feature has an advantage over measurement methods based on rating scales or the weak/medium/strong type, where the assessment remains more subjective because the same situation can be evaluated as an average by a person and as a weak by a more demanding one. The descriptive definition avoids differences of appreciation between assessors.
- *Visibility of the progression:* the ascending order of the maturity grids makes it possible to know all the possible states of a company to reach the maximum level. This is very useful for defining a strategy or an improvement plan because the manager visualizes the steps to be undertaken which results in the following sequences in the maturity grid.

The grid (with a matrix format) typically lists the criteria. Each cell describes, in a few words, the typical behavior/results exhibited by an organization at each level of maturity.

4.5 Conclusion of the chapter 4

We presented the core concepts coming from the state of the art and supporting our research. They will help us in the chapter 7 to build a framework answering the question of research presented in the chapter 5.

CHAPTER 5 Directions for research

5.1 The Stakes of this work

Why having a more efficient relationship between the startup and large corporations? As presented in the first chapters, a startup is a SME from a legal point of view. But whereas most SMEs are satisfied with a few tens or hundreds of customers and smooth growth of incomes, the startup is constantly looking for strong growth that will allow it to become a large company. So, the startups have a pivotal role in the innovation ecosystem. They can take more risks than large corporations and are more agile. Nevertheless, within an innovation ecosystem, the success of a startup does not depend solely on the company itself, but also on external partners. The question of strategy then arises differently [158]. It is no longer just a question of positioning itself in a competitive environment to capture value, but also to act on this environment, as an actor engaged in a process of co-creation of value [159].

Having efficient relationships in the innovation ecosystem has a deep impact on the local economy. This is why we show it in chapter 3, several innovation plans were adapted to the regional context. Furthermore, we highlight that the policies are focused on financial support or network development and not on business activities. That is the reason why there is room for private support, which is de facto connected with the market, customers.

As presented in chapter 3 and in chapter 4, there is an abundance of open innovation plans targeting startups at different maturity stages. As a matter of fact, for a startup, it might be hard to appreciate at the same time, its level of maturity, and the opportunities offered by an open innovation plan. Consequently, large corporations have a key role to lay in the innovation ecosystem in terms of the effective process when it comes to startups selection.

On the other hand, large corporations must compete with other plans to support startups (university incubators, public support plans, private incubators or accelerators, venture capitalists and, business angels...). Then they are pushed to excel in their startup support, in other words to source the relevant startups and market accurately for their open innovation plans.

5.2 Scope of the research

We identified a research gap between case studies and the literature regarding the setup and operations of an open innovation plan. If large corporations are looking for business efficiency and startups are looking for swift and efficient support, this leads to several questions: How can large corporations adapt their open innovation offering to startup concerns? How can we compare the different impacts of open innovation plans? How can we analyze the maturity of the open innovation plan rather than the maturity of the organization?

To fill in these gaps, we propose a maturity-grid-based approach as a tool to analyze the expected added value of open innovation measures proposed by large corporations. At this point, we propose to highlight two main aspects. Firstly, on the type of engagement and relationships between large corporations and startups, under an open innovation

approach. Secondly, on the domains that the development of a startup should consider under the lens of the new ISO standards on innovation management.

Scope of the research from a theoretical perspective: This research will participate in strategic management fields. Open innovation involvement requires also strategy decisions, in particular the acceptable openness level [160], [161]. Startups and large corporations do not have the same language, nor the same temporality, but they both have needs [162]. These needs influence their strategies. For everyone, working together is a choice but also a responsibility. What are the challenges to ensure successful business collaboration between corporates and startups? [163]. For large corporations, the biggest challenge is to be able to get closer to the constraints of startups and develop their innovation. For startups, the main need is to know how to be supported and to demonstrate their ability to exist in the long term.

Faced with the multiplicity of possible partners, companies must define upstream which open innovation strategy they wish to implement, around questions such as: with whom to collaborate? on what subject? how? how often? Most of them choose a progressive opening, both on the network of partners and the range of subjects concerned. Indeed, open innovation is not necessarily synonymous with total openness and we have identified three types of approach: open innovation oriented towards certain themes, open innovation oriented towards certain partners and, completely open innovation.

Scope of the research from a practitioner perspective

We survey the characteristics of open innovation in France and examine the challenges of open innovation theory. The French innovation ecosystem is vibrant and strongly supported by French government actions [164]. Nevertheless, the support of the private sector is also important in the French open innovation landscape. So, we focus on CAC 40 French large corporations and investigate their relationships with startups. CAC40 gathers large corporations with diversified profiles (hospitality services, oil and gas, automotive, civil engineering, bank, telecom operators...). This diversity will help to support the genericity of the approach

5.3 Our scientific question

Large corporations such as Xerox [165], IBM [166], and Procter & Gamble [167], Nokia [168], and Deutsche Telekom [169] were early adopters of open innovation with startups. So, it shows that open innovation impacts different types of industries as well as different geographic areas of the world.

To understand the impact of the open innovation phenomenon, it is important to consider its two faces: *outside-in* and *inside-out* [170]. Outside-in covers the situation where corporations capture external sources of knowledge and acquire technologies externally. On the other hand, inside-out refers to the actions where corporations export knowledge and technologies that are developed internally.

In our work, we focus on a kind of outside-in approach of the large corporation targeting startups having an inside-out strategy. In particular, we seek to understand, how do we measure the engagement of large corporations as a springboard for innovation by

startups? How do we define the maturity degree of large corporations' open innovation plans?

Measuring the engagement with open innovation may focus on the maturity of the organization [23], on the open innovation practices in business activities [171], [24], or the quality of the relationships themselves, with the cultural dimensions [25]. Nevertheless, as stated by [26], we have to consider the polymorphism of open innovation relationships, and also the transactional costs of collaborations [27]. The cost of the opening is not yet well defined and further studies are needed to understand all the mechanisms [28], [29]. Laursen [172] shows that there is a strong relationship between the degree of support and performance. We found that open innovation is often studied from a macro level and rarely from an operational level to assess the impacts and maturity of the different open innovation measures. Few papers are focusing on the operational aspects of the innovation. For example, Bertin [31] identifies the organizational factors favoring collaboration but does not cover the other aspects of innovation management.

Greco [173] performs a literature review about empirical studies on open innovation in Europe. He found that the effect of the open innovation process and product innovations were always positive in the reviewed articles. This article shows how open innovation improves innovation performance but did not analyze open innovation from a cost/benefit perspective. More precisely, they identify the lack of longitudinal studies regarding the adoption of open innovation actions and the evolution of their impact on organizational innovation performance. They analyze some measurements of innovation performance. To make this analysis, they propose a novel taxonomy for open innovation consisting of four categories (inbound, outbound, coupled and, internal), six sub-classes (strategies, customers, suppliers, research institutions, competitors, foreign organizations), and two dimensions (depth and breadth). Unfortunately, their measurement is not focused on startup/large corporations' relationships.

We intend to analyze the specificities of these relationships in terms of indicator, as in the open innovation plan, startups are looking for excellence domains of large corporations and large corporations are looking for answering startups needs. Open innovation consists of bringing external knowledge, competencies, and resources into the innovation processes. In creating a large network of partner organizations with the knowledge to innovate faster. Open innovation is implemented through cross-functional processes breaking silos among different diverse departments, such as procurement, supply chain, marketing and sales, R&D legal, finance... The success of this approach depends on various factors, such as innovation strategy, organizational culture, the ability of implementation, the ecosystem, the industry, the region...

5.4 Conclusion of part 5 and the part I: the research question

The analysis of the state of the art allows us to conclude that in the research field of the relationships between startups and large corporations, there is no comprehensive and operational analytical framework to compare the modes of relationships. As a consequence, this research aims to design an analytical framework with a systematic and operational approach and articulate our research questions below.

Research Question:

How to show the adequation between the needs of a startup and an open innovation plan of a large corporation by proposing a framework for a systematic and exhaustive analysis of the relationships between large corporations and startups?

- **What are the startups' needs? Are they evolving as the startup becomes more mature?**
- **How to design tools for a systematic and exhaustive understanding of the open innovation plans and the support provided?**
- **Is there an approach to identify the adequation between startup's needs and large corporation supports?**

In the next part, we present the methodology to build a framework answering this question and the instantiation of this methodology for our context of research: the relationships between large corporations and startups.

Based on our context analysis in part I, we conclude on the need to get an operational and systematic framework to analyze open innovation relationships between startups and large corporations.

In part II, the chapter 6 describes a generic methodological approach to compare the relationships between two partners.

In chapter 7, we propose an instantiation of this methodology to create a framework comparing the open innovation plans supporting startups based on the core concepts presented in chapter 4.

PART II METHODOLOGY FOR FRAMEWORK DESIGN TO COMPARE OPEN INNOVATION PLANS FOR STARTUP

"One of my fears is being this big, slow, constipated, bureaucratic company that's happy with its success"

Mark Parke CEO of Nike

CHAPTER 6 The methodological approach to design a framework analyzing relationships between two types of partners

After giving an overview of the methodology to compare the relationships between two partners, we present each step of the methodology and discuss the approach in this chapter.

6.1 End to end overview of our 4 steps methodology

We propose a representation of our 4 steps generic methodology in the figure below in figure 20.

This methodology aims at analyzing the relationships between two types of actors, consequently, it is deployed in parallel for both actors to allow the analysis.

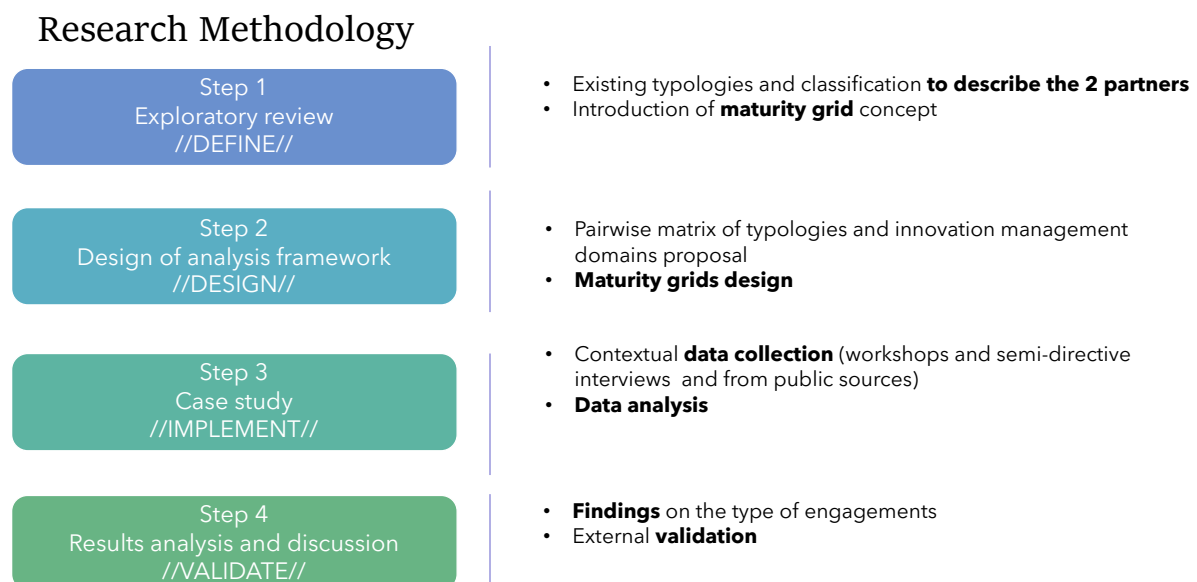


Figure 20 Our 4 steps methodology deployed in parallel for the 2 different partners

The first step consists in defining the core concepts based on the state of the art and associated classification. We propose to discuss the classification approach and to identify the core concepts we need to define and design classification.

The second step addresses the design of the framework to analyze the relationships between two partners based on the core concepts defined in the first step.

The third step shows how to implement the framework through data collection based on the practitioner's interview. The aggregated results are consolidated in heat maps.

Finally, in the fourth step, the results are presented to external stakeholders to the research, as a validation step to get feedback and other perspectives on how to improve the framework.

6.2 In-depth explanation of our 4 steps methodology

/DEFINE / Classification approach of a concept

In part I, we have given the required definitions of the concepts as a starting point to frame the context. Now, we go one step further in the understanding of the presented concepts with the classification approach. We propose to discuss the classification approach.

Jacob [174] defines categorization as any grouping based on similarity. In proposing a definition for a concept, we generated a tag for the concept only. We need to divide a concept into classes to refine our approach, so it involves a formalized, predefined system of organization: it is the classification approach. As we want this system of organization to be as exhaustive as possible, we need a deep dive into the existing classifications from the research literature and the practitioner contributions to define a classification as exhaustive as possible.

/DESIGN/ Maturity grid design

At this step, we design the framework with maturity grids. The concept of the maturity grids is detailed above in section 4.4. To design our maturity grids, we need to describe each level. The difficulties consist in defining these typical behaviors/results and best practices at each level. How to capture best practices to design maturity grids?

A good practice is a successful experience that has been tested and replicated in different contexts and can, therefore, be recommended as a model. It deserves to be shared so that more people can adapt and adopt it.

By capitalizing and sharing good practice, any organization can learn from its own experiences and those of others. This provides an opportunity to turn knowledge into action and to build capacity to improve results and respond more quickly and effectively to different types of crises or changes that may arise.

If steps are not taken to analyze, capitalize and share the knowledge gained in programs and projects, mistakes are likely to be repeated, successful experiences may be forgotten and opportunities to improve practices lost.

A practice often evolves through a four-step process. Initially, a potential innovation, new technique or technology being piloted has minimal evidence of results. Then, after being repeatedly tested in a specific context, it becomes a promising practice; that is, a practice that is effective in a specific context, but represents a risk if applied in a different context. Finally, when its effectiveness has been proven to have been successfully replicated in multiple contexts, the practice can be qualified as good practice and be widely shared so that it can be adapted and adopted by others. In some cases, a good practice may evolve to become institutionalized, for example when it is used as a basis for formulating a policy or standard.

The idea of standards started with the idea of sharing common measures for weight and length [175]. [176] show how the standards are mainly targeting the interoperability in technology, information, and communication issues. In the '80s a growing need to improve quality happened in particular in the automotive suppliers' ecosystem. The ISO

9000 family of quality management systems (QMS) is a set of standards that helps organizations to ensure they meet customers and other stakeholder needs within requirements related to a management system.

[177] shows that knowledge loss resulting from a retiring workforce continues to be a management nightmare. Then, many organizations developed strategies to document mission-critical knowledge with standards documentation. Standards became interesting as source of practices. Different types of standards are developed by national and international standardization bodies.

Terminology standards

They are generally the first step of standardization. Sharing the same vocabulary is mandatory before any work. It clarifies the concept behind each word and then obviously limits misunderstanding behind two parties having different backgrounds. This first step is also necessary to define the standardization boundaries: it will support the development of the standards documents but also mobilize the stakeholder. Indeed, as the terminology is one of the first documents published, this document gives visibility to the working group, and then generally new members are joining.

Technical specifications

Like interfaces, standards concentrate on technologies and technical works. All the stakeholders have to be around the table to debate, share, and establish relevant specifications, which would be widely adopted. This family of documents requires the involvement of an efficient rapporteur to drive the agenda, moderate the discussions and coordinate the writing activities. There are big stakes behind this kind of document, each company or consortium of companies wanting to see his in-house technology adopted by the community to capture any potential market, including a significant portion of key patents necessary to implement the standard. Performance standards describe the minimum set of performances that a product or a service may fulfill to be compliant. This family of standards can also crystallize some market frictions. A company wanting to penalize a competitor may propose (and see enforced) unreachable, non-relevant, or out of scope performances.

Management standards

They are nowadays often known as management systems, and support companies in the creation of their internal policies. They facilitate the relationships between different partners for co-development, research (common technical interfaces), procurement relationship (decision chain identified), or supply chain management (common quality control), etc. They are also a powerful tool to disseminate good practices and to improve the efficacy in organizations.

[178] presents Management standards through Management Systems standards (MSS): MSS set out requirements or guidance to help organizations to articulate their policies and processes. MSS are designed to be applicable across all economic sectors, various types and sizes of organizations and, diverse geographical, cultural, and social conditions. By bringing a methodical and harmonized approach, complex concepts such as quality management are defined in a way that is easy to grasp and implement. But more than this, ISO Standards have proven potential to save money through more efficient use of resources, such as energy. What is less well known is that ISO management systems offer the same benefits to smaller businesses as they do to multinationals.

/IMPLEMENT/ Implementation of our framework

To implement our framework, we propose the following steps:

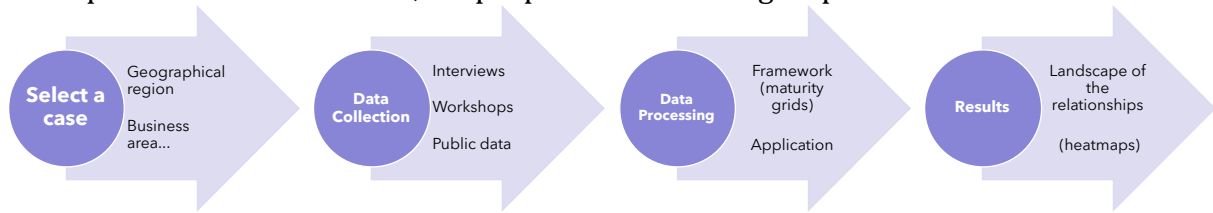


Figure 21 Implementation of the framework

The first step consists in selecting a case, it can be a specific geographical region or a business area. Data needs to be collected from the field.

These data are the result of interviews with the stakeholders of the selected case. To visualize these data, we propose a heatmap, giving a numerical result (average of the levels or degrees of the maturity scale) for each pair.

As the data collection is critical in this phase, we propose to discuss the interview approaches to collect data and the questionnaire approach.

Implementation with a set of interviews from a targeted audience

The interview has several advantages depending on the objectives, it allows:

- The analysis of the meaning that the actors give to their practice and to the events to which they are confronted with their value systems their normative reference points, their interpretations of conflict situations, etc.
- The analysis of a specific problem: its data, its stakes, the different parties in the conflict, presence, relationship systems, etc.
- The reconstruction of a process of action, experiences, or events from the past.

Types of interview approach:

There are three types of approaches. In general, it is the research topic that determines the type of interview the researcher can use [179].

Non-directive interview: In this type of interview, the respondent announces the topic of the interview without asking direct questions. It gives the respondent the freedom to organize his or her speech as he or she wishes. The interviewer's role, in this case, is not to encourage the informant to speak. On the contrary, he or she should adopt a neutral position. And he must appear as a person capable of listening to and accepting what the informants say. The investigator can intervene but only to show his agreement through terms such as (yes, I see, I agree, then). The advantage of this type of interview is that it is accessible to several people because it does not require any particular skills. However, it has the disadvantage that it does not delimit the precise subject on which the informant will speak. As a result, the informant approaches the topic of the survey in a general way.

The directive interview: This type of interview is similar to the questionnaire method. Indeed, before going into the field, the researcher establishes a series of specific questions that he or she will ask the interviewees. To compare the data scientifically, the researcher will ask the same questions to all the interviewees. Of course, this type of interview is reassuring for the researcher. The researcher arrives with a series of pre-established questions. However, it only leaves the respondent a small amount of room for maneuver. Because of the limits that the interviewer places on him or her, the respondent will not have much freedom to express himself or herself.

Semi-directive interview: This third type of interview falls between directive and nondirective interviewing. It is characterized by the fact that it leaves the interviewer a large enough space to share a point of view. The interviewer asks questions and lets the respondent answer freely. The role of the interviewer is to encourage the interviewee to talk and to give more information on the subject of his or her research. The questions asked in this type of interview are open-ended. The interviewer must refocus them so as not to lose sight of the goals he or she has set.

In our specific context, we kept the semi-directive interview for its flexibility capabilities.

Implementation in appealing to a cohort through social networks

It is very complex to get feedback from startups on their strategy as they focus on their operations and they are very secretive of their strategy. So, we propose to use an appealing cohort methodology which is based on the principle of surveying a target population. Social media platforms allow the creation and mobilization of the target population through online communities. These communities bring together people who share the same needs, context and exchange information. Consequently, we will launch a questionnaire survey as it is a tool widely used by researchers to analyze and understand a phenomenon thanks to the collected data and at a very low cost. It is simple to set up and generally inexpensive, especially since the democratization of the online questionnaire.

The questionnaire is a method of gathering information to explain and understand facts. Unlike interviews, which is an individual method, the questionnaire is only a collective method. In the following section, we will study how to design a relevant questionnaire for our purpose.

There are two main types of structure [180]:

- *The open-ended questionnaire:* in this type of questionnaire, the order of the questions and their wording are fixed. However, the participant can express himself or herself as long as he or she wishes, and it might be difficult to compare the results.
- *The closed questionnaire:* in the closed questionnaire, the questions and the list of proposals to be submitted to the participant are fixed in advance. They are pre-coded. This allows the speaker to make the best possible choice.

Since it is a question of aggregating and comparing the answers, the questionnaire will always take a standardized form, and the answers will sometimes be pre-coded. Our

questionnaire survey aims to test the research hypotheses, by verifying the suggested correlations. So, we chose a closed questionnaire.

So the design of a questionnaire will make it possible to translate the indicators into questions and formulate them appropriately [181]. The wording of the questions is important to ensure that the language is appropriate to the respondent's language and that the questions are unambiguous in particular to avoid unclear grammatical formulas (e.g., double negation), and to ask neutral questions (without the risk of induced suggestions).

/VALIDATE/ Interview with external stakeholder

To validate the results, it is possible to identify external stakeholders and to adopt the following approach:

- First, present the results presenting the landscape (heatmaps).
- Then we continue the discussion in understanding the stakes of the interviewee to ensure that their opinion is relevant.
- Finally, they can use the results: what they would keep from our research, and what could be improved.

This step helps to understand the relevancy of the approach for the organizations. It is also helpful to get insights about how to continue this research.

6.3 Conclusion of the chapter 6

In conclusion, we proposed a methodology based on maturity grids built from good practices codified by standards.

Chapter 6 details our methodology in a generic manner. Chapter 7 presents an instance of our methodology and presents the expected framework to compare/benchmark open innovation plans and to measure the startups' maturity.

CHAPTER 7 The framework to analyze open innovation relationships between startups and large corporations

In this chapter, we propose an instantiation of the methodology presented in CHAPTER 6 for our specific context of the relationships between startups and large corporations.

The figure below presents the instantiation of the methodology for our research context: the large corporations and the startups



Steps from the generic methodology	Steps for the large corporations 	Steps for the startups 
Step 1 //DEFINE//	Innovation management domains Open innovation plans Startup maturity stages Maturity grid concept	
Step 2 //DESIGN//	2 dimensions maturity grid: open innovation plans and innovation management domains	2 dimensions maturity grid: maturity stages and innovation management domains
Step 3 //IMPLEMENT//	Interview of innovation managers of large companies	Appealing a cohort of startups
Step 4 //VALIDATE//	Presentation of the research results to external stakeholders	

Figure 22 Methodology to analyze the relationships between large corporations and startups

7.1 Articulation our core concepts

In CHAPTER 4 , we presented the 4 core concepts we use for the first step /DEFINE/ of our methodology: Open Innovation Plans, Innovation Management Domains, the startups’ maturity stages, and the maturity grids. The figure 23 below presents how these core concepts help us to build the framework.

