Legitimacy of the internal Fab Lab: granted or earned? Between difficulties and challenges, the case of the i-Lab (Air Liquide)

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Résumé :

Les Fab Lab internes sont des espaces d'innovation appartenant à des entreprises. De plus en plus d'entreprises adoptent ces tiers-lieux d'innovation. La littérature explique ce phénomène en soulignant les nombreux bénéfices liés à la mise en œuvre d'une structure de type Fab Lab interne, notamment le support à l'innovation d'exploration. Cependant, une récente étude montre que la plupart des entreprises qui adoptent un Fab Lab interne ne parvient pas à innover grâce à cette structure, qui disparaitrait dans le temps. Si la littérature n'étudie que très peu le sujet, certains auteurs suggèrent que pour être pérennes, les Fab Lab internes doivent être légitimés. En d'autres termes, les Fab Lab internes doivent être acceptés et perçus comme souhaitables dans les entreprises qui les adoptent. Cependant, légitimer un Fab Lab interne peut présenter des difficultés, voire même être paradoxal, dans la mesure où ces entités permettent aux entreprises de penser "out of the box", et de contourner leurs normes selon des procédés d'essai-erreur. Dans la lignée de l'approche institutionnelle, la légitimité d'un Fab Lab interne peut donc remettre en question les attentes rationnelles des entreprises qui adoptent ces structures. Cette recherche exploratoire tâche d'étudier ce gap en considérant le cas unique de l'i-Lab, le Fab Lab interne de l'entreprise Air Liquide. Notre travail suggère que si la légitimité est primordiale pour supporter la pérennisation du Fab Lab interne, et *in fine* l'exploration d'innovation, cette dernière ne peut être construite. Elle doit être gagnée et détourner de nombreuses difficultés relatives aux tensions entre (1) la perspective institutionnelle inhérente à la légitimité et aux caractéristiques des Fab Lab internes et (2) les perspectives institutionnelle et rationnelle impliquées par l'adoption d'un Fab Lab interne. Nous identifions plus particulièrement (a) des difficultés à gérer la distance géographique entre l'i-Lab et les équipes de R&D, (b) la création d'une proximité organisationnelle et (c) la création de valeur, comme les difficultés principales pouvant questionner la légitimité de l'i-Lab, et donc freiner sa pérennisation au sein d'Air Liquide.

Mots-clés : Fab Lab interne – légitimité – innovation – perspectives institutionnelle et rationnelle

Abstract

Internal Fab Labs are corporate dedicated innovation entities. They attract the attention of an increasing number of firms. The literature explains it by pointing out the many benefits of implementing an internal Fab Lab, such as exploration innovation. Nevertheless, a recent study shows that most of firms fail to implement internal Labs and little is known about it. The literature suggests that to be sustained, internal Fab Labs must be legitimate. In other words, they have to be accepted and perceived as desirable by the adopting firm. However, legitimating an internal Fab Lab could be difficult, even paradoxical as these entities allow firms to think "out of the box", away from their norms, following a trial-error approach. In line with an institutional perspective, the legitimization process of internal Fab Labs can be questioned by a firm's rational expectations. This exploratory research begins to fill this gap by considering the single case study of the i-Lab, the internal Fab Lab of Air Liquide. We show that even if legitimacy is key to support an internal Fab Lab's sustainability, it can't be earned. It has to be granted by facing challenges related to tensions between (1) the institutional perspective of legitimacy and an internal Fab Lab's characteristics and (2) the institutional and rational perspectives involved in the internal Fab Lab implementation. We identify (a) the management of geographical the distance with R&D site, (b) the creation of organizational proximity with R&D units and (c) value creation as the three main challenges internal Labs have to deal with.

Keywords

Internal Fab Lab – legitimacy – innovation – institutional perspective – rational perspective

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Introduction

Third places and collaborative space attract more and more attention from both researchers and practitioners (de Vaujany and Mitev, 2013; Fabbri et al., 2016). The implementation of Fab Labs[1] particularly increased since MIT Professor Neil Gershenfeld founded the Fab Foundation and the Fab Lab Network in 2009. According to the Fab Foundation[2], a *"Fab Lab is a platform for learning and innovation: a place to play, to create, to learn, to mentor, to invent."* If Fab Lab was originally an independent and open access space, firms take ownership of the concept and now implement their own Fab Lab, also known as "internal" Fab Labs (Lô, 2017).