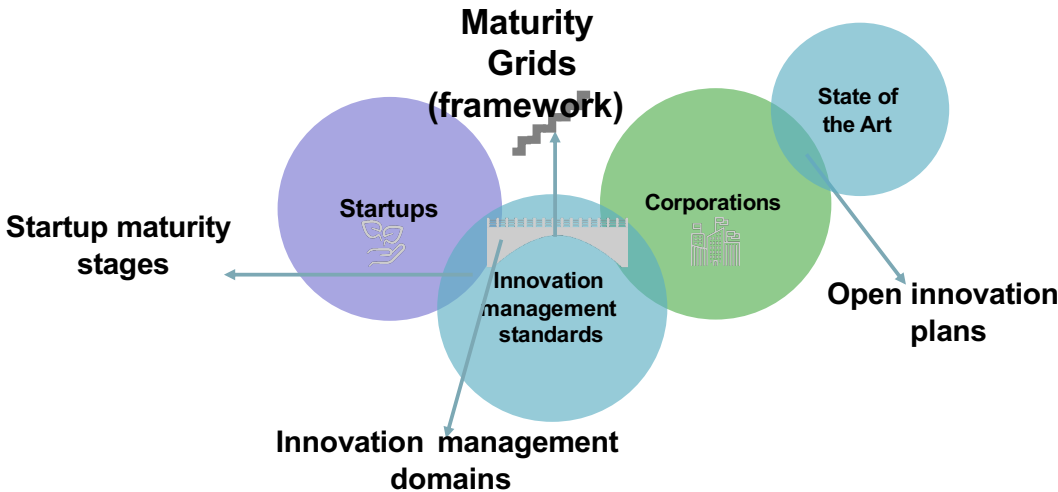


Figure 23 Relationship between 4 core concepts

The figure 23 above shows that the first core concept (section 4.1) of open innovation plans is based on an analysis of the state of art and helps us to classify the approaches of the large corporations. The second core concept (section 4.2) focuses on the startup's maturity stages based on the innovation management standards.

The innovation management standards (the third concept section 4.3) help us to create a bridge between the startups and the large corporations, so they can be the common dimension to build the maturity grids (the fourth concept, section 4.4).

Our framework is made of two maturity grids:

- One addressing the startups maturity. It is built in section 7.2, based on the core concept of the startups' maturity stages and the innovation management domains.
- The other addressing the large corporations' open innovation plans: we build it with the classification of the open innovations plans and the innovation management domains as presented section 7.3.

7.2 Instantiation of the framework for the startups

In section 4.2, we proposed different stages to describe the maturity of the startups. To obtain the maturity grid, we discuss each level of maturity grid in using the structure of the innovation management domains.

7.2.1 /DESIGN/ Maturity grids for startup

In the sections below, we propose an overview of the specificities of each development level of the startup given by innovation management standards and the state of the art.

	Identify opportunities	Create concepts	Validate concepts	Develop solutions	Deploy solutions	Startups maturity stages
Marketing & Sales						Analysis of FDX 50-271 (operation and strategy approaches) and ISO 56002 inputs (system approach) with a startup standpoint
Technology						
Legal						
Finance						
Organization						
Innovation Management Domains						

Figure 24 Design of Maturity grid for startups maturity stages

We now present how we structure these considerations following the different innovation management domains that obtain the maturity grid for startups. The synthesis is presented at the conclusion in **Erreur ! Source du renvoi introuvable.**

7.2.2 Identify opportunities, embryonic startup, and their needs

At this stage, the startup is financed by the own funds of the founder. The Ideation is the starting point for the growth of a startup. The following challenges have met to generate growth:

- Define the positioning of the offering.
- Define a relevant business model.
- Define the unique value proposition.
- Consolidate a vision.

As the startup is rarely incorporated at this stage, we won't consider this early stage in our maturity grid: startups rarely benefit from the support of large corporations.

7.2.2.1 Create concepts, the birth of the startup

The startup focuses on project and feasibility studies, research and development studies, as well as financial, accounting and, legal services. In this phase, there are a lot of uncertainties regarding team and execution capabilities. The seed capital phase is used to introduce the project. This step helps to nurture the idea of the startup with the hope that this idea will evolve into a mature operational company with the help and perseverance of investors.

Seed capital provides the necessary funds to support the company's initial market research and development work (which product for which target customers). This first financing also makes it possible to recruit a team (often entrepreneurs work alone at the beginning of the project).

The key players in this phase are mainly the founders, their family and, friends ("love money"). There may also be business angels or seed capital companies specializing in these risky operations.

Typically, from a financial dimension, the funds raised during the seed phase are generally between €100k and €500k depending on the company [182].

The startup focuses on project and feasibility studies, research and development studies, as well as financial, accounting and, legal services. In this phase, there are a lot of uncertainties regarding team and execution capabilities.

The seed capital phase is used to introduce the project, just like planting a seed capital. This step helps to nurture the idea of the startup with the hope that this idea will evolve into a mature operational company with the help and perseverance of investors. The challenges to be met to generate growth:

- Create a Minimum Viable Product and test it.
- Define a customer acquisition strategy.
- Work on the Marketing Personas.
- Recruit the necessary technical skills.

7.2.3 Validate concepts

The startup uses relating effectively the product/service, then to acquire first customers. The startup delivers a Minimum Viable Product (MVP) which is the unfinished version of

a new product that collects as much validated information as possible about its customers while requiring as little effort as possible.

The vocation of the corporate incubator of startups is to develop innovation and agility. Corporate incubators can therefore easily be qualified according to the work of [183] as a structure “adhocratic”. The latter requires the implementation of genuine coordination to respond to this twofold global mission: to support companies’ internal startups and to produce innovation with them. This coordination refers to managerial work adaptation for its adoption and marks the intentionality, novelty, and operability specific to managerial innovation. As a result the research field of managerial innovation becomes an original ground to investigate the dissemination/adoption of corporate incubators and more broadly open innovation[184].

7.2.3.1 Develop solutions

The startup focuses on a complex transition: from a company with a potential of growth to a company with a great offering with rapid and predictable growth.

This round table consists in taking the company to the next level, beyond the development stage. Investors help startups by broadening the commercial reach. The stakes are higher for investors who have an idea at this stage of what the company should look like and what they can expect to gain.

Building a high-performance product and expanding a team requires qualities in talent recruitment. Strengthening the business development, sales, advertising, technical, support and, other teams are the biggest costs for the company at this stage.

The processes and actors of Series B are similar to Series A. Series B is generally led by the same players as the previous round with the difference of adding new venture capital funds specialized in financing more mature companies. The funds raised are generally between €2m and €10m.

The challenges to be met to generate growth:

- Develop the functionalities of startup offers. The businesses or market Pivot based on the market feedback.
- Accelerate the customer acquisition strategy.
- Define a customer retention strategy.
- Launch the first Marketing campaigns.
- Define and monitor the right performance indicators.
- Recruit management profiles.

7.2.3.2 Deploy solutions

Scale-up is a startup that has grown considerably, both internally and externally, and that would continue its strong growth by meeting long-term prospects that ensure relative strength.

At this stage, investors inject capital into successful companies. The objective for them is to double their initial investment, beyond a return on investment. This step consists in rapidly perfecting and expanding the already established activity of companies. One way to gain market share and gain more competitive advantage is to acquire (a foreign competitor, a complementary company).

Implementation of a reliable, agile and, robust information system, reorganization of roles and teams, implementation of agile and scalable processes, increased use of IT solutions, acquisition of new skills, the evolution of work tools, the evolution of the platform/product, choice of partners,

The challenges to be met to generate growth:

- Identify new markets or segments to conquer.
- Implement a Marketing strategy to accelerate growth.
- Use data to improve user experience, acquire new users and build their loyalty.
- Recruit quickly and well.
- Identify high-potential markets.
- Adapt the offering and marketing strategy to the characteristics of new markets.
- Industrialize and automate the marketing strategy.
- Strengthen the sales team.

7.2.3.3 Presentation of the Maturity grid of startups development

Based on the above considerations, we propose the table below to measure the maturity of the startups. This tool allows us to understand the variability of the needs of a startup during its development.

	Create concepts	Validate concepts	Develop solutions	Deploy solution
Description	The startup focuses on project and feasibility studies, research and development studies, as well as financial, accounting and, legal services. In this phase, there are many uncertainties regarding team and execution capabilities.	The startup focuses on creating effectively the product/service, then on the acquisition of the first customers. a Minimum Viable Product is the unfinished version of a new product that collects as much validated information as possible about its customers while requiring as little effort as possible.	The startup focuses on a complex transition: from a company with a great offering a potential of growth to a company with a great offering with rapid and predictable growth. The Series A round can happen if a first investor is convinced that a company could scale.	Startups that have successfully transformed their innovative product into a profitable business. Scale-up is a startup that has grown considerably, both internally and externally, and that would continue its strong growth by meeting long-term prospects that ensure relative strength.
Marketing and sale	Startup looks for business opportunities, in identifying a problem that needs to be solved.	Startup business models with the early customers of their target audience to identify the product-market fit for their offering.	Business development is started, to get the first contracts.	Business development optimizes the sales process (targets highly profitable markets) to allow the scale-up of the business.
Technology	Technologies can be scouted or developed by startups to solve the problem identified.	Startups focus on the prototyping and testing of their project.	Startups develop the first specification for the first stable release of the product or service.	Technology is optimized to scale the delivery of the products or the service.

Regulation and IPR	A study of freedom to operate supports startups in the elaboration of development strategy.	As the project is becoming more mature, startups can establish an IP management strategy as well as regulatory risk assessment.	As technology and business are mature, startups start to develop their IP and standardization strategy to mitigate IP and regulatory risks	Startups continue to develop their IP and standardization strategy to mitigate IP and regulatory risks.
The organization, project management	Startups founders are developing the business plan to prepare the funding of the next phase	Startups founders identify competencies need for the different activities listed above. These competencies are acquired by the recruitment of employees or outsourced.	Startups start first hiring to run the business and set up the first process to start scaling the business.	Startups increase hiring to support business growth.
Finance	Love money	Seed	Funds raising called Series A	Funds raising called Series B

Table 6 Startup maturity grid (our research)

7.2.4 /IMPLEMENT/ Appealing a startups cohort through social networks (virtual and in real life)

7.2.4.1 Design of the questionnaire

The design of a questionnaire makes it possible to translate the indicators into questions and formulate them appropriately [181].

The wording of the questions is important to ensure that the language is appropriate to the respondent's language and that the questions are unambiguous in particular to avoid unclear grammatical formulas (e.g., double negation), and to ask neutral questions (without the risk of induced suggestions). The questionnaire is available in Appendix C – Questionnaire for Startup maturity assessment, it was hosted on a cloud platform.

7.2.4.2 Selection of social networks to distribute the questionnaire

As discussed previously we decided to appeal to a cohort through social networks. There is a huge diversity of social networks: generalist or specialized social networks, professional social networks, mobile-only social networks. Here is the list of social networks, we selected:

Facebook

Facebook is the world's largest social network. Having become for many their gateway to the web, Facebook allows us to discover new content, follow the life of friends. Facebook also offers effective solutions to reach niche communities. That's the reason why we first launched the survey on Facebook startups groups where there is regularly request for many surveys to test an idea, about startups management, to get early users feedback...

LinkedIn

LinkedIn is a professional network allowing people to connect with their professional network: colleagues, partners, customers.

Network from the Real life

Building a network in Real life is part of professional tasks. We used the launch of this questionnaire to revitalize our network with CAC 40 managers and invited them to share the questionnaires with interesting startups hosted in their open innovation plans.

7.2.4.3 Results of the survey to collect startups feedbacks

Once we collect startups responses, we can analyze the results with different angles:

- with the participation of the questionnaire, we analyze the impact of our communication through different channels
- with the results by maturity level and type of corporate support, we present the landscape of the answering startups and the validity of our approach
- with a focus on startups supported by large corporations we measure the impact of corporate support on the different innovation management domains
- with a focus on the incubator/accelerator support, we present the limits of our survey
- at last, with the results for the startups without any corporate support, we analyze the results and compare them with the ones of the startups supported by a corporation.

7.3 Instantiation of the framework for the large corporations

7.3.1 / DESIGN / Design of maturity grid for open innovation plans of large corporations

The proposed framework is composed then by a pairwise matrix including two main areas based on the previously detailed concepts: the typologies of Corporation/Startup engagement models, and the 5 innovation management domains describing the expected impacts on the startup plans by a set of studied corporations.

7.3.1.1 The framework to design the maturity grid for open innovation relationships

The evaluation of every plan will be assessed thanks to the maturity grids approach. We propose to design a second maturity grid to compare the different plans, as it has proven to be an effective tool to study an existing situation, and as we can add a notion of effort level provided by the large corporation. Here, the concept of analysis is considered as a measure to quantify the level of support offered by large corporations [153].

The goal has been not only to identify the typology and domains but also the current degree of engagement with startups for each corporation; the evaluation of every plan will be assessed using a maturity grid approach, as presented in Appendix B - Description matrix of level of support offered by open innovation plans.

Presentation of the method for assessing the large corporation's engagement

Following the maturity grids, Appendix B shows the proposed assessment grid for each innovation domain, with the different levels of the implication for the large corporation being evaluated.

We propose to use the maturity grid methodology to compare the different plans so that it is possible to compare the different levels of effort for innovation plans per different domains of innovation management. This concept helps to analyze current practices and assessing them [149]. How do we design this maturity grid and identify the relevant practices to measure the different levels of support?

There are two dimensions in a maturity grid comparing the different open innovation plans:

- The different degrees of engagement (levels of effort by the large corporation)
- The different innovation management domains (Marketing and Sales, Technology, Legal, Finance, Organization)

To define these, we adapt the methodology proposed by [185]. We consider the level of engagement of the large corporations, i.e., the level of effort for the large corporation to provide this service: from the lowest 0 (no support) to the most engaging for the large corporation, Level 5 (support for operations) as shown in Figure 25. We detail the construction of this table in the following sections.

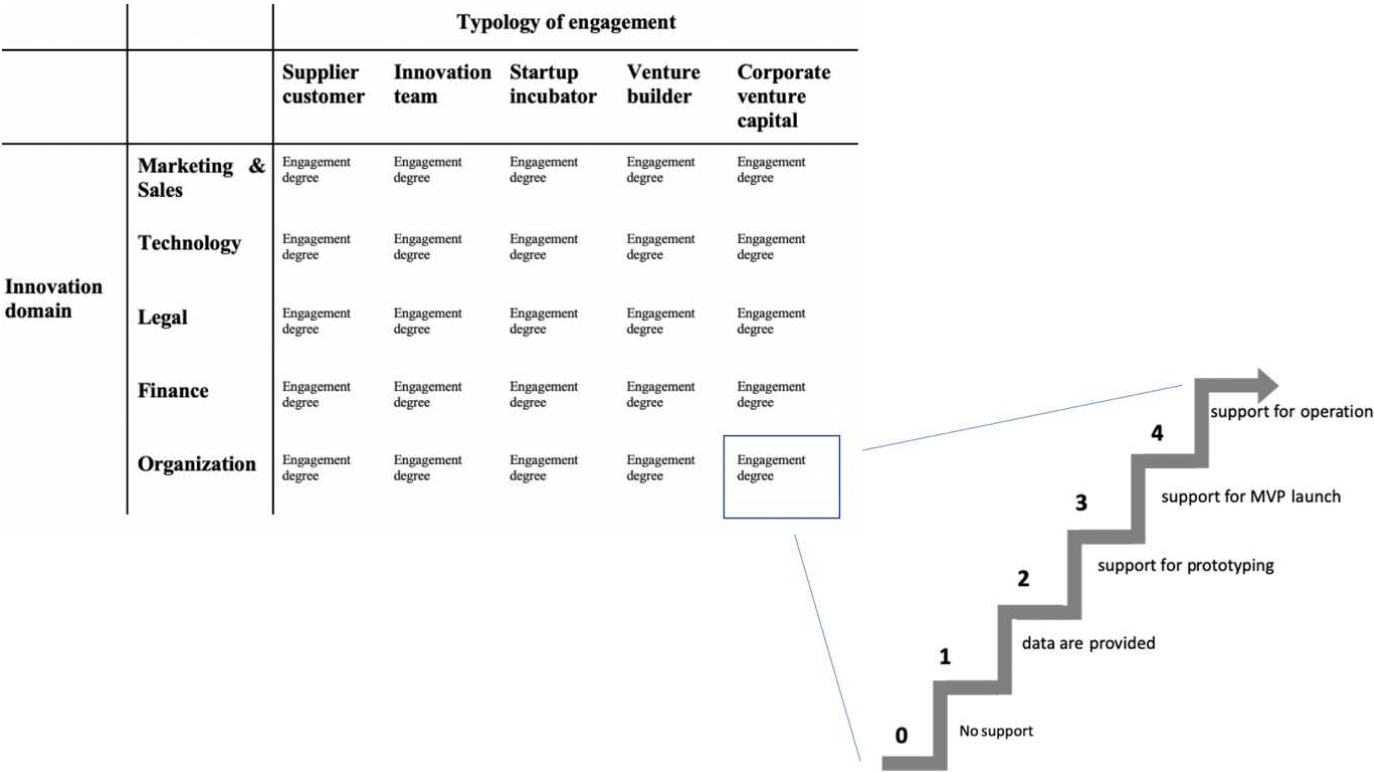


Figure 25 Overview of the proposed framework to evaluate the engagement degree of corporations with startups.

To get a description of each cell of the figure 25, we have to describe each engagement degrees. This engagement degree can be described through the companies' assets made

available to the startups. We propose to review the different types of company assets in the sections below.

7.3.1.2 Company Assets: resources

The activities and processes of the large corporations are based on certain assets called resources. These resources can be generated amid the large corporation or externally from the suppliers/partners. These resources can be tangible or not. Typically, the intellectual property rights (patent, copyrights, trademarks), technological resources (know-how, secret, innovation culture), and the large corporation reputation (goodwill, branding) together form the intangible resources.

7.3.1.3 Company Assets: resources Competencies

A large corporation owns specific abilities or capabilities to compete with other organizations in the business. These abilities or capabilities form the competencies of the organization. The competencies cannot be useful to a large corporation when they are in silos. They have to be combined in the right combination with the large corporations to gain a competitive advantage. Quélin [186] shows that this approach illustrates the emergence of a new concept in strategic analysis. A company's strategy can be based on the assets, resources, and knowledge it has acquired or accumulated. Secondly, the resources and skills approach to impact the design of the strategy in responding only to market constraints, and in limiting its adaptation to its environment. The development of the company's resources and skills, based on their specificity or uniqueness, would weigh in the strategic decision. Thirdly, this approach introduces a renewed design of the company: less centered on its activities, products, and markets as means, but singularly more focused on its internal resources and capacities, both tangible and intangible. Subsequently, the primacy of resources and skills paved the way for two currents in strategic management: skills management and knowledge management.

7.3.1.4 Company Assets: data

To increasingly automate their processes, to gain in productivity, and to be closer to their market or ecosystem, organizations have embarked on an ever-increasing collection of data.

The more companies succeed in leveraging this data, the more they increase this collection to be more accurate, precise, and faster in terms of understanding their environment and relevant in terms of decision making.

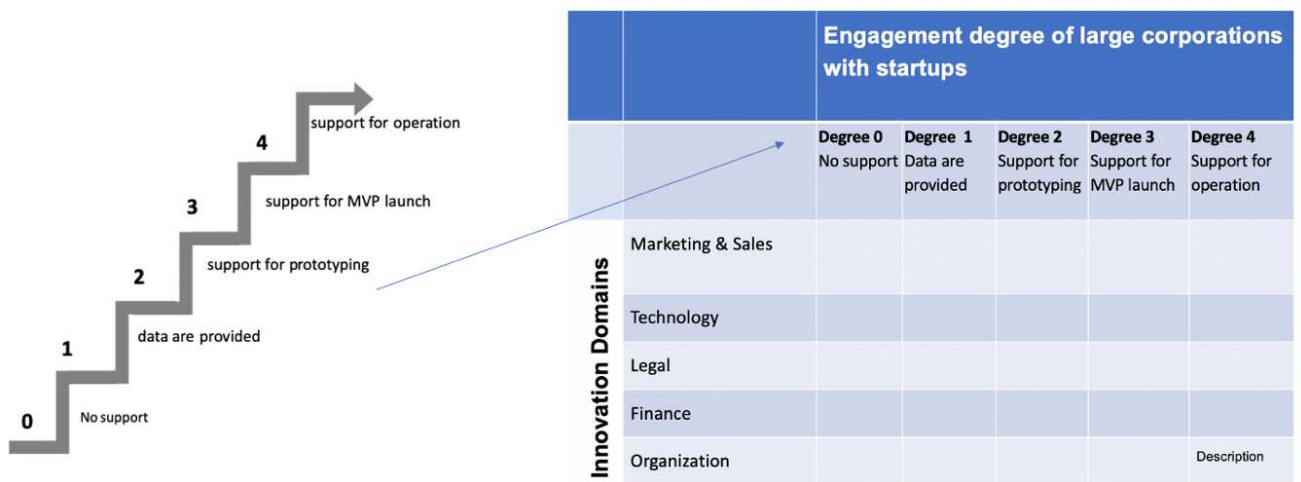


Figure 26 Description of the degrees of engagement by large corporations with a startup (full description available in Appendix B - Description matrix of level of support offered by open innovation plans)

This maturity grid will be completed with the results of the interviews of the heads of open innovation in large corporations.

7.3.1.5 Description matrix of the level of support offered by open innovation plans support

Following the maturity grids concept, we proposed an assessment grid for each development dimension, the different levels of the implication of the evaluated large corporation. To define them, we adapt the methodology proposed by Osorio [185]. We consider the level of engagement of the large corporations, i.e. the level of effort for the large corporation to provide this service: from the lowest 0 (no support) to the most engaging for the large corporation, level 4 (support for operations).

We fulfilled this maturity grid with the results of the interviews of heads of open innovation in large corporations.

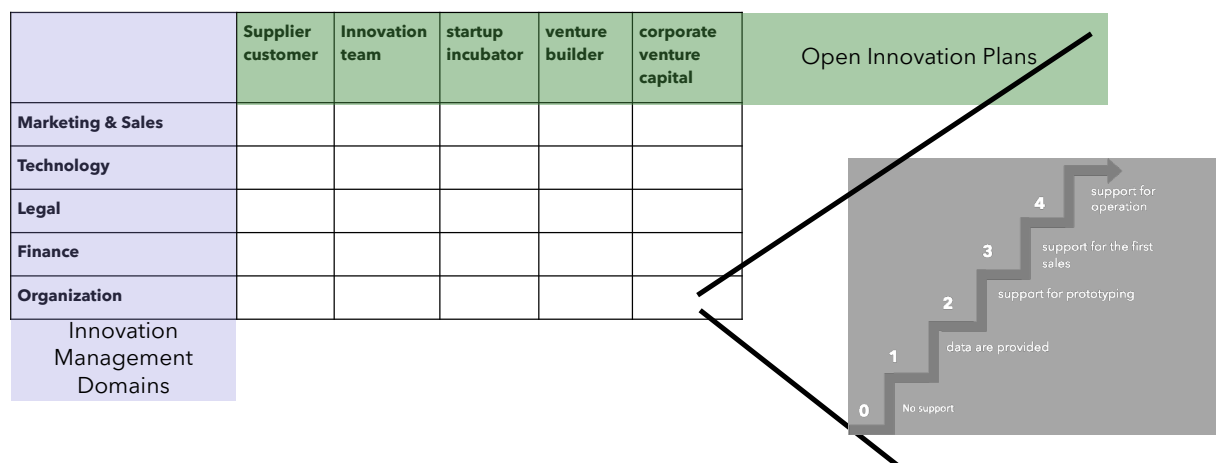


Figure 27 Template to build a heat map for open innovation plans

7.3.2 /IMPLEMENT / data collection and processing

The proposed framework was applied, following the research design, to the entire CAC40 large corporations in France. This research aims to answer the Why and How questions, in an exploratory manner, by combining qualitative data provided by the semi-directive interviews, application of the proposed framework based on maturity grids, and contextual data provided by public sources.

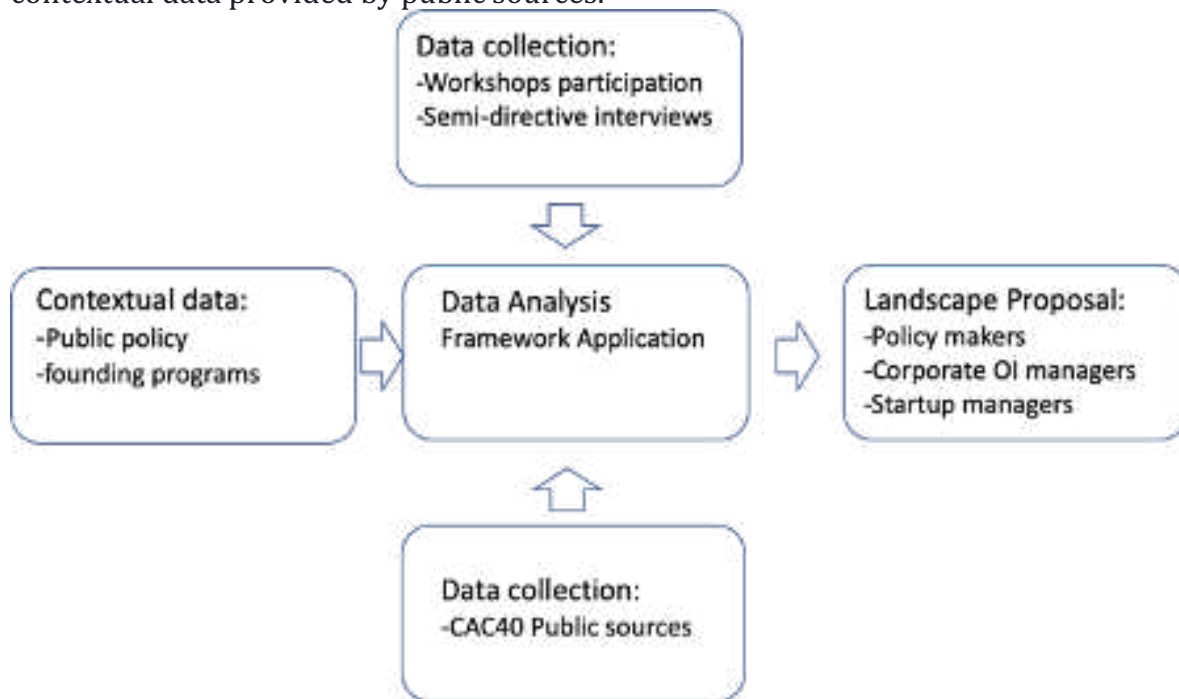


Figure 28 Research design.

Collection of data from CAC 40 large corporations

Based on the methodology presented, the largest corporations ranked in the CAC 40 index (French stock exchange index) were surveyed. They have diversified profiles (hospitality services, oil and gas, automotive, civil engineering, bank, telecom operators...) and are present during different startups events. Data comes from interviews with open innovation managers (or equivalent positions) of all CAC40 companies, 40 interviews were performed between 2017 and 2019, so 100% of large corporations are covered.

Interviews were designed around two axes to understand the approach deployed: the return of investment expected by the large corporations (branding development, R&T scouting, innovation scouting, Business development...) and the degree of openness of large corporation with startups (level of embedment of the startup in large corporation business, Intellectual Property strategy). These semi-guided interviews were designed around two axes to understand the plan deployed:

- Why do large corporations launch such a plan?
- How do large corporations support startups?

Then Data collected are organized with the classification below:

- Type of plan (Supplier/customer, Innovation team, startups Incubator/ accelerator, Venture builder, Corporate Venture).

- The expected return of investment by the large corporation
- Level of openness of large corporation in collecting the propensity for cooperation in Marketing and Sales, Technology, Regulation, intellectual property, Finance, Organization, project management

To analyze this data, we propose a 3 steps approach:

- After the interview, we map the type of services proposed by the large corporations through a matrix with 2 dimensions:
 - The first dimension is based on domains of development. We take into consideration the 5 relevant domains of development for innovation management defined in 7.1.
 - The second dimension is scoring levels of services offered by the large corporations as defined in Figure 26.
- With the means of each score, we obtain a matrix showing for each innovation support score regarding their levels of support in each development domain.
- In comparing the startups' needs of the matrix and the score matrix, we can propose a map showing adequate large corporations' support depending on the startup development stage.

7.4 Conclusions of the chapter 7 and Part II

The chapter 7 presents the framework to analyze the relationships between the startups and the large corporations based on the core concepts presented in chapter 4 and on the methodology described in chapter 6.

Part II, we present the generic methodological approach and how we use this methodology for the context startup and the large corporations' relationships to build the frameworks.

Now they are built, in PART III we present how we implemented them, in chapter 8 is still following our methodological approach. We propose in chapter 9 to make a deep dive into the results obtained with these frameworks for the French ecosystem.

**PART III STUDY CASE FOR IMPLEMENTATION OF THE FRAMEWORK: THE FRENCH
CAC 40**

"Business has only two functions - marketing and innovation."

Milan Kundera

CHAPTER 8 /IMPLEMENT FOR LARGE CORPORATIONS/ Application of our framework to analyze open innovation plans from French CAC 40

In the part II, we presented the methodology. We propose in the chapter 8 an implementation of the framework for French large corporations in CAC 40 stock exchange index, as the French ecosystem is vibrant as shown in chapter 3. As we interviewed all CAC 40 heads of innovation, we propose to analyze the interviews based on our proposed maturity grids in 7.2. So, we can propose an analysis of the different open innovation plans. Then in the chapter 9, we implement the framework for the startups as presented in 7.3 and we analyze the relevancy of the results.

8.1 Analysis of the Interviews of CAC 40 heads of innovation

Based on the methodology presented, in we survey the largest corporations ranked in the CAC 40 index (French stock exchange index), as they have diversified profiles (hospitality services, oil and gas, automotive, civil engineering, bank, telecom operators...) and are present during different startups events. Data comes from interviews with open innovation managers (or equivalent positions) of all CAC40 companies, more than 40 interviews were performed between 2017 and 2019, so 100% of large corporations are covered.

These interviews happened during a set of events that highlight the collaboration between startups and large corporations:

Vivatech ('17,'18) is a French event inspired by CES (Consumer Electronics Show), the world's leading technology event in Las Vegas. This exhibition is hosted in Paris. It has been created in 2016 and is co-organized by Publicis Groupe and the Les Echos Group. Most of the major French groups (Airbus, Air France, Engie, BNP, La Poste, Orange, RATP, SNCF, LVMH...) promote startups engaged in their transformation during this event.

Hello Tomorrow ('16, '17, '19) is a French non-profit organization, sourcing deep tech projects, and startups and facilitating collaboration between entrepreneurs, industries, and investors to propel innovation from the lab to the market. Hello Tomorrow is mainly financed by large French companies with Air Liquide, Airbus, L'Oréal, BNP, Airbus, ADP, Michelin, Renault, Solvay, Servier, and Carrefour, each of which comes to promote its accelerated or supported startups.

Innovation Roundtable ('16,'17, '18, '19) is a private Danish company that animates a network of multinational firms and organizes meetings to exchange new practices. They organize events where large corporations (P&G, LEGO, Solvay, 3M, Airbus, Google, Adobe...) discuss topics relating to disruptive innovations, artificial intelligence, digital transformation, design thinking, and startup collaborations. (<https://innovationroundtable.com>)

Open Innovation clubs (2015 to 2020) are French non-profit organizations. Since 2012, in Paris, the Open Innovation Club has been a collective of 60 major companies "evangelists" of innovation (la Poste, SNCF, EdF, Airbus, Total,...), who want to accelerate

the transformation of their organizations through Open Innovation. The club also has local implementations in Paris and Occitanie.

Innov'Acteurs is a French non-profit organization. This community creates a network of companies of all sizes, public organizations, universities, and associations with stakes in Open Innovation and collaborative innovation. The goal of this organization is to share practices, expertise, and returns of experience.

Open Innovation Forum The Open Innovation Forum was launched in December 2015, bringing together companies of all sizes to share best practices in open innovation. An Open Innovation Alliance, designed by the Open Innovation Institute (IOI) of Centrale Supélec, was formed on this occasion. It was based on various themes: the creation of a trustworthy partnership relationship, the methods of financing open innovation, the promotion and international projection of open innovation.

The list of interviewed companies and the date of the interviews are available in the appendix A. Interviews were done during “demo days” of startups, or innovation fairs such as Vivatech, or during phone calls. After the interviews, notes were taken by the interviewers to capture the insights. Each open innovation plan has been scored in using the table presenting the level of support offered by open innovation plans. Based on interviews of CAC40 innovation managers, we have identified a total of 87 open innovation plans proposed by all French top 40 companies. We present in the figure 29 below the repartition of these 86 open innovation plans.

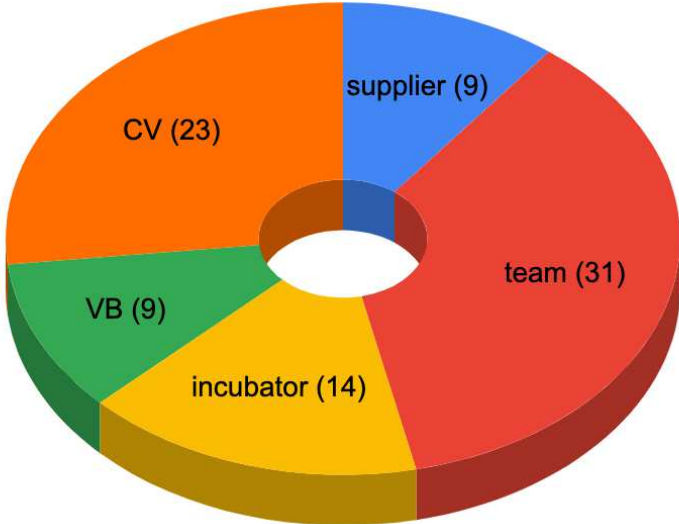


Figure 29 Repartition of type of support of open innovation plans results of CAC40 managers

It is also interesting to note that the plan, which is the most widespread plan, team for co-development in large corporations as identified in the figure 29, is also the one which has no focus domain. We could explain this fact with the mission of this type of plan. As explained above, the type of team is an entry point for startups and provides contacts in

the large corporations. Indeed, they have been described in the interviews as the team in charge of “building a portfolio and ecosystems of innovation partners”. The support to the startups will be then made through other types of plans.

All large corporations offering more than 3 plans have actually an innovation team. Most of the time this team oversees promoting open innovation plans externally with the organization of hackathons, meet’up, conferences...

Large Corporations proposing only one open innovation plan have an incubator or innovation team. Most of these infrastructures are young (less than 2 years).

Innovation teams are the entry point for collaboration and appear as the first plan deployed by a large corporation starting an open innovation. Existing incubators are most of the time the transformation of the innovation team and the formalization of the open innovation activities. During the interviews, it appeared that the companies with 3 plans or more struggle to federate the different plans, as a consequence each plan is challenged every 18 months in average by the executive committees of the company. Plans are regularly revisited to maximize their impact on large corporations’ businesses, hopefully, these restructuration impact rarely startups when there is a contractual agreement.

For each category of open innovation plans, we measured the level of commitment for each innovation domain through the maturity grids as described in details in Appendix B. In that follows, the figure 30 shows the results after the assessment of the CAC 40 corporations by using the proposed approach. The values represent the average degree of maturity level over the whole set of corporations, 4 is the maximum degree of maturity as defined before, the standard deviation is in parenthesis. For example, the corresponding value of 3.9 for the domain Marketing and Sales for the supplier customer relation, means that this area has a high degree of development over the whole set of firms.

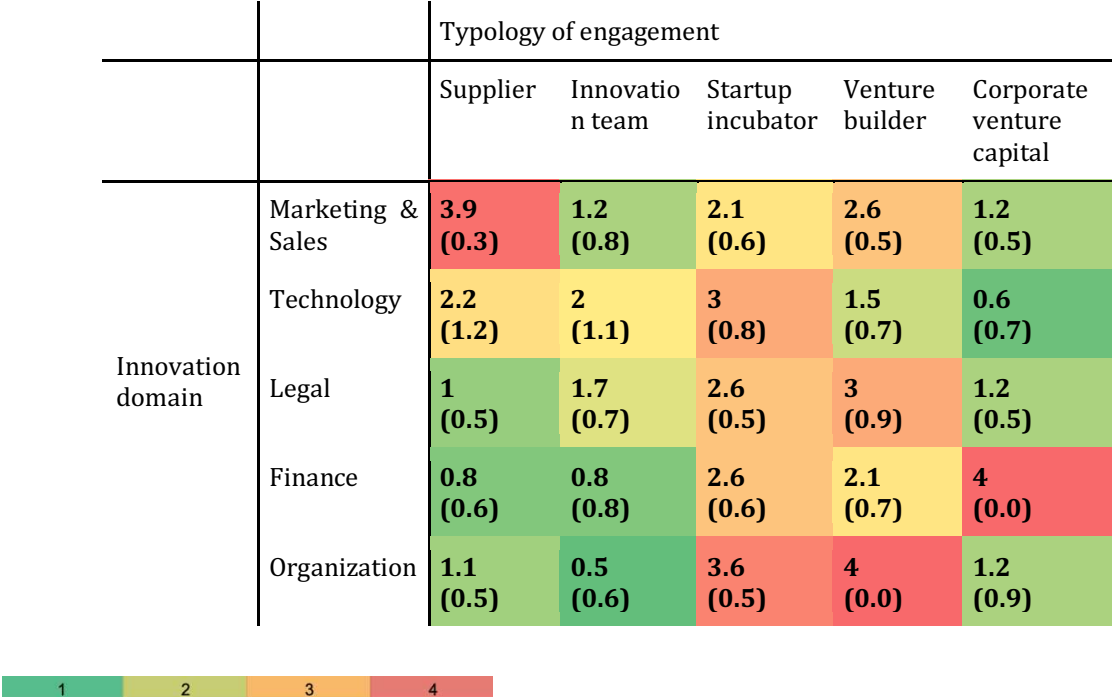


Figure 30 Heat map representing the open innovation plans of CAC 40 corporations by development domain and typology of engagement model.

For ease of comprehension, a color code in the form of a heat map has been used: red color for the highest scores, orange for the middle and green for the lowest.

The low scores (around 0 and 1) show an absence of support, the scores (between 1 and 2) show a weak support (typically only data are shared), the scores (between 2 and 3) show a support for testing, prototyping and the highest scores (between 3 to 4) show a strong support for business, operations. These scores help to understand the strength of each open innovation plan.

For example, supplier plans focus on marketing sales capabilities whereas corporate venture capital is more focused on the finance domain.

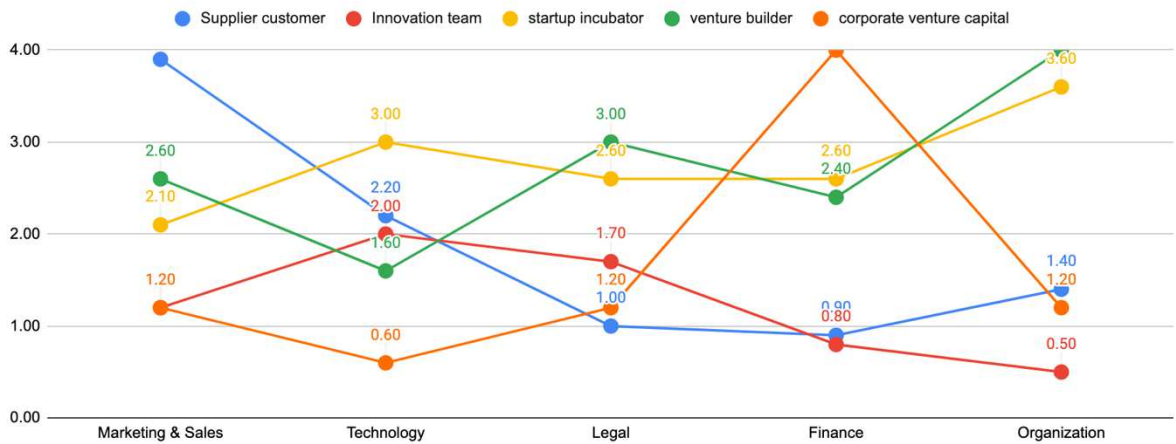


Figure 31 Score of the different open innovation plans

The representation above is the synthesis of the interviews. The interviews provide more details on the actual interactions and explain the scores. We list the relevant entries:

- A supplier customer relationship develops mainly the capabilities of the startups in the marketing and sales domain, as the startup is able to develop sales channels with the large corporations. A lot of large corporations adopt this plan because they consider that a startup can grow efficiently in selling. To a lesser extent, startups can develop their technology as they get the feedback of their customers and can develop the robustness of their technology. They can also develop their legal capabilities as in selling they must have robust contract management. It is the reason why we observe a high score here in Marketing and Sales, innovation management domain
- The innovation team does not present any domain with a score above the mean. As it is the entry point for all the startups, they have to propose a wide panel of competences to understand the needs of the startups and redirect them to the relevant interlocutor in the company.
- The startup incubator proposes a strong support in the organization domain. This result can be surprising: the mission of the incubator is mainly to help the startup to design a minimum viable product, then we could expect a support focused on marketing & sales, or technology. The organization domain outperforms the others, we would propose as explanation that the large corporations have developed a robust experience in management and are transmitting these capabilities to startups with the coaching approach of the incubators.

- It is interesting to compare the results of the venture builder and the corporate incubator: they have comparable scores in nearly all innovation management domains, except in the technical domain. As the venture builder can be disconnected from the technical experts of the large corporation.
- Obviously, the corporate venture capital brings a strong support for financial aspects. The technical aspect is (in a lesser extent) developed as large corporations propose deals to embed the technology of the standards in some of the large corporations' projects.

Type of support	Major domain of development	Second domain of development
Supplier Customer	Marketing and Sales	Technology
Innovation Team	Technology	Legal
Startup Incubator/Accelerator	Organization	Technology
Venture Builder	Organization	Legal
Corporate Venture Capital	Finance	N/A

Table 7 Top 2 areas of development proposed by the open innovation plans of large corporations

These results confirm some observations from the scientific literature: Large corporations have found a profitable business model and optimized their operation to maintain and increase their profitability [187]. So, through their open innovation plan, they can propose to share what makes them successful. For example, Greene [188] shows the different excellence domains for luxury corporations such as LVMH, or Kering: their experience in brand management, packaging, and marketing helps them to excel in sales experience and brand management. Other technology corporations such as Thales or Orange developed technical competences and the ability to navigate in regulated businesses. It could be interesting to investigate if all open innovation plans are the same or if the type of business of the large corporations impacts their open innovation plans. For this we need a framework enabling this type of comparisons. Of course, from an ecosystem perspective, there is a need to get an accurate classification of the different open innovation plans to focus on the startups needs.

8.2 Analysis of supports offered by large corporations

Based on the above presented heatmap, we propose to analyze the different open innovation plans and the insights gathered during the interviews of CAC 40 open innovation leaders. Beyond the quantitative results, the surveys have allowed very rich exchanges and that these exchanges will be described with regard to each of the supports offered by the major groups.

8.2.1 Supplier/customer relationships

In the case of a direct partnership, the startup supplies a product and/or service to the corporate and there is no risk-sharing during the collaboration. Indeed, the results of open innovation managers interviews show that in this type of relationships the large corporations are really supportive to help startups in the development of their market.

Then the large corporation has to adapt its internal criteria for supplier selection, contractual framework, and marketing rules.

As shown in Figure 30, the competence and data transfer via a direct partnership appear to be quite low, it might be interesting for technology developments (score 2.0) but with a certain disparity (1.3 variance). With the interviews, we noticed that direct partnership for Proof of Concept can be interesting with technology large corporations to develop some technical competences, but service large corporations (bank or insurance) cannot efficiently support startups with such a plan (legal, Marketing and sales score under 1.7). This type of partnership can put the startups at risk, as the financial contributions of large corporations are low (score 0.5).

The co-marketing of offers that can take place once the product is validated, if it runs on top of the large company's platform. In the case where it is integrated into the large company's offer, it is rather referred to as white label selling.

In French tech barometer, [90], Charkani, Chief Innovation Officer at AXA Partners, explains how they have adapted their procurement process for startups: *“For example, on the procurement side, when it comes to dealing with startups, the Group has developed what we call a “Fast Track”. In other words, we have created lighter and generic contractual clauses to make sure that the procurement process is as fast as possible. Indeed, time is a valuable asset for everyone but especially for startups.”* AXA is a French large corporation specialized in insurance services

Consequently, the procurement department is integrated into all aspects of partnerships and considers what can be achieved in terms of contact management and financing.

Even if the procurement of a large corporation adapts its procurement policies, startups have to be mature enough to follow the delivery frequency, quality, and requirements expected by the large corporations. The results of the interview show that Sales and technology have to be matured. This type of partnership is not applicable to startups in early stages.

For Séguet Directeur Innovation France Atos *“there are the Open Innovation approaches with our customers and startup partners, which I am particularly enthusiastic about because for this 70 % of startup partners we are no longer in a customer/supplier relationship with our common customers. Here, we have a right to experiment (and therefore to make mistakes) in order to innovate. If ROI is your prerequisite for innovation, you are wrong. You have to innovate, then look for a first ROI and accelerate once you have found it. You also have to know how to kill projects when the results are not there. This is not possible when we work with clients under results-based contracts.”*

A large corporation shared with us that *“around forty projects are carried out each year in cooperation with the innovation procurement team. Innovative projects that allow us to constantly conduct full-scale tests, in order to enrich the customer experience and develop solutions and services that respond to new consumer habits, in multiple formats, and in different countries. It is also a way of providing corporation employees with the expertise and agility of the best startups in order to enhance their know-how and sharpen their creativity.”*

8.2.2 Innovation team

2018 French Tech barometer [90] gives some insights on how these internal teams are working. After the first few years of experimentation, the Open Innovation departments have greatly increased in maturity and weight in the organization. For 66% of respondents, innovation is the driving force behind the coordination of startup partners - large corporations[90].

In majority, large corporations have an innovation team. Through the interviews, we discovered that most innovation teams have a dozen headcounts on average. They are not part of operational teams (i.e. profit center), instead they are part of Headquarter (i.e. cost center). So they are transforming this constraint into an opportunity: they are gradually becoming internal service platforms, particularly for the Business Units. Like a platform, the role of these departments is clearly oriented towards 3 main missions: to impulse a startup culture (disseminate the best practices), to equip teams with tools to better manage innovations, and to connect innovation strategy with business stakes. These teams are focused on participative innovation (innovation generated by employees), nevertheless they are the main entry point for startups, and they facilitate the relationships with other entities in the large corporation. They are also in charge of preparing proofs of concepts (PoC).

These pilot projects allow the startup to test its offer in a large company. This is a critical point in this relationship. It starts with the identification of the business entities interested in the solution. It continues with technical integration work and, last but not least, with a field test with real internal or external customers. A successful PoC must lead to commercial deployment. If possible, a PoC is paid for by the large enterprise.

The head of open innovation of Accor hotel, T. Viort, defines his position as: *“create an entry point with Accor for entrepreneurs and small companies, to both facilitate the link and give access to the Group’s decision makers, to accompany entrepreneurs during their set-up phase and to generate plans and agility within Accor”*.