In France, lots of firms consider the emergence of Fab Labs as relevant for innovation, as evidenced by the creation of the lobby "Fab&co" in 2016, which include implementing firms such as Renault, Air Liquide, Airbus etc. To explain this interest, the literature shows that Fab Labs support exploration innovation (Mérindol et al., 2016; Lô, 2017), that is *"things captured by terms such as search, variation, risk taking, experimentation, play, flexibility, discovery, innovation"* (March, 1991: 71). However, despite its managerial attraction, little is known about Fab Lab implementation (Lô, 2017), even though it is argued that firms can face difficulties (Fuller et al., 2014). According to a Capgemini study[3] (2016), 90% of internal Labs fail. First, this can be explained by a lack of coherence between firms' innovation plans and firms' motivation to implement a lab (Capgemini, 2016). Second, according to Hatchuel[4], it seems that Fab Labs' business model isn't known yet**.**

[1] Contraction of Fabrication-Laboratory
[2] Source: http://www.fabfoundation.org/index.php/what-is-a-fab-lab/index.html
[3] Source: http://ebooks.capgemini-consulting.com/the-innovation game/Standalone_Infographic_Content_Innovation_Centers_main_22_7_15_v2.pdf
[4] Source: http://www.lemonde.fr/idees/article/2017/11/29/fab-lab-l-innovation-cherche-encore-son-modele-de-gestion_5222143_3232.html

Some academics (Mérindol et al., 2016; Mérindol and Versailles, 2016) suggest to legitimate the internal Fab Lab within the adopting firm to sustain it. In line with an institutional perspective, legitimacy is defined as « *a generalized perception or assumption that the actions of an entity are desirable, proper, or appropriate within some socially constructed system of norms, values, beliefs, and definitions.* » (Suchman, 1995: 574). In other words, an organization builds legitimacy when it conforms to its environment (e.g. Meyer and Rowan, 1977).

However, the legitimization process of such an entity can be difficult to reach, even paradoxical. First, internal Fab Lab implementation involves both the formal and informal spheres of an organization (Lô, 2017). Second, it requires new ways of management and practices to think "out of the box", thus differing from firms' norms (Mérindol et al., 2016). As internal Fab Labs aim to support exploration (Capdvila, 2015; Mérindol et al., 2016; Lô, 2017), they call for a separate structure, even sometimes a geographical distance (Capdevila, 2015; Mérindol et al., 2016). Finally, internal Fab Labs use trial-error approach (Lô, 2017), while these entities should support value creation (Mérindol et al., 2016). The institutional perspective of legitimating the internal Fab Lab is thus questioned by a rational actor perspective, drawing on an "efficient-choice" perspective (Volberda et al., 2014: 1247).

Despite the questions raised by these institutional vs. rational perspectives tensions, little is known about it. Our study aims to contribute to this body of research by investigating the following research question: *How to legitimate an internal Fab Lab to sustain it?* To answer this question, we consider the single case study of Air Liquide's internal Fab Lab, the i-Lab, founded in 2013. We selected the i-Lab case because it provides a theoretically relevant context (Eisenhardt, 1989) and empirical evidence from a successful case. This single case study also fits with Yin's (2013) recommendations to study a representative or revelatory case.

Based on 13 semi-structured interviews, more than 30 secondary data and a non-participant observation, our findings suggest that Air Liquide is succeeding in legitimating the i-Lab, despite many difficulties related to tensions between the legitimization process and the i-Lab characteristics, and between the institutional perspective of legitimacy and rational expectations related to the i-Lab. To be perceived as legitimate without neglecting its goal of supporting exploration, it seems that the i-Lab had to succeed in overcoming three challenges regarding the management of geographical the distance with the R&D site, the creation of

organizational proximity with R&D units and value creation. Our study has both theoretical and managerial implications. First, this article extends the undeveloped knowledge on Fab Labs (Lô, 2017). We extend the empirical literature dealing with the organizational integration of third-place for innovation within the firm (Ben Mahmoud-Jouini, 2016). Second, we shed light on the tension between exploration activities (through the implementation of an internal Fab Lab) and exploitation using the institutional perspective, while most of the literature uses the ambidexterity framework (Tushman and O'Reilly, 1996). From a managerial perspective, this article draws a set of recommendations for firms.

The article is structured as follow: first, we present the theoretical background, defining internal Fab Labs and drawing on the neo-institutional literature. Then, we describe the i-Lab and present our methods. In a third part, we expose our findings. Finally, we discuss these findings and conclude with the limitations and future research avenues.

1. Theoretical background

1.1. Internal Fab Lab: origins and definition

The role of physical spaces to support innovation within organizations attracts more and more the attention of academics (Capdevila, 2015; Ben Mahmoud-Jouini, 2016; Fabbri et al., 2016; Mérindol et al., 2016). Among the various types of open spaces for innovation, open labs, defined as *"a place and an approach carried by various actors, in order to renew innovation modalities, through the implementation of collaborative, iterative and open processes, leading to a physical or virtual occurrence"* (Mérindol et al., 2016: 4), attract more and more attention. Mérindol et al. (2016) identify various types of open labs: Fab Labs, Living Labs, hackerspaces and makerspaces, and TechShops.

Table 1: Types of Open Labs (free adaptation of Mérindol et al., 2016)

Fab Lab	"A fab lab (*fabrication laboratory*) is a small-scale workshop offering open access to (personal) digital fabrication."
Living Lab	"Set of multidisciplinary experts that develop, deploy and test, in a real or realistic environment, new - technologies and strategies in response to world's transformation."
Hacker and maker space	"Open collaborative spaces where people sharing technological common interests meet and innovate."
Techshop	"Techshop is a chain of workshops and fabrication studios. In 2017, the US Techshop have been reorganized and reopen under the name of TechShop 2.0."