These innovation teams are close to the business, “to identify the most important problems to be solved” and they also have a presence outside the large corporations with the relevant parameters with which to manage their strategy. They also have a scouting role in “expecting the unexpected and embracing the unavoidable as quickly as possible”.

Péguet Directeur Innovation France Atos explained *“In truth, what speeds up the process is quite simple: the fact that I manage it myself. There are several reasons for this. First of all, they are processes that are adapted to each individual case. A fixed and unique process would be unnatural, because it doesn't give the right to make mistakes. Secondly, the objective is to go quickly into the field, not to get caught up in the group's processes, and therefore to bypass them. I am convinced that while agility is essential for startups, what large corporations like ours need is flexibility. The ability to move sometimes entrenched processes when necessary, to serve innovation.”*

The innovation team can also transform the internal processes to adapt them for open innovation. For example, the Procurement Department, with the support of the Director of Transformation, can thus help all the company's functions to source innovation thanks

to solutions developed by startups. The most advanced companies have implemented "best practices":

- Set up a sourcing platform that will help reducing the time to identify and evaluate startups.
- Accompany buyers because they will have to progressively acquire the rules of innovative purchasing.
- Set up a formalized process that includes monitoring and measuring key indicators, while adapting to the specific needs of startups.
-

When it comes to dealing with startups, AXA and even Airbus have developed what is known as a "Fast Track". In other words, they have created streamlined and generic contractual clauses to make the purchasing process as fluid as possible. Time is indeed a precious asset for everyone, and especially for startups.

The startup purchasing process can then be industrialized, without losing sight of the flexibility objectives, which gives quite remarkable results. This is how some companies manage to halve the contracting time while doubling the transformation rate. The approach then enables purchasing to formulate and promote an "innovative purchasing by startups" service offer that materializes their contribution to the company's innovation strategy.

8.2.3 Startup incubator

Startups incubators offer tangible resources such as office space, as well as intangible resources such as coaching or consulting services, but their purpose is also to animate internal networking and cross fertilization between startups [120]. In a nutshell, startups incubators foster access to information, knowledge, branding, and insights captured from a variety of sources such as customers, suppliers, competitors, R&D institutions, and governmental bodies [122].

In 2014 Orange, Airbus, and Total, opened their corporate incubators. By hosting startups for a period of 18 to 24 months, these large corporations took advantage of startups' technical skills and their ability to adapt quickly. In some cases, they can even collaborate with their incubated startups to develop the innovative product or service in order to best integrate it into their development roadmap and in the direction. A brand is able to launch its incubator because it is the leader, or challenger, in its market and they can propose startups to get feedback from the market. Its reference status then makes it possible to give credibility to the startups actions and to make it benefit from its image. Incubators and accelerators are also an innovation showcase for the large corporations. "It's a signal that we're on the move."

Le Village by CA (Crédit Agricole, a French bank) has been launched in 2014 by Crédit Agricole, a French bank on the "Rue de la Boétie" site, the prestigious headquarter in Paris. The site is an incubator that welcomes startups from all sectors. It also promotes innovation in all its forms, serving the economic development of the regions, in particular by linking startups, SMEs and large companies. After the Paris site, Le Village has become a national network that will eventually include more than thirty interconnected Villages in France and several relays abroad, such as in New York and Singapore.

The team in charge of an incubator directs the execution of the interactions between the startup and the permanent employees of large corporations. The achievements between startup and permanent employees of the large corporation then depend on this team. Our results show that the main area where the startup can develop its capabilities is in the organization. Having an incubator at the service of the startup helps to drum beat its development, its organizational capabilities. There is also a proximity with the technical teams helping the startups to develop their technical capabilities.

Corporate incubators do not only have advantages; one of the classic pitfalls is the impact on the financial scheme of the startup. Joining an incubator may also require entrepreneurs to give up a share of their shares in writing. There is also some skepticism among venture capitalists about investing in a startup that has participated in a corporate incubator. The reason is that they believe that an incubated company has a market that will by definition be limited.

8.2.4 Venture Builder

What distinguishes venture builders (also called Startup Studios) from incubators and other accelerators? Startups are born there directly, with ideas coming from their permanent teams. The human resources needed for the project are made available to the project leaders, including designers, developers and business developers who help to structure the projects.

Venture builder has been defined by one of our interviewees as *“an organization whose purpose is to produce a regular flow of new startups within it, as founder or co-founder, sharing common leadership, methods and resources.”* The concept of the corporate venture builder, also called corporate startup studio, by large corporations consists in developing several companies in parallel and capitalizing on the experience and shared resources to launch a startup with a better chance of success. A head of ventures builder explained to us that: *“this approach allows us to combine our perspectives and mix our skills to create a new dynamic and bring out innovative solutions. In order words I have no crystal ball, I am just creating options.”*

Ozdemir [189] proposes a presentation of the venture builder process:

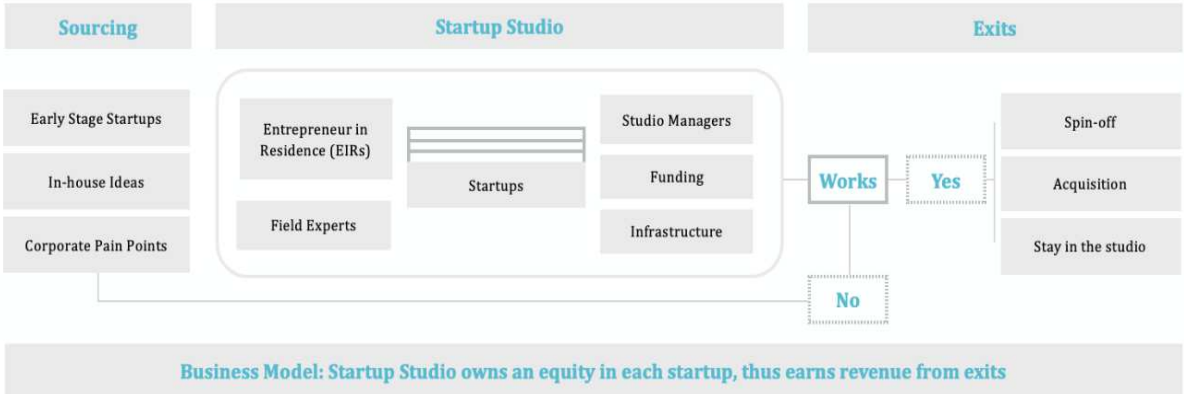


Figure 32 Presentation of startup studio (i.e. venture builder) [189]

One of the strengths of the venture builder is definitely its capacity to set up a team and propose an efficient organization (organization scores 4 with a null variance in our

heatmap figure 30). The venture builder is a kind of industrialization of the startup phenomena, as most of the startups are facing failures. If startups are massively generated, it increases the rate of success.

One of the interviewees called the venture builder a “startup studio”, comparing it with its Hollywood model. Indeed, like in Hollywood, they do not rely on a single project. They reduce risk by supporting multiple plans that promise to be decisive. A startup studio relies on a “producer” who must find industrial problems before seeking ideas for solutions that could lead to successive company launches. The systematic nature of the approach makes it possible to maximize the effects of experience and reduce the failure rate. Then, the operational management of the startups is entrusted to a “director” who has acquired proven experience. It uses a shared set of talents (marketing, sales, legal, financial) - lighting and sound engineers, decorator film editor- to reduce costs at the startup stage. That’s how the startup studio model was inspired by Hollywood.

AXA created “Kamet”, a venture builder for technological innovation serving policy makers. This entity has initially been endowed with 100 million euros and aims to initiate, launch and support innovation in the insurance area called “InsurTech”. These projects are supported by AXA teams (funding, expertise, data...) and led by external entrepreneurs (management, strategy, customers relationships), in order to benefit from the agility of a venture builder structure while benefiting from AXA’s know-how and expertise.

Venture builder does not bring so much technical competence, lowest score (1.6) in our survey. During the interviews, it appeared that as a high return of interest is expected in a startup created by the venture builder, only proven technologies are used.

In a nutshell, a venture builder is a hybrid model located between the incubator, the investment fund and the accelerator targeting an industrialization of startup development. Now large corporations have translated this concept into corporate venture builders.

8.2.5 Corporate Venture Capital

Corporate venture capital refers to the development of dedicated venture capital structures within large corporations, enabling them to acquire a direct stake in innovative small companies. Equity participation in early-stage companies is no longer restricted to traditional investment actors. This new trend also shows that venture investment is now seen as an integral part of the company's strategy.

Corporate venture targets clearly finance support (scoring 4.0 with no variance), other domain scores are very low. Large corporations limit their interference with startups. There are legally bound and large corporations cannot access confidential data of a startup. The corporate venture capital is a separated legal entity whose mission is to be aware of the large corporations' strategy and able to translate it into investments and influence in startups boards.

The corporate venture capital team has also to know deeply the startup strategy to decide further investments in the startup. So, this team has to know everything about the two entities but cannot communicate elements.

Established corporate ventures such as Safran Corporate Ventures or Total Energy Ventures regularly take shares in promising startups around the world. These entities are reporting to their mother companies (Safran and respectively Total) but they are separate legal entities. They have been described as “an investment fund endowed with hundreds of millions of euros, linked to a large corporation in its financing but autonomous in its operation and investment decision-making.” Data from startups supported by corporate ventures can be shared openly with the mother companies. Future investors or customers of a startup might be reluctant to work with a startup already backed by competitors.

Corporate venture funding

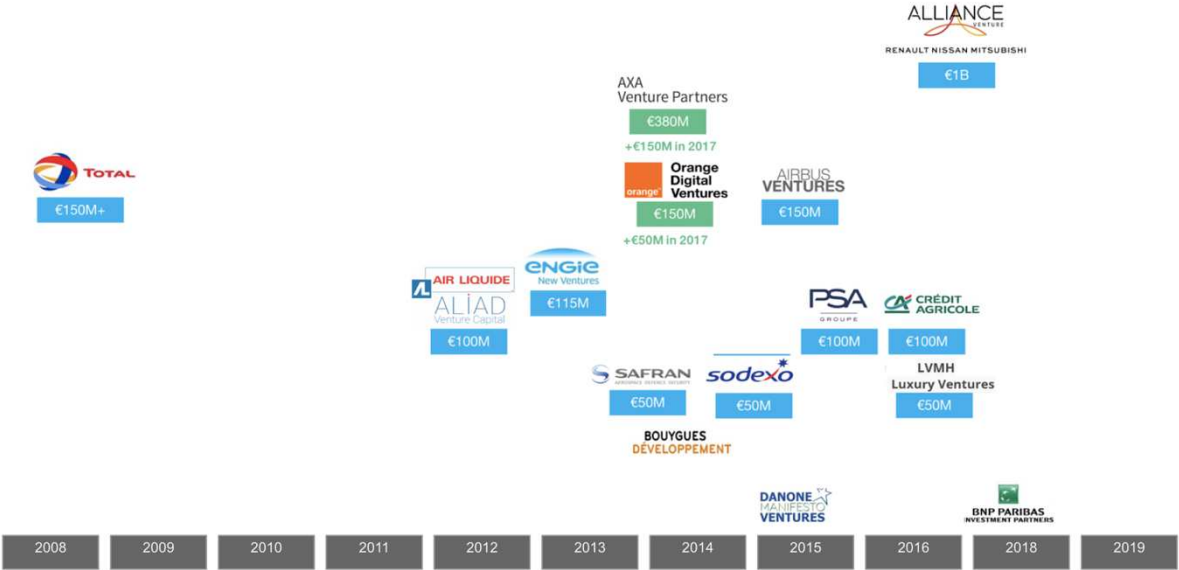


Figure 33 Timeline with development of corporate venture capital from French CAC 40 (source our research)

Two out of three French Corporate Venture Capitals were born in the past 5 years (Figure 33). In 2017, Renault-Nissan-Mitsubishi announced a mega fund of 1B€, Alliance Ventures, while 3 other investment programs were launched: PSA Ventures (100M€), Crédit Agricole (100M€), LVMH Luxury Ventures (50M€). Some of the CAC 40 prefer to outsource their venture capital, such as Crédit Agricole that has decided to delegate their Fintech fund to Breega Capital (50M€) and their generalist fund to a new VC, Supernova invest.

Major French fundraising events have recently taken place thanks to the corporate venture, such as with OnePark (32M \$from Keolis and AccorHotels) in 2018 and Wynd (123.5M\$ with the participation of Natixis, Orange, and Sodexo) in early 2019. These are big fundraising events never seen before with French investors only.

To motivate CAC 40 large corporations, the government has set up an incentive system with a large number of tax incentives. The measure allows companies to amortize over five years, within a limit of 1% of their assets, their minority subscriptions to the capital of startups. To prevent startups from being bought by large corporations, the system also provides that the latter may only invest up to 20% of the capital of the chosen company and for a minimum period of two years.

Corporate venture investment obtained a preferential tax regime by the 2013 Finance Act: the depreciation over five years of the investments made came into force. These decisions brought more resources to the financing of innovation in France and encouraged large corporations to invest in innovative SMEs. The measure brings a limit of 20% of the capital of the SME benefiting from the investment. As for startups, their main objective is to obtain more than the financial support and management capabilities promised by traditional venture capital firms.

Like independent venture capital, corporate venture capital corresponds to financial objectives and is managed in the same way as private equity funds, with some nuances. However: average investment amounts are more than doubled in corporate investments, average investment periods before exit are slightly longer by a few months and exit strategies would be different (IPO versus buyout by the group - majority takeover).

The startups demand is generally to access risk capital. Applying to the fund of a group in the same sector of activity provides the opportunity for a better and faster understanding of the innovative aspect of the project. But it also involves risks regarding Intellectual property risk and financial dependence.

8.3 Conclusion of the chapter 8

In this chapter we implement our framework for the specific use case of the French CAC 40 companies. In the next chapter, we propose to implement the framework for some startups established in France.

CHAPTER 9 /IMPLEMENT/ for startups based in France

In this chapter we present the implementation of the framework with startups feedbacks. Unfortunately, the questionnaire was launched on the 4th March 2020. Initially the questionnaire was supposed to be available for 2 months, but the sudden COVID-19 lockdown forced most of the startups to refocus and reshape their business approach. We stopped the questionnaire at this time as we expected no more answers from startups owners who were focused on crisis management.

9.1 Participation to the questionnaire

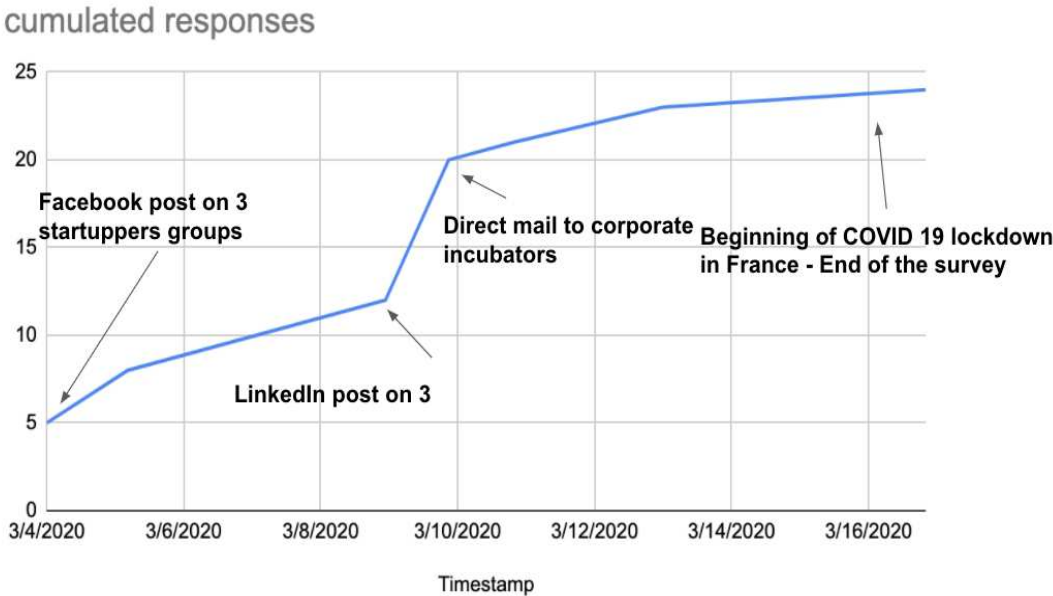


Figure 34 Cumulated responses for questionnaires targeting startups

A total of 24 answers to the survey were obtained in 12 days, this promising participation has been stopped by COVID-19 crisis and the announcement of the lockdown in France.

9.2 General comments about our startups sample regarding startups Maturity level vs Corporate support

The following table lists the maturity level and type of corporate support are given by the answers of the respondents.

Maturity Level/ Corporate Support	Identify opportunities	Create concepts	Validate concepts	Develop solutions	Deploy solutions	Total
No support	2	1		2	4	9
Innovation team					2	2

Corporate accelerator or incubator			3	3	3	9
Corporate venture capital					1	1
Supplier			1		2	3
Venture Builder						
Total	2	1	4	5	12	24

Table 8 A landscape of maturity of the startups answering our questions (the blank cells equal 0)

In our survey, 37.5% of the respondents are not supported by a large corporation and most of the supported startups are hosted in a corporate incubator or accelerator. This sample is not representative of the reality as we asked the heads of innovation from CAC 40 to send our survey to their contacts. Only one respondent is benefiting from corporate venture support. There was no responding startup in a venture builder. In our questionnaire, there was the possibility to mention several corporate supports. We did not get multiple answers to this question, it means that all startups are supported by only one open innovation plan.

The majority of the startups answering this survey (50%) are mature (at deploy solutions stage), and then focus on the growth of their business. We have few respondents for the earliest stage of development (identify opportunities, create concepts and validate concepts), but we get at least one respondent for each maturity stage and each level of maturity. That’s the reason why this cohort is not covering all the aspects of the relationships of startups and large corporations.

9.3 Interpretation of the results with the scope of the innovation management domains

We propose to analyze the maturity levels of the startups both, with a corporate and without a corporate support and analyze the answers to the questions on innovation management dimensions.

For each level of maturity, we assigned a score from 0 to 5 (Detailed description of scoring is available in appendix B)

	Marketing & Sales	Technical	Legal	Finance	Organization
Average	3	3	2.5	2.9	2.7
Standard Deviation	1.1	1.1	1.3	1.6	1.5

Table 9 Results per innovation domain

When we analyze the answers for all the responding startups (benefiting or not from a corporate support), we see there is a variability in the maturity level with a standard deviation >1.1. The responding startups are at a relatively mature stage as the average of

maturity is >2.5, which is coherent with the fact that 50% of the startups in the cohort are at an advanced stage (deployment of the solutions).

With a deep dive in the table 10 representing the maturity stages vs innovation management domains, a net trend in the extreme values can be observed: it could be observed that low levels in innovation management domains (all levels at least <1) lead to one of the first development stages, we defined “identify opportunities”. The most mature development stage corresponds to high scores in innovation management domains.

Development stage / Innovation management domains	Identify opportunities	Create concepts	Validate concepts	Develop solutions	Deploy solutions
M&S	1	3	2	2.8	3.9
Tech	1	2	2	3	3.9
Legal	1	1	1.75	2	3.6
Finance	1	1	2.5	3	3.5
Organization	0	0	1.5	2.6	3.8
Average	0.8	1.4	1.81	2.68	3.74
Standard Deviation	0.45	1.14	0.24	0.41	0.18

Table 10 Heatmap of the startups cohort

When we consider the intermediate maturity stages (create concepts, validate concepts and develop solutions), it is interesting to focus on the average of the score of the 5 domains, we can see a progression in the score 1.4 for create concept and 1.81 for validate concepts and 2.68 for develop solutions. We can see a similar progression among the scores of the 5 innovation management domains except for the domain Marketing and Sales Solutions where for “create solutions” the score is 3, whereas for the more mature stages such as validate concept and develop solutions where the scores are respectively 2 and 2.8. We do not have any validated explanation for what could be perceived as an aberration.

At early stage such as “create concept”, startups may feel that they have mastered customer needs because they have not yet been confronted with customers, whereas more mature startups have been confronted with customers and have understood that they need to have a certain humility in front of the customer and develop their ability to understand them.

We see the correlation between the innovation management domains maturity and the maturity stage. It confirms that there are differences between the different maturity stages and that the innovation management domains help to assess them.

9.4 Focus on startups benefiting from a corporate support

In the table 11 below we measure the average of the answers given to assess the maturity of the startups in the different innovation management domains. We consider the 8 startups without corporate support (we excluded from the responses the project at “identify opportunities” stage).

The table 11 below represents the maturity stage and innovation management domains for startups.

Development stage / Innovation management domains	Validate concepts	Develop solutions	Deploy solutions
M&S	3	3	4
Tech	3	3	4
Legal	2.5	2	4
Finance	2.5	2.5	2.3
Organization	3	3	4
Average	2.8	2.7	3.66
standard deviation	0.27	0.45	0.76

Table 11 Heatmap of the startups with a corporate support

As we have no startup at early stages (identify opportunities and develop solutions), we notice that startups are mainly at a high mature stage in all dimensions of innovation management. (>2). It is also really interesting that with this cohort of 8 startups, we have a very consistent set of answers (with a standard deviation very low <1). We can see the same type of progression for the average as we notice before, except a particularity regarding the finance dimension of innovation, it is surprisingly very low for all the maturity stages and even at the stage of deployment of solutions. We were not able to validate our explanation, but we may think that the startups supported by large corporations are less eager to raise funding to develop their industrial capabilities or access some competences as it is offered by large corporations.

Focus on Startup hosted in corporate incubator/accelerator

As we have a majority of startups answering this questionnaire and supported by a large corporation (9) are hosted in a corporate incubator/accelerator, we propose to make a deep dive in their results. First if we compare the level of maturity:

Validate concepts	Develop solutions	Deploy solutions
3	3	3

Table 12 Repartition of startups answering this questionnaire and supported by a large corporation following their maturity level.

The startups are equally spread among the 3 most advanced levels of maturity. There is a fit between the level of maturity and the type of corporate support. Unfortunately, we did not ask for how long the startup are hosted in the incubator. It could be expected that there is a difference in term of maturity between a startup joining freshly an incubator and a startup ready to leave an accelerator.

	Tech	M&S	legal	finance	organization
Average	2.8	2.9	2.4	2.2	3
standard deviation	0.8	0.8	1	1.4	1.3

Table 13 Results for startups hosted in incubator/accelerator per technical domain

By comparing the innovation dimensions, we see that the main area of development is the organization. We notice that there is a high standard deviation for 2 dimensions finance and organization. It might be because that is in these dimensions that the incubator and accelerator are proposing support as mentioned earlier we suspect that there is disparity due to the time spent in the incubator/accelerator.

"If the accelerator is simply there to make connections, you should know that this has little or no value. For this, there are Facebook and LinkedIn that work and are cheaper!"

Mathias Fille, Axeleo

9.5 Focus on the startups without any corporate support

In the table below we present maturity levels per innovation domain of the responding startups without corporate support.

Development stage / Innovation management domains	Identify opportunities	Create concepts	Validate concepts	Develop solutions	Deploy solutions
M&S	0	1	-	3	4
Tech	0	1	-	3	4
Legal	0	1	-	1.5	3.9
Finance	1	1	-	2.5	2.3
Organization	0	0	-	3	4
Average	0.2	0.8	-	2.6	3.64
Standard Deviation	0.24	0.76	-	0.65	0.75

Table 14 Heatmap for startups without corporate support

We observe that companies without corporate support are also getting more and more mature in the innovation management domains as there are becoming more mature. We can notice that the level for the legal domain is very low before the last maturity stage, whereas for the startups supported by large corporation, the progression is smoother. This must come from the fact that startups in relations with large corporations are confronted with legal teams quite early in their development.

9.6 Conclusion of the chapter 9 and Part III

The chapter 9 presents the implementation of our framework for the startups based in France. This research is in progressed as we did not collect the expected amount of data as the COVID-19 crisis interrupted the data collection.

As discussed in the introduction of the Part 3, we have been able to use the frameworks to analyze open innovation plans from major French companies as well as for a cohort of startups. We validate the applicability of our frameworks and demonstrate that they are useful in the analysis of an ecosystem. They are exhaustive: we have been able to cover all types of open innovations plans of large corporations as well as all maturity stages of startups.

They are operational as the maturity grids have been easily translated into questionnaire and the interviewee fully understood the purpose of each question.

The next step is to validate the robustness of our methodology and frameworks, as well as identify a set of recommendations for future research. This is presented in Part IV.

PART IV DISCUSSION OF THE RESULTS WITH EXTERNAL STAKEHOLDERS

"The future is built on the flow of new ideas."

Paul Meyer

CHAPTER 10 /VALIDATE/ Enquiry mode (La Poste, Siemens)

10.1 Approach

We decided to present our results to companies with profiles different from the ones of the CAC 40. We selected la Poste, which is the main and historical postal service company in France and today a French public limited company, and Siemens which is an international group of German origin.

The interview roll-out is in 4 parts:

- First, we present our results (classification for the open innovation plans, maturity questionnaire for the startups and the analysis of the French ecosystem)
- Then we continue the discussion with their existing innovation strategy and their existing open innovation plans
- We propose to focus on their relationships with the startups then we ask for their feedback on the open innovation classification in particular and also on the other results
- Finally, we discuss how they can use the results: what they would to keep from our research, and what could be improved.

10.2 Enquiry with La Poste

10.2.1 Presentation of La Poste innovation approach

La Poste was created in 1991 following the split of the French “PTT” founded in 1879, (Postes, Télégraphes et Téléphones), a national entity responsible for mail, telegraph and telephone services. The “PTT” was then divided between La Poste, which became responsible for postal service, and France Télécom (nowadays Orange) for the telecommunication services.

Today La Poste is a French public limited company mainly active as a postal services operator (mail, parcels and express), bank, insurance, mobile phone operator, provider of digital services and business solutions, e-commerce (marketing, logistics) and data collection and sales. La Poste is owned by the Caisse des Dépôts et Consignations and the French State.

La Poste has a user centric approach for its innovation strategy with encompasses different axes:

- the well-being of seniors
- simplifying the life of small businesses
- supporting creative entrepreneurial projects (kisskissbankbank)
- international logistics
- develop digital safes.

10.2.2 Presentation of La Poste relationships with startups

In September 2013, J.P. Fabre launched La Poste Lab in Paris in a mail operations center where the letter carriers of the 9th arrondissement are located.

The Lab is an incubator for new service projects to shorten time to market. The three main missions are:

- testing of new services in real life with customers and letter carriers
- building an ecosystem of partners
- structuring an R&D activity and responding to calls for projects

Yellow Innovation is defined as neither an incubator nor a startup accelerator but as a digital lab by their creators: "*We work in an unconventional way to foster innovation. We are internal to the group.*" said the Innovation Director of Yellow Innovation during our discussion. There are about forty startups part of Yellow Innovation. This digital lab is distinguished by a small group of projects, but above all by an approach focused on design. "*We have a design first approach, that's what's important here. The project managers are facilitators, but it is the artistic managers who give the thread*". So, the profiles, a mix between creative and technical, generally take four months to develop a first prototype.

Its goal is to work with startups to source innovations and feed its own offerings. This gives rise to a classic customer-supplier relationship, or even to the acquisition of startups: "*In this case, you have to be a "good customer" for the startups and take into account their constraints: don't waste their time with interminable sales cycles and unreasonable payment terms.*" This model works well in a "b-to-b" or "b-to-b-to-c" approach when the startup's solution helps a large company build a consumer offering, which is often the case in media, telecom or retail.

In 2016 Fayon launched Timetopost, an open innovation plan targeting startups. The Group proposed to test a concept, a prototype or a newly marketed offer in the field. To this end, it makes its exceptional assets available to digital startups and companies:

- 75,000 letter carriers equipped with smartphones all over France every day
- The 1st fleet of electric vehicles in the world
- Letter Boxes in all the communes 100 to 50,000 m² of floor space divided into industrial
- Logistics and commercial parks
- More than 5,000 daily road connections
- The mail medium: 96% of the French read their mail

An evaluation of the application and a first answer is provided within 15 days. If the evaluation is positive, a feasibility study of the experiment with the partner Business Unit. Tests lasting from 2 weeks to 4 months, dimensioned according to determined objectives and indicators.

10.2.3 Feedback on our research framework

We obtained the following feedback from our discussion, the transcription of one of our interviews is available in appendix E:

- The approach is really interesting and structures well the existing landscape.
- The approach does not consider enough the time dimension which is crucial in the relationship between startups and large corporations. Scaling up and industrialization of solutions represents the greatest challenge to improve the speed of collaboration. Startups consider that these deadlines are slow or very slow and our interlocutor is of the same opinion: the teams dedicated to

collaboration in large corporations allow to accelerate these deadlines. It is all the more a point of attention with the COVID- 19 crisis.

10.3 Enquiry with Siemens

10.3.1 Presentation of Siemens innovation strategy

Siemens is a conglomerate focused on technology and electrical engineering. At its heart is the listed Siemens AG, which includes numerous German and international group companies. The group has 125 locations in Germany and is represented in 190 countries. It is one of the largest electrical engineering and electronics companies in the world. The company's headquarters are in Berlin and Munich with nearly 380 000 employees. The group has been in a phase of fundamental restructuring for several years. The aim is to focus the company more on the key areas of electrification, automation and digitalization. A number of companies have been sold, while others have been organized as independent companies in which Siemens AG holds stakes.

Today, nearly two-thirds of its sales are generated in activities where the Group is market leader or No. 2. Then Siemens needs to constantly innovate to stay competitive and maintain market-leading positions. Their innovation strategy consists of 5 elements:

- Adopt a leadership role in technology
- Promote Open Innovation
- Drive forward digitalization
- Tap growth areas
- Live Business Excellence

The commitment to open innovation seems to be especially strong. Siemens maintains a broad innovation network that includes research institutes, industry partners, and startups that the company uses as external sources and collaborates with to develop new technologies.

10.3.2 Presentation of Siemens relationships with startups

Engaging with startups can play an important part in the Open Innovation strategy for established companies. Siemens does this in four axis:

1. Investing in startups: The Siemens Venture Capital (SVC) provides financing to promising companies. It has invested 800 million euros in over 180 startups.
2. Creating startups: Siemens Novel Businesses (SNB) enables the company to experiment with new technology areas and business models by establishing its own startups and reintegrating them into the business as appropriate.
3. Scouting for startup partners: Siemens Technology to Business (TTB) centers in Berkeley, Munich, and Shanghai identify and network with startups in emerging areas that are of potential interest to Siemens.
4. Next47 is a venture builder firm backed by Siemens that invests in a technology companies and gives board advice to achieve growth in business. The firm's relationship with Siemens gives access to international markets, a global customer base, and technical experience, all of which is used to catalyze portfolio company growth. The company works with startups who are using deep technologies such as artificial intelligence, augmented and virtual reality, cybersecurity, autonomous driving, IoT, robotics, and advanced manufacturing.

10.3.3 Feedback on our research framework

Pasta leads the open innovation in Siemens mobility. He provided feedback on our methodology and our results:

- The classification clarifies ideas and concepts; the maturity grids are great and even more the adaptation of the standard in business and startup language.
- The Classification is interesting for benchmarking with other large corporations and to better present our offer. But it would have been necessary to look at the impact of the devices because the indicators of the large corporations to measure the ROI of their collaboration with the startups. Impact means:

On the side of large corporations

- New Uses and User Experiences
- Gain in terms of image
- Acceleration of the project
- New customers
- Cost optimization

And startup side:

- the increase in turnover,
- the increase in the number of references
- a better visibility of the roadmap of key accounts.

We got also the feedbacks of Cassagnol, the transcription of her interview is available in appendix E.

The role of the intellectual property should also have been deepened. As an illustration, Siemens uses only 10% of its patents, but nevertheless pays millions of dollars in annual renewal fees for the remaining 90%. So, it is a strategic tool for large corporations. How does the relationship between startups and large corporations influence this tool?

This validation step helped us to identify some of the strengths and weaknesses of our research. We propose in the chapter 10 to synthesize the results obtained with this research and to discuss their robustness.

CHAPTER 11 Results and discussion on methodology robustness

11.1 Findings and research limits

11.1.1 Toolset from the designed framework

Our focus in this contribution is how to analyze the open innovation plan of the large corporations, as most of the recent publications are focused on the maturity level of the organizations rather than on the capabilities of the open innovation plans. To build our framework we used 4 core concepts:

- A Model of relationships between large corporations and startups called open innovation plans and presented in section 4.1
- Maturity levels in startup development presented in 4.2
- Innovation Management domains in 4.3
- Maturity matrix concepts in 4.4

The structure of these standards was adapted into a maturity grid comparing the different plans. Thus, the proposed tool uses the new standards on innovation management in an innovating way, as a structured collection of innovation management practices. In particular, these standards cover all types of organizations, making it possible to grasp the relationships between startups and large corporations from each side with the standards as a common vocabulary.

The contributions of this research work concern both scientific research and the corporate world. The results obtained are promising, and they open up new avenues for research interesting to continue along this path. A 3-years research project is not enough to fully explore all the issues addressed by the topic. It is therefore important to clarify the limits of this work, in order to be able to improve it later. This is the purpose of the next section.

11.1.2 Adequation of large corporation and public supports with startup development stage

In order to complete the overview of the French corporation/startup ecosystems, this section will present a synthesis (Figure 35) of the public/private support programs regarding the startup's stage of development based on the ISO56002:2019 classification. This methodology was constructed by associating startups' needs with focus domains of open innovation management domains, as described in Section 4.3. The synthesis diagram shows the maturity level of the startup, as described in figure 35 in the abscissa and the type of support (public or private) in the ordinate. For the public support plans, the report on fifteen years of innovation policies in France was considered in order to analyze the impacts of these measures[190]. In 2016, the French government created the CNEPI, National Commission for the Evaluation of Innovation Policies, and their first production was this report, synthesizing all French public policy for innovation, including open innovation.

Innovation plan supporting startups <

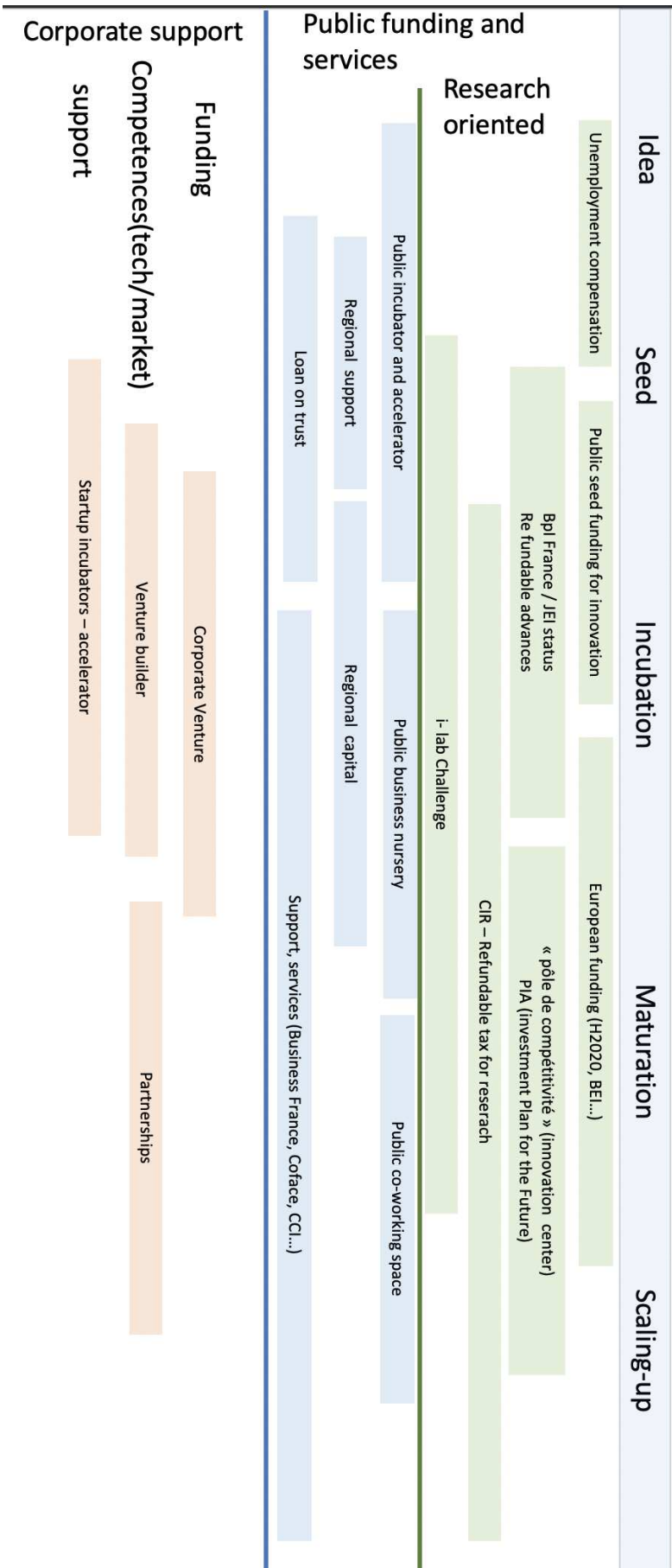


Figure 35 Mapping of plans supporting startups in France

This diagram is a support tool for startups to define their strategy with large corporations. Once the maturity level has been identified, the startup can select the relevant type of open innovation plan, which would maximize the benefits of the plan.

This diagram shows the multiple potential programs and resources that French ecosystems offer the startup as a support tool for investigating Open Innovation with large corporations. Efforts remain to be made to improve the coordination and the global efficiency of the entire system, for instance to make it possible for the startup to select the relevant type of open innovation plan once the development stage has been identified, which would maximize the benefits of the plan.

11.1.3 Research limits

While we have so far tried to highlight the contributions of the present research, we are nonetheless aware of a number of limitations. Some of these are expressed below.

The first limitation of our research work concerns the test with the startups. We got only 24 answers from startups, which is a quite limited number of answers compare to the 42 interviews performed for the implementation (40) and 2 for the test phase.

A second limitation of our study concerns the operational development of framework. However, it is essential to capture the feedback of the users during the interview process to reinforce its robustness and adaptability.

The most important limitation is the human factor: we interviewed heads of open innovation, innovation directors, etc. As they represented large corporations with strong branding, their answers are politically correct and strongly impact by the culture of the large corporations. As most the open innovation plans are recent (less than 5 years in average which is too short to get enough distance on the impact of these plans) it is difficult to challenge the say of the managers.

This limitation does not question the methodology itself but the quality of the data, that can be collected. So far, interviewing business leaders is the one of the most widespread approach to collect data.

11.2 Discussion for future research to improve the framework

Our work has opened up several research perspectives. These avenues for improvement are first of all theoretical, through the consolidation of the proposed framework.

11.2.1 Geographical scope

The scope of our study was limited to French ecosystem, it could be relevant to investigate other ecosystems in the world and compare the public policy towards open innovation. In particular how a government can facilitate the relationships between large corporations and startups. German federal ministry of economic cooperation and development published a brochure [191] where they present overview of programs (tax program, education, promotion ...) for startup promotion that are in use in OECD countries and discuss critical success factors for each of those public tools. It could be interesting to analyze these programs under the lens of our framework and identify any common pattern.

11.2.2 Reinforce the startup perspective

We tried as much as possible to use data from startups; the part III of this work is based on forensic analysis of stopped startups, we collected data from startups. Nevertheless, to design the startup maturity grid as well as the appendix C, we used best practices from innovation management standard which are general and not only valid for startups but for all types of organizations. It would be interesting to challenge this appendix C with a lot of startups and get their feedback to improve and complete the content.

In the collected dataset mentioned in section 9.1.2, this cohort is not covering all the aspects of the relationships of startups and large corporation we are missing some categories (none of the startups in the cohort is in a venture builder and we do not have too few answers (one to two) in most of the categories). So, it could be great to relaunch this survey.

11.3 Potential follow-up of this framework outside of research area

How might we take advantage of the described framework outside of the research domain? Of course, as a follow up, we will thank all the participants for the interviews and present the conclusion of our work, but it won't be enough to make this framework credible and legitimate. A solution could be the standardization.

A standard is a reference framework that aims to provide guidelines, technical or quality requirements for products, services or practices serving the general interest. It is the result of a consensual co-production between professionals and users who have committed themselves to its development. So, the standardization process could improve and complete the proposed classification in this work and help to spread such a classification. We can take the case of La Poste, working in incubator mode with their digital lab and describing it as not being an incubator as there is no common understanding of what an incubator is.

It would also be interesting also to propose this framework for a standardization process as many stakeholders might be interested in it. For startups it may help them to measure their maturity and to, better understand the added value of each open innovation plan. For the large corporations such a framework may help them to assess maturity of startups applying for and mobilize the relevant competences to get fruitful open innovation plan for startups optimizing the use of their own resource.

In this chapter, let us review the recommendations from ISO 56003:2019 [192] to establish partnerships and collaborations between different organizations, and how it can support specifically large corporations and startups relationships.

This guidance provides a structured approach for organizations looking to enter into an innovation partnership with another organization. It helps them not only decide if collaborating with other organizations on their innovation project is worthwhile but how to select the right partners, align partners and agree on a common understanding. It also gives guidance on how best to assign roles and responsibilities as well as put effective governance procedures in place.

This document provides guidance for innovation partnerships. It describes the innovation partnership framework to:

- decide whether to enter an innovation partnership,

- identify, evaluate and select partners,
- align the perceptions of value and challenges of the partnership,
- manage partner interactions.

The guidance provided by the ISO document is relevant for any type of partnerships and collaborations and it is intended to be applicable to any organizations, regardless of its type, size, product/service provided.

Our work could be considered during a revision of this standard in bringing a focus on the relationships between startups and large corporations for the two first steps of partnerships (decide to enter a partnership, evaluate/select partners). We could hope that during the standardization process, the discussions may help to generalize the framework for other types of relationships

11.4 Conclusions of Part IV

The goal of the Part IV is to validate our methodology and results with the views of innovation practitioners who were not involved in our research works. The different feedbacks help us to identify how to improve our research results and also encourage to make the framework known to the business. This chapter concludes the end of our research work.

CHAPTER 12 Contributions of this work

This work provides frameworks to analyze in systematic, exhaustive and operational ways the relationships between large corporations and startups. We summarized in the figure 36 below, the different elements of the frameworks:

Large corporations	Startups
Classification of the open innovation plans	Maturity stages
Maturity grid (open innovation plans vs innovation management domains)	Maturity grid (maturity stages vs innovation management domains)
Questionnaire design to assess open innovation plans	Questionnaire to assess startups maturity

Figure 36 Contributions of our research: elements of our frameworks

12.1 Contributions in reviewing the table of content

PART I contextualizes our approach through three chapters:

CHAPTER 1 : The main contribution of this chapter consists in:

- the articulation the concept of startup, as well as a deep understanding of the development phases of the startup.
 - an understanding of the issues of relationships between large corporations and startups
 - an analysis of the importance of these relationships in an innovation ecosystem.
- Then we were able to show the motivation and rational of our work.

CHAPTER 2 focuses on the status of the startup in the open innovation strategy of a large corporation. We detail the factors influencing large corporations in their innovation strategies, as well as the typologies of these strategies and their effectiveness in the French context. Then we understood the impact of the open innovation in the large corporation strategies and in particular the role of the startups in the open innovation approach.

CHAPTER 3 focuses on the landscape of existing supports in an innovation ecosystem, including public and private supports. This chapter helps us to understand that the public support is not enough in the development of the startups, the private support is also mandatory.

The focus on the French ecosystem helps us to demonstrate its vivacity and the role of French large corporations completing the support from the government. It allows us to deepen this notion of innovation ecosystem by looking at the weight of the CAC 40 in the open innovation approach. This chapter justifies the interest of using the French ecosystem as a use case.

CHAPTER 4 presents the 4 core concepts that builds a framework of analysis for our work: open innovation plans, innovation management domains, startups maturity domains and maturity grids.

CHAPTER 5 presents the directions of our research: the stakes, the scope and our scientific questions.

Thus, this first part helps us also to frame our work in understanding the stake of the relationships between startups and large corporations as well as the interest of our work.

CHAPTER 4 sets the methodology and designs our frameworks.

CHAPTER 6 depicts an overview of our methodology with the 4 steps approach: DEFINE/ DESIGN/IMPLEMENT/VALIDATE. It contributes to our work with the analysis of other maturity grids (for project and governance), this helps us to understand the principles of maturity grid and how to design them. . We propose a presentation of a generic methodology, like a generic protocol to help other researchers to reuse this methodology in other contexts.

CHAPTER 7 designs our frameworks for the purpose of our research. It presents an instantiation for the large corporations and an instantiation for the startups. We explain how to implement this framework.

Thus, part II allows us to address the strategic and operational aspects of the relationship between large corporation startups and gives us the frameworks with the different classifications, and maturity grids.

PART III is focused on the implementation of the frameworks to show their applicability and relevancy in chapter 6 and 7:

CHAPTER 8 implements frameworks for the French CAC 40: companies are very active. There is a diversity of open innovation plans to understand the different startups needs. Companies in finance business propose open innovation plans focus on financial maturity (ex: corporate venture capital), whereas companies with a strong technical background proposes incubators to reinforce the relationships between in-house experts and startups. This implementation helps to understand how to use this framework to analyze an ecosystem.

CHAPTER 9 mirrors the chapter 7 for startups and proposes to show the relevancy of our approach and the issues in its implementation. Due to the COVID 19, we obtained a weak number of answers for our questionnaire. Nevertheless, we have been able to see that startups in their early phase declare having a clear understanding of their market whereas startups after testing their market assumption seems less confident on their understanding of the market.

Part III shows that with our frameworks we can find the adequation between open innovation schemes and the maturity level of the startup.

PART IV seeks to validate our tools and hypotheses with a different approach through chapters 8 and 9.

CHAPTER 10 presents how to test our framework by validating our hypotheses with the startup point of view and large corporations outside of the CAC 40. This

approach has made it possible to highlight the potential benefits of such a tool for companies, as well as to the limitations associated with it that still need to be worked on.

CHAPTER 11 addresses all of our results and their robustness in analyzing the different issues in our research (limited geographical scope and lack of data from startups), we also propose plans for further research, and we analyze a potential follow up to spread the results into the business through the standards.

The part IV allows us to provide the following conclusion of this manuscript:

12.2 Which are the managerial implications of our contributions?

First, we would like to focus on the operational aspects with are the core of our approach and show how the results can be used today by the business stakeholders. Our frameworks are not only applicable as an all, but their element can also be used separately for different purposes, we would like to share some of them

12.2.1 Maturity grid of the startups

The maturity grids for the startups can help the startups to self-assess where they are in term of development and help them to focus their strategy of development.

This tool is also relevant for all the structures coaching startups. It is useful in the selection process, as well as to drive the startups in its development.

12.2.2 Cards to support startups development

The maturity grid is the essence of a work presented in appendix C. Even if for our work, we kept only the maturity grid, we would like in this conclusion to raise the added value of this appendix C which in a very operational way and appealing format (practical guide) is the result of the consolidation of practices captured in standards, research literature, as well as discussion with practitioners.

This tool can help startups leaders, and coaches to define a development strategy and guide them step by step.

12.2.3 Framework the open innovation plans (classification /maturity grid)

The classification of the open innovation plans may help large corporations to better articulate their open innovations strategies especially internally when the innovation managers have to prove the return of investment of the open innovation to the senior leaderships team.

In particular the framework is very helpful to build benchmark and to compare the different return of investment. For example, the return of investment of a corporate venture is completely different from the return of investment of an incubator.

CHAPTER 13 Perspectives

13.1 Geographical scope of the strategy

The internationalization of startups creates value for the company and its investors. Going international means for a startup to access larger markets in order to grow faster. Also, there is a need to develop knowledge of the networks in which entrepreneurs who internationalize are embedded. Entrepreneurs are in a phase where financial capital is scarce, and reputation is still under construction. The ecosystem surrounding it then plays a decisive role in the direction the new company takes [193].

Internationalization therefore means growth for companies, especially for startups seeking rapid growth. [194] shows that the benefits of internationalization can only be realized by assuming a certain number of additional costs, infrastructure costs but also information costs that are not a priori very visible. Is the support of large corporations able to reduce that cost and speed up the internationalization in reducing the risks?

Commissioner for Regional Policy C. Crețu declared for the launch of the 2019 European innovation scoreboard: *“The EU's Cohesion policy funds are the main driver for innovation and sustainable development. startups and small enterprises help create new business models in the digital or green sectors. However, innovation hubs can also grow in countries with less strong economies, and these findings help us support innovation in regional ecosystems, including in less developed regions.”*

13.2 Future Collaboration guidance impacts on public policy and corporate practices

The French government will also use the PACTE law [195] to simplify the thresholds that inhibit certain companies when recruiting. For the thresholds of eleven, twenty and fifty employees, a rule will be introduced that the threshold will be considered as having been crossed "only when the company has exceeded it for five consecutive calendar years".

In November 2018 during the presentation of the collaboration barometer between startup and large corporation of the FrenchTech. Brosset, Bpifrance Hub CEO declared *“We've been hearing the same complaints for years: startups complain about long decision-making times and a cultural gap with large corporations, and they struggle to get the desired impact from startups. So, I want to review all the practices, identify the good ones and point to the bad ones, to start from there and move forward”*. These good practices have been captured in ISO standards proposing guidelines on innovation management ISO 56005:2019 on collaboration details good practices for collaboration in the frame of an innovation project for all types of organizations.

It could be interesting to study the impacts of this standards on public policy as well as on corporate practices towards collaboration. Indeed, there are some cultural shifts between startups and large corporations. For example, when a group buys a startup to strengthen its positions in its core business, synergies are often quickly identified and activated.

13.3 Cultural differences

In 2018 French Tech barometer in Open Innovation Mangaud, CEO and Co-founder, PIQ (startup specialized in IoT, for consumer goods) declared *“A whale can unintentionally*

injure a smaller fish. The differences in time between startups and large corporations are immense and are not about to diminish. It is necessary to understand the decision-making cycle of these larger organizations in order to adapt, be more agile and navigate effectively through their repositories. The decision-making matrix of large corporations and its different levels of validation cannot be changed: it must be accepted, adapted and moved forward."

While large corporations seek the agility of startups, this agility also leads to impatient behavior on the part of startup companies when they are confronted with the bureaucracy of large corporations. Even if a third of startup managers come from these same large corporations, they quickly forget the "necessity" in a large corporation that there is a need to produce a lot of supporting documents and presentations, even for an innovation project. And this impatience is in turn difficult for his interlocutors within the large corporation to understand, even though they can make, at least individually, efforts to promote the startup.

13.4 Open innovation for SMES (with an established business model)

The levers for implementing an open innovation strategy are still too often perceived to be relevant only for large corporations. Examples prove that SMEs are at the forefront of open innovation:

- The Poult company (700 people), a leader in the manufacture of private label biscuits, has set up a partnership program with startups, an internal project incubator and creativity training for a large number of employees from all areas of the company.
- The 80-strong company RaidLight, a leader in trail equipment (shoes, bags, etc.), has developed a community of passionate lead users who co-design its new products: it has even provided them with an Outdoor Lab to help them test their innovative ideas in real life.

It might be interesting to analyze with the proposed framework the relationships between the startups and SMEs that will develop best practices in open innovation even faster than large corporations in the years to come?

13.5 Startups fueling ideas for our global ecosystem in transition

Servigné [196] presents the triggers of the potential collapse of our system, and some potential manners to start a transition. From the 1950's there was a boom in term of PIB, consumption, and in parallel exploitation of natural resources, as if we were in an infinite world looking for an infinite growth. Unfortunately, our planet has limited resources, for example [197] shows that we may run out Indium in 10 years. The prediction was made in 2007, 13 years ago, nevertheless the scarcity is reflected in the price of Indium (\$60/kg in 2006 and \$800 in 2020).

It is also the case for the fossil energy, according to [198], the entire economy of Western countries is based on abundant and cheap energy. Our modern energy consumption (industry, farming, transportation, ...) puts at our disposal the equivalent of more than 400 "energy slaves" per French person. Most of it is fossil fuels (oil, gas, coal), which alone account for 80% of world consumption. Oil and gas have just or are in the process of reaching their peak production and their supplies will therefore inexorably decline for physical reasons.

Bruel, Engie CEO, [199] shows that innovation strategy of large corporations has to change to embrace the challenges of the investment in sustainable development and recruiting the talents. It should be interesting to integrate the impacts if the sustainable dimensions in our framework, as it will be the game changer for the next decades.

13.6 Digital transformation

Any transformation is a change: it is the act of moving from one form to another. In this case, the digitalization of the economy is a kind of "natural" evolution. The internet and new technologies have opened up new possibilities revolutionizing the practices of consumers, employees, marketing communication, information collection and management, etc.

During the 2019 Netexplo event, Air Liquide CEO: *"For us, digital is both an accelerator and a lever that allows us to go much deeper and to realize the projects that we have had in mind for several years. From now on, beyond a governance that has gone from a hierarchical organization to a network operation, IoT, artificial intelligence and algorithms have entered Air Liquide's businesses."* Digital transformation is not only how an economy originally based on physical structures (points of sale, offices, files, cash transactions...) becomes dematerialized and becomes more and more exchanges of digitized information), it is also how the whole organization can better perform.

When we present some of our results to some of the participants from the first set of interviews, they were immediately very interested in the concept of the maturity grid to measure their digital transformation. During the discussions we co-designed maturity grids in taking into account maturity levels of the digital transformation (not started, under study, started, on-going, done) and different dimensions of this transformation (transform tools, transform data, and transform people). It could be interesting to develop this approach and adopt the same methodology of interviews to compare the different approaches and propose a classification of the digital transformation approaches.

13.7 COVID 19 disruption

With COVID-19 pandemic, the urgent need became to reduce costs generated a forced digitalization of the company: teleworking, changed customer expectations and capabilities.... According to a survey conducted by France Digitale in April 2020 [200], 65% of innovation managers of major French groups anticipate a decrease in their budget following the crisis. However, 75% of them also declare that new innovation themes will emerge from this crisis. In particular, 77% of them indicate that environmental and societal issues will increase in importance. In other words, when it comes to innovation, we will have to do more for the sustainability of the business and the environment with less resources.

May these changes in innovation strategy have an impact on the relationships between large corporations and startups?

If we have a look at the results of the 2020 French startup barometer [201]:

- 56% of startups and 53% of large corporations saw their collaboration projects put on hold during the Covid crisis. 29% of large corporations refocused on their core business.

- 75% of large corporations cite innovation in customer experience as a priority for collaboration with startups, while for 82% of startups it is the increase in turnover that is the most important factor.
- Speed remains a major issue: a rapid scale-up of solutions is the biggest challenge in collaboration. A nearly unanimous number of startups (96%) and more than three-quarters of large corporations (75%) find these timescales too long.

These results show that the relationship is evolving towards a co-construction model with a stronger alignment of the strategies in which startups, sell more quickly to large corporations (thus responding to their turnover priority) and develop their product or solution through this collaboration. It would be very interesting to analyze the impact of this sanitary, economic, environmental, societal crisis on the open innovation strategy of the large corporations as well as on the innovation dimensions, that we defined.

As a final word, we have sketched several aspects of the large companies and startups interactions. Such interactions will increase in the near future, leading to new modes of cooperation. This work could serve as a basis for their future study.

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PART VIII APPENDIX

Appendix A – List of interviewees from French CAC 40 companies

Company	Domain	Function of the interviewee	Date of the interview
AccorHotels	hospitality trade	Chief disruption and growth officer	03-2016
Air liquide	gas industry	Head of Open Innovation & New Ventures	04-2020
Airbus	aeronautics and space	Head of Corporate Innovation	07-2018
ArcelorMittal	steel	Head of global research and development	06-2017
Atos	ICT consulting	Head of innovation France	06-2016
Axa	insurance	Head of digital transformation, brand and partnership	06-2017
BNP Paribas	bank	Head of open innovation & startups cooperation	01-2016
Bouygues	civil engineering	Head of Bouygues Development	03-2016
Capgemini	ICT consulting	Business development director	04-2020
Carrefour	retail	Head of strategy	10-2020
Crédit agricole	bank	Head of le village by CA	03-2018
Danone	food	Head of Open Innovation	03-2018
Engie	energy	Head of digital transformation	10-2020
Essilor	optic	Director of Marketing and Communication for the Essilor Vision Foundation	11-2020
Groupe PSA	car	Head of open innovation and public affairs	02-2020
Kering	luxury	Head of Kering Digital Academy	12-2020
L'Oréal	cosmetics	VP head of innovation	06-2016
Lafarge Holcim	building materials	Head of Lafarge Holcim R&D, Innovation and IP	06-2018
Legrand	electrical materials	Head of innovation	04-2020
LVMH	luxury	LVMH Research director	06-2017
Michelin	Tires	Transverse innovation director	06-2017

Orange	telecommunications operator	Senior VP Open Innovation & Startup, Orange	06-2018
Pernod Ricard	alcohol	Head of cell BIG	03-2017
Publicis Groupe	commercial	Global chief strategy and innovation officer	03-2016
Renault	car	Head of Digital factory	03-2016
Safran	aeronautics and space	Head of Safran Innovation	05-2020
Saint-Gobain	building materials	Head of innovation and research	06-2018
Sanofi	pharmacy	head of Innovation and Business excellence	04-2020
Schneider Electric	electrical materials	head of strategy and innovation	03-2016
Société générale	bank	Innovation director	06-2017
Sodexo	hospitality trade	Chief Digital and Innovation Officer	06-2017
Solvay	chemistry	Innovation Excellence Director	06-2018
STMicroelectronics	electronics chipset	Director of innovation, collaborations, and R&D efficiency	08-2020
TechnipFMC	energy	Innovation manager	12-2020
Total	energy	Chief innovation officer	04-2020
Unibail-Rodamco	real estate	Head of innovation marketing and service	03-2016
Valeo	car parts supplier	Head of Open Innovation	05-2020
Veolia	services and utilities	Head of innovation	04-2020
Vinci	civil engineering	startups and open innovation manager	01-2018
Vivendi	media	Head of Vivendi Village	03-2017

Appendix B - Description matrix of level of support offered by open innovation plans

Domain of development	dimensions	0 (no support)	1 (data are provided)	2 (support for prototyping)	3 (support for MVP launch)	4 (support for operations)
Marketing and sale	competence	no support	Business model support	design market studies	design of customer support and service	Integrate startup offer into sales offering
	resources/data	no support	provide market studies to identify target customers	provide market studies to identify target customers	launch common minimum viable product	Integrate startup offer into operation plan
Technology	competence	no support	propose meeting with technical experts to challenge startup	design market studies	access to IPR	industrialization (process and scale-up)
	resources/data	no support	access to technical knowledge of the large corporations	access to the market for studies	co-design of the product	Integrate startup offer into operation plan
Regulation and IPR	competence	no support	meeting with legal experts is proposed to identify legal and normative context			
	resources/data	no support	meeting with legal experts is proposed to identify legal and normative context	support research of freedom to operate	support activities to influence regulations and standards,	share strategy to influence regulation and standards, co-fill patents and share IPR
Organization, project management	competences	no support	facilitate access to business and social networks	Propose coaching support	hosting is offered for free	Propose partnerships, business alliance
	resources/data	no support	meeting with legal experts is proposed to identify legal and normative context	support research of freedom to operate	support activities to influence regulations and standards,	share strategy to influence regulation and standards, co-fill patents and share IPR
Finance	competences	no support	one shot incentive is given, the amount is not significant for startup development	Introduction to capital investors	investment in minority in the company	Full merge or partial merge
	resources/data	no support	meeting with legal experts is proposed to identify legal and normative context	support research of freedom to operate	support activities to influence regulations and standards,	share strategy to influence regulation and standards, co-fill patents and share IPR

Appendix C – Questionnaire for Startup maturity assessment

A rapid questionnaire to assess the maturity of your startup

* Required

Marketing and sales

This domain encompasses everything relating to the deployment and dissemination of innovation project results to customers or users.

What have you achieved so far in your startup? *

- You have an idea, but you have not shared it
- The pitch is articulated, and you present it
- The usage scenarios are built, and first customers have been approached
- You started selling and you are tuning the product market fit
- You are managing the growth of the sales

Technology

In addition to the scientific and technical aspects of product and process innovation, this domain covers all the technologies and methods to be implemented for all types of innovation.

Where are you in the readiness of your product or service? *

- You're not sure the product is technically feasible
- You are aware of the potential solutions
- You have a working prototype
- You have a minimum viable product ready for sale
- You are operating, delivering your product or service

IPR, regulations, norms, and laws

The organization needs to manage intellectual property issues, factor in the normative framework aspects.

What have you done so far to be familiar with the legal framework of your business? *

- You have no clue about what we are talking about
- You know the existing patents and freedom to operate, and identify the risks of any difficulties or barriers
- You have a plan to protect your intellectual property strategy
- You protected your intellectual property rights, and all your agreements are reviewed by a competent person
- You set up a system to manage contracts, agreements, IPRs

Finance

The organization needs to manage all financial aspects.

How are you financing your project?

- You are looking for a financial support
- You are supported by love money (funding coming from your relatives or yourself)
- You have a support from a governmental/institutional funding
- You have the support of a business angel
- you have raised funds (series A, B or C)
- You do not need any external funds, you have an organic growth

Organization

This domain encompasses process control, resource management and regular reporting on process progress.

How are you organized?

- You are looking for co-founder
- You have created a legal entity and you have a roadmap
- You deploy tools: planning, management, oversight and reporting
- You have the necessary decision-support elements for moving onto the product/service launch phase
- You manage the growth of the product/service

What is the best statement to describe the current maturity level of your startup?

- You have the desire to start a new venture but there is no legal entity
- You are looking for funding to test your idea of business
- You are prototyping your idea of business
- You have started to sell your minimum viable product
- You are developing your offering
- Other:

Have you any "corporate" support from a large corporation?

- You are fully independent
- You are supplier of a large corporation (you are referenced by Procurement department)
- You are in a corporate incubator
- You are in a corporate accelerator
- You are supported by a corporate venture capital
- You have a R&D agreement with a large corporation

Other:

If you want to get the results of this survey and receive our guide for startups development, please leave your email address:

Your answer

Appendix D - Startup development process

ISO 56002 process steps	Create concepts	Validate concepts	Develop solutions	Deploy solution
Description Startups needs per categories	Startup focuses on project and feasibility studies, research and development studies, as well as financial, accounting and legal services. In this phase, there are many uncertainties regarding team and execution capabilities.	Startup focuses on creating effectively the product/service, then on the acquisition of the first customers. Startup delivers a Minimum Viable Product which is the unfinished version of a new product that collects as much validated information as possible about its customers, while requiring as little effort as possible	The startup focuses on a complex transition: from a company with a great offering a potential of growth to a company with a great offering with rapid and predictable growth. The Series A round takes place when a Series A investor is convinced that a company could scale.	Startups that have successfully transformed their innovative product into a profitable business. Scale-up is a startup that has grown considerably, both internally and externally, and that would continue its strong growth by meeting long-term prospects that ensure relative strength.
Marketing and sale	Startup looks for business opportunities, in identifying a problem that needs to be solved	Startup test business models with their early customers of their target audience to identify the product-market fit for their offering.	Business development is started, to get the first contracts.	Business development optimizes sales process (targets highly profitable markets) to allow the scale up of the business.
Technology	Technologies can be scouted or developed by startups to solve the problem identified.	Startups focus on the prototyping and testing of their project.	Startups develop the first specification for the first stable release of the product or service	Technology is optimized to scale the delivery of the products or the service
Regulation and IPR	A study of freedom to operate supports startups in the elaboration of development strategy	As the project is becoming more mature, startup can establish an IP management strategy as well as regulatory risk assessment.	As technology and business are mature, startups start to develop their IP and standardization strategy to mitigate IP and regulatory risks	Startups continue to develop their IP and standardization strategy to mitigate IP and regulatory risks
Organization, project management	Startups founders are developing the business plan to prepare the funding of the next phase	Startups founders identify competences, they need for the different activities listed above. These competences can be acquired by recruitment of employees, or outsourced.	Startups start first hiring to run the business and setup the first process to start scaling the business	Startups increase hiring to support business growth.
Finance	Love money	Seed	Series A	Series B

Objectives

- Analysis of the emerging needs, pain points
- Positioning of current or potential rival products and services
- Analysis of the market access, barriers and potential drivers
- Assessment of the potential business levels
- Identify potential partners

Recommended actions

	Done	N/A	Who/When?
Carry out market research (competitive intelligence, customer focus, pilot customers, standardisation work, etc.)	<input type="checkbox"/>	<input type="checkbox"/>	
Analyse and anticipate rival products and services to the project (direct competition, substitute offerings, existing offerings or newcomers)	<input type="checkbox"/>	<input type="checkbox"/>	
Analyse the terms for accessing the market with the project (distribution channel, etc.)	<input type="checkbox"/>	<input type="checkbox"/>	
Identify and select potential partners	<input type="checkbox"/>	<input type="checkbox"/>	
Examine the Business Model positioning	<input type="checkbox"/>	<input type="checkbox"/>	
Take into account the expectations of all stakeholders, especially in terms of sustainable development.	<input type="checkbox"/>	<input type="checkbox"/>	



Outputs

startup slidedeck presenting the chosen approach for developing the business (product/service...)

Stakeholders

- Internal: startup founder with marketing competences
- External: target market, market research firms and forecasting companies

Knowledge & skills

- Strategic marketing skills
- Skills in authoring business models and plans
- Skills in mobilising competitive intelligence outputs

Methodological approaches

- Design Thinking with empathic approach, pain points capture
- Competition analysis
- Identification of potential business partners
- Identification of business uncertainties/risks

[Review of the potential technical solutions]

TECHNOLOGY

Create concepts

Objectives

- List the technical elements/ competences available for realising the project (what has been acquired)
- Identify the project's technological barriers (what is missing)
- Highlight potential solutions

Recommended actions

	Done	N/A	Who/When?
Describe the principles and/or original technologies underlying the project	<input type="checkbox"/>	<input type="checkbox"/>	
Validate the technical opportunities and/or technical substitute solutions	<input type="checkbox"/>	<input type="checkbox"/>	
Identify the internal and external resources that the startup needs to mobilise in order to introduce the new technology if applicable	<input type="checkbox"/>	<input type="checkbox"/>	
Specify all the technological elements available for overcoming the technical barriers	<input type="checkbox"/>	<input type="checkbox"/>	
Identify which technical elements need to be acquired (R&D work, patents to acquire, identification of technical partners that need mobilising, etc.)	<input type="checkbox"/>	<input type="checkbox"/>	
Identify the project's technical uncertainties	<input type="checkbox"/>	<input type="checkbox"/>	
Carry out a functional analysis	<input type="checkbox"/>	<input type="checkbox"/>	
Identify, both internally and externally, the technologies with the greatest promise of meeting sustainable development constraints (CSR)	<input type="checkbox"/>	<input type="checkbox"/>	

5

[Review of the potential technical solutions]

TECHNOLOGY

Create concepts

Outputs

- State of the art, review of intellectual property associated with the technologies that need to be mobilised for the project
- Different technical scenarios
- Functional analysis

Stakeholders

- Internal: Startup founders with technical competences
- External: Public or private organizations (research centers, specialised in relevant technologies)

Knowledge & skills

- Scientific and technical knowledge concerned
- Design competencies

Methodological approaches

- Knowledge management
- Integration of sustainable development issues (CSR: Corporate Social responsibility)
- Idea management

Objectives

- Define an intellectual property strategy for the different project stages
- Arrange appropriate contracts for managing relations with external organisations
- Ensure access to technologies that are not available within the organisation

Recommended actions

	Done	N/A	Who/When?
Evaluate the situation of the project in terms of patents and freedom to operate, and identify the risks of any difficulties or barriers	<input type="checkbox"/>	<input type="checkbox"/>	
Specify the project's strategy in terms of intellectual property and positioning against standards and regulations; set up an appropriate intelligence gathering system, especially relating to third-party rights	<input type="checkbox"/>	<input type="checkbox"/>	
Define and implement the intellectual property and/or confidentiality actions required for the different project stages	<input type="checkbox"/>	<input type="checkbox"/>	
Specify and implement the contractual aspects of intellectual property or collaborative arrangements with potential partners	<input type="checkbox"/>	<input type="checkbox"/>	
Allow for suitable specific agreements in case of partnerships outside the economic scope, especially for projects with a predominant sustainable development feature	<input type="checkbox"/>	<input type="checkbox"/>	

[Understand the legal context]

LEGAL/NORMATIVE
/FINANCIAL

Create
concepts

Outputs

- Document summarising the intellectual property rights implemented in the project, the provisional patent application and the legal terms and conditions for managing partnerships

Stakeholders

- Internal: Project manager, project team, legal function, intellectual property function, financial and accounting function
- External: Legal and intellectual property consultants, public and private backers

Knowledge & skills

- Ability to manage the technical, legal and intellectual property interfaces
- Legal knowledge specific to intellectual property and the contract

Methodological approaches

- Strategic intelligence management
- Intellectual property management

Objectives

- Specify the financial projection
- Love money financing
- Confirm the project's financial feasibility and projected profitability

Recommended actions

	Done	N/A	Who/When?
Identify the Business Model for realising the project and achieving profitability	<input type="checkbox"/>	<input type="checkbox"/>	
Identify the areas at risk of a financial drift	<input type="checkbox"/>	<input type="checkbox"/>	
Validate and update the planned financing arrangements	<input type="checkbox"/>	<input type="checkbox"/>	
Identify new opportunities for additional financing	<input type="checkbox"/>	<input type="checkbox"/>	
Qualify and compare the opportunities for additional financing	<input type="checkbox"/>	<input type="checkbox"/>	
Establish the general foundations for the business plan and particularly the financing plan	<input type="checkbox"/>	<input type="checkbox"/>	
Identify the Business Model for realising the project and achieving profitability	<input type="checkbox"/>	<input type="checkbox"/>	
Identify the areas at risk of a financial drift	<input type="checkbox"/>	<input type="checkbox"/>	

[Formulate the financial projections finance

Create
concepts

Outputs

- financial projection
- Draft Project business plan and business model, including the initial financing plan and the targeted financing arrangements

Stakeholders

- Internal: founders with finance and accountant competences
- External: accountant, financial community

Knowledge & skills

- Expertise in the tools used for financial evaluations and formalising financial documents
- Financial analysis and simulation capabilities, knowledge of the implications of the financial choices on project management and the organisation

Methodological approaches

- Risk assessment
- Financial management
- Business modeling

Objectives

- Specify the project and define the components, such as resources, organisation (roles and responsibilities in the team, competencies), schedule (milestones, operational plan, etc.) and financing

Recommended actions

	Done	N/A	Who/When?
Define the project plan and milestones	<input type="checkbox"/>	<input type="checkbox"/>	
Define the deliverables or expected results for the project tasks	<input type="checkbox"/>	<input type="checkbox"/>	
Define the skills and knowledge that need to be mobilised	<input type="checkbox"/>	<input type="checkbox"/>	
Size the strategic intelligence resources required to move the project forward	<input type="checkbox"/>	<input type="checkbox"/>	
Define the project's financing support framework	<input type="checkbox"/>	<input type="checkbox"/>	
Define the project's risk analysis	<input type="checkbox"/>	<input type="checkbox"/>	
Set up a project reference sheet (Project Poster for Communication)	<input type="checkbox"/>	<input type="checkbox"/>	
Define the plan for reporting project progress	<input type="checkbox"/>	<input type="checkbox"/>	

Create
concepts

Outputs

- Roles and responsibilities in the startup
- Founders agreement

Stakeholders

- Internal: Project manager, Coach (project methods manager), people with technical and non-technical needed skills, Advisory Board
- External: lawyers, accountant

Knowledge & skills

- Project management knowledge and skills
- Ability to report on project progress

Methodological approaches

- startup organigramme with role and responsibilities
- project management
- external coaching, Open innovation

[Identify first customers]

Validate
concepts

Objectives

Build the usage scenarios for best defining innovation and its sales and marketing challenges

Identify the first customers

Recommended actions

	Done	N/A	Who/When?
Identify the potential uses of the innovation	<input type="checkbox"/>	<input type="checkbox"/>	
Define and enrich scenarios for the planned uses according to the value creation objectives	<input type="checkbox"/>	<input type="checkbox"/>	
Specify the potential market segments	<input type="checkbox"/>	<input type="checkbox"/>	
Compile the expertise contributed by partners (suppliers, potential users, etc.)	<input type="checkbox"/>	<input type="checkbox"/>	
Ensure marketing and sales feasibility	<input type="checkbox"/>	<input type="checkbox"/>	
Verify that all scenarios are compatible with sustainable development	<input type="checkbox"/>	<input type="checkbox"/>	

[Approach the first customers]

Validate
concepts

Outputs

Qualified list of the usage scenarios and markets for the project
List of early adopters

Stakeholders

- Internal: Marketing & sales function, legal function, technical services function
- External: Market research firms, specialising in lifestyles, consumer habits and analysing new consumer and consumer profiles

Knowledge & skills

- Marketing
- Competitive intelligence skills

Methodological approaches

- Strategic intelligence management
- Customer relationship management

[Prototype]

Validate
concepts**Objectives**

Examine and validate technical realisation of the project and define the technical performance levels to be achieved, the technical or regulatory barriers to be overcome, planning of the forthcoming work and the technical specifications

Recommended actions

	Done	N/A	Who/When?
Provide required resources to the technical team	<input type="checkbox"/>	<input type="checkbox"/>	
Define the target performance levels and decide which technical options need to be taken	<input type="checkbox"/>	<input type="checkbox"/>	
Involve the partners, suppliers and other organisations in the technical feasibility study	<input type="checkbox"/>	<input type="checkbox"/>	
Examine the freedom to operate	<input type="checkbox"/>	<input type="checkbox"/>	
Make provisions for partnership agreements if the organisation lacks the necessary technology	<input type="checkbox"/>	<input type="checkbox"/>	
Identify the roles, responsibilities and resources considered by the partners and suppliers in anticipation of future production	<input type="checkbox"/>	<input type="checkbox"/>	
Risk analysis	<input type="checkbox"/>	<input type="checkbox"/>	

[Prototype]

Validate
concepts

Outputs

- Validated target performance levels and technical options for the project
- Technical specifications
- Table comparing the technical options

Stakeholders

- Internal: Project team, technical services function, marketing function
- External: Scientific partners, technical partners, business partners, pilot users, research centres, designers

Knowledge & skills

- Technical expertise skills
- Knowledge of the organisation's potential
- Team leadership skills
- Ability to integrate the external technological development into the organisation

Methodological approaches

- Strategic intelligence management
- Intellectual property management
- Creativity management
- Idea management system

[Set up financing and test partnerships]

LEGAL/NORMATIVE
/FINANCIAL

Validate concepts

Objectives

- Confirm the intellectual property strategy
- Organise, formalise and broker partnership agreements (financial, legal and technical)
- Approve the business plan
- Confirm the sources of financing for the project

Recommended actions

	Done	N/A	Who/When?
Prepare the patent applications and draft standards; send the first applications	<input type="checkbox"/>	<input type="checkbox"/>	
Analyse legally responses from partners, subcontractors, and so on, to the specifications	<input type="checkbox"/>	<input type="checkbox"/>	
Adapt agreements and contracts to the characteristics of the partnerships	<input type="checkbox"/>	<input type="checkbox"/>	
Fine-tune the intellectual property budget for incorporation into the financing plan (cost of the rights to be acquired, future profitability of any transfers, etc.)	<input type="checkbox"/>	<input type="checkbox"/>	

Outputs

- Applications for patents and other property rights (as and when necessary)
- Contracts formed with partners / subcontractor

Stakeholders

- Internal: financial function, intellectual property function
- External: partners, service providers, subcontractors, etc.

Knowledge & skills

- Expertise in financial control, simulations and financial communication
- Skills in legal and financial negotiation
- Skills in intellectual property and commercial law
- Expertise in financial tools (budgetary analysis, investment tables, financing plan, income statements, cash flow plan)
- Financial management of intellectual property

Methodological approaches

- Financial management
- Intellectual property management
- Open innovation, collaborative innovation
- Risk assessment
- Integration of sustainable development issues (CSR: Corporate Social responsibility)

Objectives

- Validated project business plan
- Confirm the project's financial feasibility and projected profitability

Recommended actions

	Done	N/A	Who/When?
Validate the project's profitability forecasts and update the projected initial revenue	<input type="checkbox"/>	<input type="checkbox"/>	
Select the financing scenario(s) in response to the chosen strategy (financial volume, expected financing duration, sources of financing, etc.) if applicable, integrate the financial consequences of the partnerships	<input type="checkbox"/>	<input type="checkbox"/>	
Test the financing plan for robustness	<input type="checkbox"/>	<input type="checkbox"/>	

Outputs

- Seed phase financing
- Validated project business plan
- refresh Project business plan and business model

Stakeholders

- Internal: startup founders
- External: organisations providing financial aid for innovation (advice, financial support, etc.),

Knowledge & skills

- Expertise in the tools used for financial evaluations and formalising financial documents
- Knowledge of the financial community

Methodological approaches

- Risk assessment
- Financial management
- Business modeling
- Fundraising

Objectives

- deploy tools: planning, management, oversight and reporting
- Provide the necessary decision-support elements for moving onto the development phase

Recommended actions

	Done	N/A	Who/When?
Agree on the decision-making process	<input type="checkbox"/>	<input type="checkbox"/>	
Set up actions for monitoring innovation development (deliverables, budget planning, etc.)	<input type="checkbox"/>	<input type="checkbox"/>	
In case of a collaborative project, set up a collaborative framework (collaborative platform, etc.) and define the governance (project monitoring, decision making process...)	<input type="checkbox"/>	<input type="checkbox"/>	
Develop the team if new talents, resources are necessary	<input type="checkbox"/>	<input type="checkbox"/>	
Develop team members competences through training	<input type="checkbox"/>	<input type="checkbox"/>	

Outputs

- Methods, tools and intermediate prototypes
- resources planning (competences, talents)
- Project monitoring indicators defined
- Updated project file

Stakeholders

- Internal: startup founders
- External: Research centres, professional technical centres, business clusters, subcontractors and co-contractors (or any other project partner)

Knowledge & skills

- Innovation project management
- Team leadership and training
- Experience of collaborative work in case of a collaborative project

Methodological approaches

- Management of innovation cultures
- Project management
- collaborative innovation, Open innovation
- Integration of sustainable development issues (CSR: Corporate Social responsibility)

Objectives

Ensure that the final configuration of the product/service meets identified requirements

Recommended actions

	Done	N/A	Who/When?
Accurately define the offering: target markets / usages, method for distributing / disseminating the product/service	<input type="checkbox"/>	<input type="checkbox"/>	
Identify a network of prescribers	<input type="checkbox"/>	<input type="checkbox"/>	
Test the prototype with potential customers / users	<input type="checkbox"/>	<input type="checkbox"/>	
Compile and deal with adaptation requests	<input type="checkbox"/>	<input type="checkbox"/>	
Specify the sales and/or distribution strategy: communication actions, prospecting	<input type="checkbox"/>	<input type="checkbox"/>	
Test product acceptability	<input type="checkbox"/>	<input type="checkbox"/>	

[Product Market Fit]

Develop solutions

Outputs

- Specification of the validated product/service
- Formulation of the value creation objectives

Stakeholders

- Internal: Product owner, marketing and sales functions, operations management functions
- External: Market research firms, firms providing usage and consumer studies, organisational consulting / research, partners

Knowledge & skills

- Sound knowledge of the target market / usage
- Skills in analysing customer feedback

Methodological approaches

- Strategic intelligence management
- Open innovation
- Integration of sustainable development issues (CSR: Corporate Social responsibility)

[Minimum viable Product]

Develop solutions

Objectives

Produce and validate the product/service prototype

Recommended actions

	Done	N/A	Who/When?
Validate the technical specifications	<input type="checkbox"/>	<input type="checkbox"/>	
Create the prototype of the new product/service and validate its final configuration	<input type="checkbox"/>	<input type="checkbox"/>	
Carry out testing and fine-tuning (techniques and customer testing)	<input type="checkbox"/>	<input type="checkbox"/>	
Mobilise suppliers or other technical partners (technology transfer research organisations) identified as offering expertise in the technologies and knowledge required to realise the project	<input type="checkbox"/>	<input type="checkbox"/>	
Continue the intelligence gathering activities associated with the project and check compatibility with the choices made for the project in terms of patents, standards and regulations, whether in force or pending, and with the conclusions of the freedom to operate survey	<input type="checkbox"/>	<input type="checkbox"/>	
Review the functional specifications based on evaluations by all stakeholders	<input type="checkbox"/>	<input type="checkbox"/>	

[Minimum Viable product]

Develop solutions

Outputs

- Intermediate and finalised prototypes of the product/service
- Intermediate files (mass production constraints, etc.) to assess the extent to which objectives have been achieved

Stakeholders

- Internal: Project manager, project team, technical services function, operations management function
- External: Component suppliers, subcontractors, technical centres, laboratories, product testers

Knowledge & skills

- Design / innovation methods
- Skills in the technologies involved in the project

Methodological approaches

- Intellectual property management
- Idea management system
- Open innovation, collaborative innovation

[Ensure legal context is favorable]

LEGAL/NORMATIVE
/FINANCIAL

Develop solutions

Objectives

- Adapt and optimise the intellectual property approach
- Successfully lead agreements

Recommended actions

	Done	N/A	Who/When?
Ensure the confidentiality of the models, prototypes and pilot production runs	<input type="checkbox"/>	<input type="checkbox"/>	
Confirm the freedom to operate and adjust protection of the new product/service in its final configuration and for all target markets / usages	<input type="checkbox"/>	<input type="checkbox"/>	
Ensure the correct performance of all current contracts, and set up new agreements if required for the project. In particular, set up usage rights with partners	<input type="checkbox"/>	<input type="checkbox"/>	
Integrate the project's results into current standardisation approaches	<input type="checkbox"/>	<input type="checkbox"/>	
Ensure compliance with regulations. Pay special attention to sustainable development and CSR constraints	<input type="checkbox"/>	<input type="checkbox"/>	

[Ensure legal context is favorable]

LEGAL/NORMATIVE

Develop solutions

Outputs

Updated and re-evaluated legal management tools for the new product/service

Stakeholders

- Internal: Top management, project manager, legal function, financial function, intellectual property function
- External: Legal consultants, financial consultants, public and private backers, intellectual property experts

Knowledge & skills

- Skills in accounting, management
- Intellectual property and legal negotiation

Methodological approaches

- Financial management
- Open innovation, collaborative innovation
- Risk assessment
- Integration of sustainable development issues (CSR: Corporate Social responsibility)

Objectives

- Validated project business plan
- Adapt financial resources to reflect changes in the project

Recommended actions

	Done	N/A	Who/When?
Adjust the financial resources required to finalise the project; evaluate the full deployment costs	<input type="checkbox"/>	<input type="checkbox"/>	
Update the business plan and the projected initial revenue, working capital requirements and the prospective return on investment	<input type="checkbox"/>	<input type="checkbox"/>	
Consolidate the necessary contacts associated with financing the project	<input type="checkbox"/>	<input type="checkbox"/>	
Adjust the financial resources required to finalise the project; evaluate the full deployment costs	<input type="checkbox"/>	<input type="checkbox"/>	
Update the business plan and the projected initial revenue, working capital requirements and the prospective return on investment	<input type="checkbox"/>	<input type="checkbox"/>	

Outputs

- Serie A phase financing
- Updated and re-evaluated legal and financial management tools for the new product/service

Stakeholders

- Internal: startup founders
- External: organisations providing financial aid for innovation (advice, financial support, etc.),

Knowledge & skills

- Ability to manage a business plan and partnerships highly prone to changes

Methodological approaches

- Risk assessment
- Financial management
- Business modeling
- Fundraising

[Oversee product/service development]

Develop solutions

Objectives

- Realise the project
- Provide the necessary decision-support elements for moving onto the product/service launch phase

Recommended actions

	Done	N/A	Who/When?
Lead the project team	<input type="checkbox"/>	<input type="checkbox"/>	
Carry out the necessary training actions for the project team members	<input type="checkbox"/>	<input type="checkbox"/>	
Update the project plan and budget (project reference sheet)	<input type="checkbox"/>	<input type="checkbox"/>	
Ensure that the project team is appropriate for the launch of the product/service (including a change of project manager if necessary)	<input type="checkbox"/>	<input type="checkbox"/>	
Update the business plan for the new product/service	<input type="checkbox"/>	<input type="checkbox"/>	
Prepare a project report	<input type="checkbox"/>	<input type="checkbox"/>	
Define the conditions for the organisation's acceptance of the project results	<input type="checkbox"/>	<input type="checkbox"/>	
Life-cycle assessment (LCA) for the new product/service possibly with partners	<input type="checkbox"/>	<input type="checkbox"/>	

[Oversee product/service development]

PROJECT
MANAGEMENT

Develop solutions

Outputs

- Product/service ready to be launched
- Organisational, technical and sales launch plan for the product/service
- Provisional launch budget
- Updated project file

Stakeholders

- Internal: Project manager, project team
- External: Research centres, professional technical centres, subcontractors, other organisations in case of a collaborative project; potential customer(s) / users

Knowledge & skills

- Expertise in the different methods and processes for developing the product/service
- Knowledge of the technologies and uses of the new product/service

Methodological approaches

- Risk assessment
- Project management
- Creativity management
- Open innovation, collaborative innovation
- Integration of sustainable development issues (CSR: Corporate Social responsibility)

Objectives

- Validate the sales / organisational objectives to be achieved in order to validate the expected value creation
- Implement the necessary actions to achieve objectives

Recommended actions

	Done	N/A	Who/When?
Define and quantify the sales / distribution objectives	<input type="checkbox"/>	<input type="checkbox"/>	
Set up the sales and/or deployment action	<input type="checkbox"/>	<input type="checkbox"/>	
Compare the value creation with the organisation's CSR policy	<input type="checkbox"/>	<input type="checkbox"/>	

Outputs

Product/service distribution plan

Stakeholders

- Internal: Top management, all functions involved in deployment, operations management
- External: Distribution networks, shareholders, market research firms, change consulting and support companies

Knowledge & skills

- Managerial skills: change management, project management
- Sales skills
- Communication

Methodological approaches

- Strategic intelligence management
- Intellectual property management
- Open innovation, collaborative innovation
- Design management
- Risk assessment
- Integration of sustainable development issues (CSR: Corporate Social responsibility)

[operation of the product/service]

Deploy Solution

Objectives

- Launch the product/service
- Qualify and organise mass production of the product/service

Recommended actions

	Done	N/A	Who/When?
Qualify the product/service during pilot production (bill of materials, organisation)	<input type="checkbox"/>	<input type="checkbox"/>	
Qualify the production process (manufacturing route sheet, process)	<input type="checkbox"/>	<input type="checkbox"/>	
Obtain the necessary approvals and accreditations	<input type="checkbox"/>	<input type="checkbox"/>	
Define the conditions for partners' acceptance of the product/service	<input type="checkbox"/>	<input type="checkbox"/>	
Open a continual improvement action plan	<input type="checkbox"/>	<input type="checkbox"/>	

[operation of product/service]

Deploy Solution

Outputs

- Qualified and documented product/service (technical aspects)
- Deployment and/or mass production plan
- Technical notices, rationale in anticipation of deployment

Stakeholders

- Internal: Project manager, project team, technical services function (operations management, maintenance)
- External: Technical centres, inspection laboratories, certification bodies, and suppliers of components, raw materials and equipment

Knowledge & skills

- Methods
- Manufacturing
- Quality
- Technical expertise

Methodological approaches

Risk control

[Finalize the intellectual property]

LEGAL/NORMATIVE
/FINANCIAL

Deploy Solution

Objectives

- Implement the legal conditions for deployment
- Capitalise on the project's legal performance

Recommended actions

	Done	N/A	Who/When?
Finalise and defend the portfolio's usage rights; finalise the necessary agreements for deployment and set up a system for monitoring agreement performance	<input type="checkbox"/>	<input type="checkbox"/>	
In case of a collaborative project, sign the intellectual property, financing and profit/benefit-sharing agreements with partners	<input type="checkbox"/>	<input type="checkbox"/>	

[Finalize the intellectual property and financing of the product/service]

LEGAL/NORMATIVE

Deploy Solution

Outputs

- Intellectual property secured from the lifecycle perspective
- Compliance with standards and regulations

Stakeholders

- Internal: Legal function, intellectual property function, financial and accounting function, intelligence function, sales function, technical services function
- External: Business partners, financial partners, legal and intellectual property consultants

Knowledge & skills

- Accounting and financial management skills
- Knowledge of intellectual property issues

Methodological approaches

- Financial management
- Open innovation, collaborative innovation
- Risk assessment
- Integration of sustainable development issues (CSR: Corporate Social responsibility)

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Objectives

- Implement the legal and financial conditions for deployment
- Capitalise on the project's legal and financial performance

Recommended actions

	Done	N/A	Who/When?
Determine and monitor the production and marketing costs	<input type="checkbox"/>	<input type="checkbox"/>	
Confirm the product/service's profitability, and the financial feasibility of the launch and lifecycle management	<input type="checkbox"/>	<input type="checkbox"/>	
If necessary, extend financing (medium and long-term financing and operational financing)	<input type="checkbox"/>	<input type="checkbox"/>	
Analyse any deviations from the project's initial projected costs	<input type="checkbox"/>	<input type="checkbox"/>	
Determine and monitor the production and marketing costs	<input type="checkbox"/>	<input type="checkbox"/>	

Outputs

- Signed agreements relating to production, maintenance and commercial use
- Validated product/service management tables for integration into the organisation's global accounts
- Analysis of the legal and financial difficulties encountered, and the methods used to overcome those difficulties in anticipation of capitalising on the lessons learned when launching new projects

Stakeholders

- Internal: startup founders
- External: organisations providing financial aid for innovation (advice, financial support, etc.),

Knowledge & skills

- Ability to update the business plan and finance setup in real time

Methodological approaches

- Risk assessment
- Financial management
- Business modeling
- Fundraising

[Supervise the growth of the product/service]

ORGANIZATION

Deploy Solution

Objectives

Supervise the growth of the product/service and send all innovation project results

Recommended actions

	Done	N/A	Who/When?
Plan deployment of the product/service	<input type="checkbox"/>	<input type="checkbox"/>	
Define the deployment budget for the product/service	<input type="checkbox"/>	<input type="checkbox"/>	
Manage the project's human resources (training, reintegration into the organisation)	<input type="checkbox"/>	<input type="checkbox"/>	
In addition to the launch, set up a dynamic system for assessing the impacts of the product/service using environmental, social, labour and economic criteria	<input type="checkbox"/>	<input type="checkbox"/>	
Close the project file	<input type="checkbox"/>	<input type="checkbox"/>	
Prepare the product/service quality file	<input type="checkbox"/>	<input type="checkbox"/>	

[Supervise the growth of the product/service]

ORGANIZATION

Deploy Solution

Outputs

- Product/service deployed
- Project realisation report

Stakeholders

- Internal: Project team
- External: Customers taking part in the launch phase, partners (distributors, services, etc.); quality auditors and assessors

Knowledge & skills

- Knowledge of the sectors of activity and technologies concerned
- Project management capacities
- Knowledge of the techniques involved in deploying a new product/service

Methodological approaches

- Project management
- Open innovation, collaborative innovation
- Integration of sustainable development issues (CSR: Corporate Social responsibility)

Appendix E - Transcriptions of Interview for Validate phase

Feedback from Fayon, Chief Digital Officer of La Poste – February 2021

« Côté grands groupes, ça éclaire la décision des directeurs d'innovation au niveau de la direction générale pour savoir dans quels paniers mettre les œufs et savoir si, en fonction des objectifs visés: prise de participation développée soit du Chiffre d'affaire additionnel (offensif) ou soit optimisée (réduire le coût des fonctions support, optimiser les RH ou d'autres choses avec d'autres choix startups), soit développer un venture capital, soit faire recourir à un tiers, venture builder etc. Et puis, en fonction aussi de l'existant, l'organisation existante des distributions de profils, le fait que l'innovation soit en silo, soit globalisée, ça permet peut-être d'éclairer les choix.

Voilà comment je vois la chose après, ce qui peut être intéressant, c'est de faire des zooms sur les entreprises du CAC un peu plus pointues ou éventuellement alors se structure post-doc, élargir au niveau du SBF 120 ou faire des comparaisons entre les entreprises du CAC. Par rapport, comme je l'ai fait au départ, entre les États-Unis, la France et le reste du monde sur la zone globale. Moi, ce qui m'intéresse serait peut-être de comparer entre la France, l'Allemagne, l'Italie et le Royaume-Uni, qui sont quand même les quatre majors de l'Europe, même si oui, oui, en Europe.

Petite critique, c'est que par rapport à l'état que tu fais avec exemple, 31 est une entreprise du CAC qui sont dans telle catégorie, etc. Ça a été étalé dans le temps sur trois ans. Or, trois ans, c'est de loi de Moore, ça évolue très, très vite et peut être qu'en l'espace de six mois, un an et surtout qu'avec la crise de la COVID, ça a été un facteur d'accélération de la transformation digitale. Pour l'aspect télétravail et nomadisme, etc.

Et ce qui peut être intéressant, ce n'est pas de faire forcément faire une enquête avec des résultats qui sont passés dans le temps, mais plutôt un panel avec un suivi des rapports entre les startups et les grands groupes des grands groupes par grands groupes pour voir les évolutions au fil des années.

Ça répond à l'objection d'une évolution temporelle perçue comme en perpétuelle effervescence, en perpétuel mouvement, voir si finalement il y avait des hypothèses qui avaient été faites à un moment donné. Ensuite, ces remises en cause.

Il faut voir aussi que dans les grands groupes de type Orange, SNCF, La Poste et tous ont des mouvements de balancier, et c'est perturbant pour les startups

Par exemple, je prends l'exemple des fonctions support système d'information ou encore RH. On prend un grand groupe comme La Poste, qui soit séparent, soit regroupent les 3 métiers que sont le courrier de colis et la banque, ou tu prends aussi d'Alcatel Alstom, tu avais un groupe qui a trois métiers l'énergie, les télécoms et transports énergie. Mais comme le transport, c'est les trois fonctions du corps des mines qui ont été absorbés en 2009 ou 2010 par le corps des télécoms en ayant énergie les télécoms et les transports qui étaient les activités d'Alcatel. Et quand tu regardes les GAFA Google, en particulier

Alphabet, tu t'aperçois que Google est présent dans l'énergie avec Nest, par exemple dans les transports avec Google Car, dans les télécoms avec Google Fiber et quelques éléments. Mais vraiment, c'est ces trois composants qui, ces trois composantes, elles sont cœur dans la smart city ou smart grid. Est-ce que tu as besoin d'avoir ton véhicule électrique ? Des problématiques de recharge et problématiques de transport, de télécoms, de smart grid, etc. Donc, c'est assez intéressant de voir dans un grand groupe ces mouvements de balancier. Tu peux dire tiens, j'ai trois ou quatre métiers : Les RH, ici, vont être répartis dans chacun des métiers. Et si au niveau de telle branche et si au niveau de telle branche, si notre branche, puis un autre moment, on dit non, on va faire ici centrale.

Le Système d'information va être factoriser et commun à l'ensemble des branches et souvent ce qui se passe et on le voit. Alors je prends l'exemple de France Télécom devenu orange. Avant, il y a eu la délégation générale des télécoms. Tout était regroupé ensuite avec l'arrivée d'Internet et du téléphone mobile. Ils ont fait ce que la maison mère, ils ont fait Wanadoo et Itinériss. Et puis après, ils ont tout regroupé étape contraire dans Orange avec la téléphonie fixe, mobile et Internet. Un mouvement de balancier qui fait qu'à un moment donné, l'innovation peut être soit groupée et factorisée ou soit émiettées. Et donc en fonction de ces mouvements de balancier. C'est pour ça que la dimension temporelle est intéressante. Peut-être que le choix d'un grand groupe d'être pour corporate venture, etc. va être évolutif et peut être que l'organisation même de l'entreprise va l'inciter à être plus dans un modèle plutôt qu'un autre. Et donc ça va avoir de gros impacts sur la startup, et notamment sur les temps de réponse, etc. Je t'avais envoyé les documents sur la relation entre La Poste via le programme Time to Test que je coordonnais. On s'est inspiré de ce que ce qui était fait au niveau de la French Tech les recommandations de la French Tech Je les ai prises et je les ai adaptées aux contraintes du monde postal

Voilà les réactions à chaud. Encore une fois, je mets un regard de chercheur, de directeur de l'innovation, donc j'essaye de mixer un peu les deux.

Il y a des éléments qui peuvent être objets à publication scientifique ou donner lieu à d'autres travaux de recherche. »

Feedback from Cassagnol, Senior Key Expert Research Scientist in Corporate R&D in Siemens –February 2021

« C'est assez éclairant. La première classe "relation client fournisseur, j'identifie ça avec les relations que nous en avons dans le Purchasing Management où l'on essaye toujours d'établir de plus en plus des relations privilégiées avec nos fournisseurs et ça peut être aussi une startup. Je n'ai pas de connaissance actuellement d'activités spécifiques management avec des startups chez Purchasing management, c'est plutôt avec des fournisseurs traditionnels.

Après tout ce qui est "innovation team", alors nous, ça va dépendre du département de la Recherche et Développement donc du département de recherche central basé à Munich. On a une équipe de d'innovation qui est établi avec une série d'activités, autrefois, plutôt tournées vers l'intérieur de l'entreprise. Mais depuis l'année dernière, on a une plateforme : ça s'appelle « Ecosystem Platform » pour avoir des relations plus faciles avec l'extérieur de l'entreprise. Par la voie de la plateforme digitale qui lance des challenges. N'importe qui peut y participer et en particulier une startup. C'est plutôt collective intelligence ou crowdsourcing.

Par les trois dernières classes, il y a chez nous et des entités qui s'en occupent de façon plus particulière. Donc, je te dis startup incubateur, c'est plus Next 47 chez nous et tout ce qui est une venture builder et corporate venture. Ça va être aussi dans ce coin-là. Tout ce que tu me montres là, c'est que ce sont des entités bien définies qui n'ont rien à voir les unes avec les autres chaînes. Cette étude me fait comprendre que ces différents dispositifs sont dans une approche open innovation. Chez nous, ils se sont intégrés dans le processus d'innovation petit à petit.

Autre question est ce que les résultats de l'analyse des relations startups grands groupes en France nous ont permis de découvrir certaines choses ?

Je trouve que c'est très intéressant d'avoir une vue d'ensemble du problème et de pouvoir établir des domaines différents en fonction accédés.

Ça permet de structurer sa pensée, je pense, et de voir les différents domaines qui sont touchés potentiellement par l'innovation et les ressources qui sont liées.

Je pense que ça peut donner des idées pour voir comment apporter un meilleur soutien aux entreprises ou aux startups. En fonction des idées, des tâches plus claires ou plus foncées, et de voir où il y a des manques et où on peut-être mieux travailler ensemble pour passer d'une étape à une autre.

Ça peut amorcer aussi la réflexion sur l'utilité de l'ajustement de deux équipes interdisciplinaires. Du côté du grand groupe, qui permet aussi d'un passage plus doux d'une étape à une autre pour essayer de se passer d'un passage de témoin. Et pas qu'à chaque fois qu'on sort d'un silo, l'autre préfère la startup soit obligé de recommencer à zéro son histoire.

Les manques que je vois dans ces travaux de recherche sont les suivants. Comment on rentre en contact l'un avec l'autre ? Comment ?

Là, il y a déjà un dialogue qui a été amorcé entre les deux pour arriver à faire ce patchwork-là. Comment on peut établir la relation avec une startup notamment avec les questions de propriété intellectuelle

Il y a aussi le volet propriété intellectuelle. Chaque fois qu'on a une activité de recherche, on est on écrit régulièrement des fiches idées en Allemagne, et donc on a tout de suite un conseil en propriété intellectuelle qui vient discuter avec nous de l'idée qui rédige une demande de brevet, qui est soumise aux chefs de départements et des chefs de départements, décide du potentiel de cette idée pour poursuivre dans leur domaine et décide.

Ils veulent prendre en charge les frais de la demande auprès de l'Office européen des brevets. On a aussi un incentive sur le sujet. Donc, je pense que les gens y pensent donc automatiquement.

Forcément, on voit aussi quand, chaque fois qu'on a des carveouts et cette histoire de brevet, c'est aussi une épine dans le pied, on essaye de savoir à qui ils appartiennent. On essaie de savoir si ce sont des projets qui sont stratégiques ou pas. C'est aussi un instrument effectivement stratégique. »

PART IX LIST OF PUBLICATIONS

Book:

How Corporate Standardisation Shapes Tomorrow's Business

A de Casanove, I Lambert

Effective Standardization Management in Corporate Settings, 1-17

2016

Conference:

ISO 50500 series innovation management: overview and potential usages in organizations

A de Casanove, L Morel, S Negny

ISPIM

2017

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IAMOT

2018

Innovation capabilities assessment: a sectorial view supported by an original diagnostic tool-the Potential Innovation Index

M Enjolras, Alice de Casanove, L Morel, J Claire

2019

Importance of and how to increase the relevancy and impact of a terminology standard? Case of ISO 56000:2020 innovation Management -- Fundamentals and Vocabulary

Alice de Casanove, Fred Gault and Magnus Hakvag

SIIT 2021

Journal :

Changer les règles du jeu de l'innovation commence par les mots

Alice de Casanove

Cahiers EPGE 2020

STIMULER LES RELATIONS D'INNOVATION OUVERTE ENTRE LES GRANDES ENTREPRISES ET LES STARTUPS. APPLICATION A L'ECOSYSTEME FRANÇAIS

Mots clés : innovation ouverte, startup, grande entreprise, écosystème de l'innovation, série ISO 56000

Le rythme rapide de l'évolution des entreprises met à rude épreuve les stratégies typiques des grandes entreprises. C'est pourquoi les grandes entreprises doivent chercher à adopter une approche agile, empruntée à l'approche startup. Plutôt que de modifier leur propre mode de fonctionnement, les grands groupes cherchent à adopter l'innovation ouverte comme moyen d'évoluer et de répondre à tout nouveau contexte commercial. Cependant, les startups et les grandes entreprises ont des stratégies opposées : les startups cherchent à s'adapter au marché et à connaître une croissance exponentielle, tandis que les grandes entreprises se concentrent sur l'optimisation et le développement de leur rentabilité. Pourtant, les grandes entreprises proposent de plus en plus de dispositifs d'innovation ouverts ciblant les startups.

Dans cette thèse, nous proposons une analyse des pratiques actuelles dans le monde des entreprises pour évaluer ce paradoxe apparent : comment les grandes entreprises peuvent-elles adapter leur offre d'innovation ouverte aux préoccupations des startups ? Comment comparer les différents impacts des dispositifs d'innovation ouverte ? L'une des principales conclusions de cette analyse est que le succès de l'innovation ouverte n'est pas lié à l'organisation elle-même, mais au dispositif de gestion de l'innovation.

Nous étudions les caractéristiques de l'innovation ouverte en France et examinons les défis de la théorie de l'innovation ouverte. L'écosystème français de l'innovation est dynamique et fortement soutenu par les actions du gouvernement français [164]. Néanmoins, le soutien du secteur privé est également important dans le paysage français de l'innovation ouverte. Nous nous concentrons donc sur les grandes entreprises françaises du CAC 40 et examinons leurs relations avec les startups. Le CAC40 rassemble de grandes entreprises aux profils diversifiés (services d'accueil, pétrole et gaz, automobile, génie civil, banque, opérateurs de télécommunications...). Cette diversité contribuera à soutenir la généralité de l'approche

La participation à l'innovation ouverte nécessite également des décisions stratégiques, en particulier le niveau d'ouverture acceptable [160], [161]. Les startups et les grandes entreprises n'ont pas le même langage, ni la même temporalité, mais elles ont toutes deux des besoins [162]. Ces besoins influencent leurs stratégies. Pour tous, travailler ensemble est un choix mais aussi une responsabilité. Quels sont les défis à relever pour assurer une collaboration fructueuse entre les entreprises et les startups ? [163]. Pour les grandes entreprises, le plus grand défi est de pouvoir se rapprocher des contraintes des startups et de développer leur innovation. Pour les startups, le principal besoin est de savoir comment être soutenues et de démontrer leur capacité à exister à long terme.

Face à la multiplicité des partenaires possibles, les entreprises doivent définir en amont quelle stratégie d'innovation ouverte elles souhaitent mettre en œuvre, autour de questions telles que : avec qui collaborer ? sur quel sujet ? comment ? à quelle fréquence ? La plupart d'entre elles choisissent une ouverture progressive, tant sur le réseau de partenaires que sur l'éventail des sujets concernés. En effet, l'innovation ouverte n'est pas nécessairement synonyme d'ouverture totale et nous avons identifié trois types d'approche : L'innovation ouverte orientée vers certains thèmes, l'innovation ouverte orientée vers certains partenaires et, l'innovation totalement ouverte.

Nous étudions les caractéristiques de l'innovation ouverte en France et examinons les défis de la théorie de l'innovation ouverte. L'écosystème français de l'innovation est dynamique et fortement soutenu par les actions du gouvernement français [164]. Néanmoins, le soutien du secteur privé est également important dans le paysage français de l'innovation ouverte. Nous nous concentrons donc sur les grandes entreprises françaises du CAC 40 et examinons leurs relations avec les startups. Le CAC40 rassemble de grandes entreprises aux profils diversifiés (services d'accueil, pétrole et gaz, automobile, génie civil, banque, opérateurs de télécommunications...). Cette diversité contribuera à soutenir la généralité de l'approche. La mesure de l'engagement dans l'innovation ouverte peut se concentrer sur la maturité de l'organisation [23], sur les pratiques d'innovation ouverte dans les activités commerciales [171], [24], ou sur la qualité des relations elles-mêmes, avec les dimensions culturelles [25]. Néanmoins, comme indiqué par [26], nous devons prendre en compte le polymorphisme des relations d'innovation ouverte, ainsi que les coûts transactionnels des collaborations [27]. Le coût de l'ouverture n'est pas encore bien défini et des études supplémentaires sont nécessaires pour comprendre tous les mécanismes [28], [29]. Laursen [172] montre qu'il existe une forte relation entre le degré de soutien et les performances. Nous avons constaté que l'innovation ouverte est souvent étudiée à un niveau macro et rarement à un niveau opérationnel pour évaluer les impacts et la maturité des différentes mesures d'innovation ouverte. Peu de documents se concentrent sur les aspects opérationnels de l'innovation. Par exemple, Bertin [31] identifie les facteurs organisationnels qui favorisent la collaboration mais ne couvre pas les autres aspects de la gestion de l'innovation.

L'analyse de l'état de l'art nous permet de conclure que dans le domaine de la recherche sur les relations entre les startups et les grandes entreprises, il n'existe pas de cadre analytique complet et opérationnel pour comparer les modes de relations.

En conséquence, cette recherche vise à concevoir un cadre analytique avec une approche systématique et opérationnelle

Comment montrer l'adéquation entre les besoins d'une startup et le dispositif d'innovation ouverte d'une grande entreprise en proposant un cadre pour une analyse systématique et exhaustive des relations entre les grandes entreprises et les startups ?

Quels sont les besoins des startups ? Évoluent-ils au fur et à mesure que l'entreprise en phase de démarrage gagne en maturité ?

Comment concevoir des outils pour une compréhension systématique et exhaustive des dispositifs d'innovation ouverte et du soutien fourni ?

Existe-t-il une approche permettant d'identifier l'adéquation entre les besoins de l'entreprise en démarrage et le soutien apporté par les grandes entreprises ?

Dans cette thèse, nous proposons une analyse des pratiques actuelles dans le monde des entreprises pour évaluer cet apparent paradoxe : comment les grandes entreprises peuvent-elles adapter leur offre d'innovation ouverte aux préoccupations des startups ? Comment comparer

les différents impacts des dispositifs d'innovation ouverte ? L'une des principales conclusions de cette analyse est que le succès de l'innovation ouverte n'est pas lié à l'organisation elle-même, mais au dispositif de gestion de l'innovation. Ainsi, notre question de recherche centrale est la suivante : comment pouvons-nous analyser le niveau de soutien d'un dispositif d'innovation ouverte plutôt que la maturité de l'organisation qui le met en œuvre ?

Cette question est au cœur de cette thèse. Nous proposons un cadre basé sur la grille de maturité pour analyser la valeur ajoutée attendue des mesures d'innovation ouverte proposées par les grandes entreprises. Nous construisons notre grille sur deux échelles :

- 1) sur le type d'engagement et les relations entre les grandes entreprises et les startups ;
- 2) sur les domaines que le développement d'une startup devrait considérer sous l'angle des nouvelles normes ISO sur la gestion de l'innovation (ISO 56002:2019).

Nous mettons en œuvre ce cadre pour l'écosystème français (entreprises du CAC 40). Enfin, une validation de la robustesse est réalisée avec une enquête sur les startups et des entretiens avec des grandes entreprises.

Pour présenter les résultats, nous souhaitons nous concentrer, tout d'abord, sur les aspects opérationnels qui sont au cœur de notre approche et montrer comment les résultats peuvent être utilisés aujourd'hui par les acteurs du monde des affaires. Nos cadres ne sont pas seulement applicables dans leur ensemble, mais leurs éléments peuvent aussi être utilisés séparément à des fins différentes, nous aimerions en partager certains :

Grille de maturité des startups

Les grilles de maturité pour les startups peuvent aider les startups à évaluer elles-mêmes où elles en sont en termes de développement et les aider à cibler leur stratégie de développement. Cet outil est également pertinent pour toutes les structures qui accompagnent les startups. Il est utile dans le processus de sélection, ainsi que pour guider les startups dans leur développement. Fiches d'accompagnement au développement des startups

La grille de maturité est l'essence d'un travail présenté en annexe C. Même si pour notre travail, nous n'avons conservé que la grille de maturité, nous souhaitons dans cette conclusion relever la valeur ajoutée de cette annexe C qui, de manière très opérationnelle et sous un format attrayant (guide pratique), est le résultat de la consolidation des pratiques reprises dans les normes, la littérature de recherche, ainsi que la discussion avec les praticiens. Cet outil peut aider les dirigeants de startups et les accompagnateurs à définir une stratégie de développement et à les guider pas à pas.

Encadrer les dispositifs d'innovation ouverte (grille de classification / maturité)

La classification des dispositifs d'innovation ouverte peut aider les grandes entreprises à mieux articuler leur stratégie d'innovation ouverte, en particulier en interne lorsque les responsables de l'innovation doivent prouver le retour sur investissement de l'innovation ouverte à l'équipe de direction.

En particulier, le cadre est très utile pour établir des points de référence et comparer les différents retours sur investissement. Par exemple, le retour sur investissement d'une entreprise est complètement différent de celui d'un incubateur.

Détails des résultats chapitre par chapitre

La première partie contextualise notre approche à travers trois chapitres :

CHAPITRE 1 : La principale contribution de ce chapitre consiste à :

- l'articulation du concept de startup, ainsi qu'une compréhension approfondie des phases de développement de la startup.

- une compréhension des enjeux des relations entre les grandes entreprises et les startups

- une analyse de l'importance de ces relations dans un écosystème d'innovation.

Nous avons ensuite pu montrer la motivation et la rationalité de notre travail.

Le CHAPITRE 2 se concentre sur le statut de la startup dans la stratégie d'innovation ouverte d'une grande entreprise. Nous détaillons les facteurs qui influencent les grandes entreprises dans leurs stratégies d'innovation, ainsi que les typologies de ces stratégies et leur efficacité dans le contexte français. Nous avons ensuite compris l'impact de l'innovation ouverte dans les stratégies des grandes entreprises et en particulier le rôle des startups dans l'approche d'innovation ouverte.

Le CHAPITRE 3 se concentre sur le paysage des soutiens existants dans un écosystème d'innovation, y compris les soutiens publics et privés. Ce chapitre nous aide à comprendre que le soutien public n'est pas suffisant pour le développement des startups, le soutien privé est également obligatoire.

L'accent mis sur l'écosystème français nous aide à démontrer sa vivacité et le rôle des grandes entreprises françaises qui complètent le soutien du gouvernement. Elle nous permet d'approfondir cette notion d'écosystème de l'innovation en examinant le poids du CAC 40 dans la démarche d'innovation ouverte. Ce chapitre justifie l'intérêt d'utiliser l'écosystème français comme cas d'utilisation.

Le CHAPITRE 4 présente les 4 concepts fondamentaux qui constituent un cadre d'analyse pour notre travail : les dispositifs d'innovation ouverte, les domaines de gestion de l'innovation, les domaines de maturité des startups et les grilles de maturité.

Le CHAPITRE 5 présente les orientations de nos recherches : les enjeux, le champ d'application et nos questions scientifiques.

Ainsi, cette première partie nous aide également à cadrer notre travail en comprenant l'enjeu des relations entre les startups et les grandes entreprises ainsi que l'intérêt de notre travail.

La deuxième partie définit la méthodologie et conçoit nos cadres de travail.

Le CHAPITRE 6 présente une vue d'ensemble de notre méthodologie avec l'approche en 4 étapes : DÉFINIR/CONCEVOIR/METTRE EN ŒUVRE/VALIDER. Il contribue à notre travail avec l'analyse d'autres grilles de maturité », ce qui nous aide à comprendre les principes de la grille de maturité et comment les concevoir. Nous proposons une présentation d'une méthodologie générique, comme un protocole générique pour aider d'autres chercheurs à réutiliser cette méthodologie dans d'autres contextes.

Le CHAPITRE 7 conçoit nos grilles pour les besoins de notre recherche. Il présente une instanciation pour les grandes entreprises et une instanciation pour les startups. Nous expliquons comment mettre en œuvre ce cadre.

Ainsi, la partie II nous permet d'aborder les aspects stratégiques et opérationnels de la relation entre les startups de grandes entreprises et nous donne les cadres avec les différentes classifications, et les grilles de maturité.

La PARTIE III est axée sur la mise en œuvre des cadres afin de montrer leur applicabilité et leur pertinence dans les chapitres 6 et 7 :

Le CHAPITRE 8 met en œuvre les cadres du CAC 40 français : les entreprises sont très actives. Il existe une diversité de dispositifs d'innovation ouverte pour comprendre les différents besoins des startups. Les entreprises du secteur financier proposent des dispositifs d'innovation ouverte axés sur la maturité financière (ex : capital-risque d'entreprise), tandis que les entreprises ayant un solide bagage technique proposent des incubateurs pour renforcer les relations entre les experts internes et les startups. Cette mise en œuvre permet de comprendre comment utiliser ce cadre pour analyser un écosystème.

Le CHAPITRE 9 reflète le chapitre 7 pour les startups et propose de montrer la pertinence de notre approche et les enjeux de sa mise en œuvre. En raison du COVID 19, nous avons obtenu un faible nombre de réponses pour notre questionnaire. Néanmoins, nous avons pu constater que les entreprises en phase de démarrage déclarent avoir une compréhension claire de leur marché alors que les entreprises après avoir testé leur hypothèse de marché semblent moins confiantes dans leur compréhension du marché.

La partie III montre qu'avec nos cadres, nous pouvons trouver l'adéquation entre les programmes d'innovation ouverte et le niveau de maturité de la startup.

La partie IV cherche à valider nos outils et hypothèses avec une approche différente à travers les chapitres 8 et 9.

Le CHAPITRE 10 présente comment tester notre cadre en validant nos hypothèses avec le point de vue des startups et des grandes entreprises en dehors du CAC 40. Cette approche a permis de mettre en évidence les avantages potentiels d'un tel outil pour les entreprises, ainsi que les limites qui lui sont associées et qui restent à travailler.

Le CHAPITRE 11 aborde l'ensemble de nos résultats et leur robustesse dans l'analyse des différentes problématiques de notre recherche (portée géographique limitée et manque de données provenant des startups), nous proposons également des dispositifs pour des recherches complémentaires, et nous analysons un suivi potentiel pour diffuser les résultats dans l'entreprise par le biais des normes.

Ces conseils fournissent une approche structurée aux organisations qui cherchent à conclure un partenariat d'innovation avec une autre organisation. Il les aide non seulement à décider si la collaboration avec d'autres organisations dans le cadre de leur projet d'innovation est utile, mais aussi à choisir les bons partenaires, à aligner les partenaires et à s'entendre sur une compréhension commune. Il donne également des conseils sur la meilleure façon d'attribuer les rôles et les responsabilités et de mettre en place des procédures de gouvernance efficaces.

Ce document fournit des conseils pour les partenariats d'innovation. Il décrit le cadre des partenariats d'innovation pour :

- décider s'il convient de conclure un partenariat d'innovation,
- identifier, évaluer et sélectionner les partenaires,
- aligner les perceptions de la valeur et des défis du partenariat,

- gérer les interactions entre partenaires.

Les orientations fournies par le document ISO sont pertinentes pour tout type de partenariat et de collaboration et sont censées être applicables à toute organisation, quels que soient son type, sa taille, son produit/service fourni.

Nos travaux pourraient être pris en compte lors d'une révision de cette norme en mettant l'accent sur les relations entre les startups et les grandes entreprises pour les deux premières étapes des partenariats (décider de conclure un partenariat, évaluer/sélectionner des partenaires). Nous pourrions espérer que pendant le processus de normalisation, les discussions pourraient aider à généraliser le cadre pour d'autres types de relations.

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