Neil Gershenfeld shed light on the Fab Lab notion. *"A Fab Lab is a small-scale workshop offering open access to (personal) digital fabrication (…), a platform for learning and innovation: a place to play, to create, to learn, to mentor, to invent.*"[5] According to the original definition, a Fab Lab is an innovation space open to everyone, where an open community of students, scientists, creative and experts can meet and innovate together, wether they are professional or not (Gershenfeld, 2012). The Fab Foundation's charter summarizes 4 criteria, defining a Fab Lab as (1) being open access, (2) being respectful to the charter[6], (3) supporting collaboration, through tools and processes and (4) being part of The Fab Lab Network. This article focuses on a particular form of Fab Labs, which draws most of the increasing attention since 2012[7].

Aware of the potential of such a space for innovation, firms take ownership of the Fab Lab concept. They now implement their own Fab Labs, also called "corporate Fab Labs", "industrial Fab Labs" or "internal Fab Labs"[8] (Lô, 2017). Internal Fab Lab is defined as *"a collaborative working space [owned by a firm] aiming to stimulate explorative and autonomous initiatives by providing a space, both technological and numeric tools and innovation methodologies to all, while it is usually restricted to experts."* (Lô, 2017: 82). Unlike traditional Fab Labs, the openness of the space is regulated and managed by the owning firm.

Mérindol et al (2016) identify 3 types of internal Fab Labs:

- "Delivery service" Labs, intended to support exploration innovation by providing research & development (R&D) teams with new methodologies;
- "Individual initiatives" Labs, whose aim is to support innovation through individuals;
- And finally "Entrepreneurship" Labs, whose purpose is to explore new growth areas and drivers. This type of internal Fab Lab works as an internal start-up.

Internal Fab Labs can be implemented through a "top down" approach (driven by top management), such as the i-Lab (Air Liquide), or a "bottom up" approach (led by employees), such as the Creative Lab (Renault). Even though the internal Fab Lab requires a dedicated space, the geographical localization varies according to firms' objectives (Mérindol et al., 2016). For example, the i-Lab (Air Liquide) is located 30 kilometers away from its main

[5] Source : http://www.fabfoundation.org/index.php/what-is-a-fab-lab/index.html
[6] Source: http://www.fabfoundation.org/index.php/the-fab-charter/index.html
[7] Source: https://collaborativespacesstudy.files.wordpress.com/2016/10/note2_rgcs_2017_version-finale.pdf
[8] In this article, we use the term « internal Fab Lab".

innovation and R&D site, while the Seb Lab (Groupe Seb) is located in a dedicated building at Groupe Seb's headquarters, near the innovation and R&D units.

Beyond its objective of involving employees within the innovation process, Laborde (2017) identifies 5 main Fab Labs goals', using entrepreneurship codes: (1) agility, i.e. think differently to innovate more quickly, (2) prospective (think for the future), (3) open innovation, (4) incubation of internal projects and (5) communication about how innovative the firm is (the Fab Lab can be the show room of innovation.) Beyond these goals, the main objective of an internal Fab Lab is to support exploration innovation (Capdevila, 2015; Mérindol et al., 2016; Lo, 2017) in order to contribute to the development of new products and services that the firm will then exploit (Capdevila, 2015).

1.2. Sustaining the internal Fab Lab to support exploration innovation

Despite the objectives ant potential benefits for firms to adopt and implement their own Fab Lab, recent studies (Capgemini, 2016; Hatchuel, 2017; Koester, 2017[9]) point out that most of implementing firms fail to sustain internal Fab Labs. On the one hand, in line with Mérindol et al. (2016) and Mérindol and Versailles (2016), we highlight that an institutional perspective, through legitimacy, can support internal Fab Labs sustainability. On the other hand, we also present a rational perspective, suggesting that an internal Fab Lab can't conform, due to its characteristics, to rational efficient-choice of firms.

1.2.1. An institutional perspective through legitimacy to sustain the internal Fab Lab

In line with the institutional and neo-institutional literatures, the institutional perspective suggests that agents adopt new management practices and structures for innovation (such as internal Fab Labs) "for symbolic reasons, seeking peer and stakeholder legitimacy" (Sturdy, 2004: 164).

Legitimacy is commonly defined as *"a generalized perception or assumption that the actions of an entity are desirable, proper, or appropriate within socially constructed systems of norms, values, beliefs, and definitions."* (Suchman, 1995: 574).

[9] Source : https://blogs.oracle.com/scm/why-innovation-labs-fail-and-what-to-do-about-it

Table 2: definitions of legitimacy

Suchman (1995: 574)	*"A generalized perception or assumption that the actions of an entity are desirable, proper, or appropriate within socially constructed systems of norms, values, beliefs, and definitions."*
Scott (1995: 45)	*"A condition reflecting cultural alignment, normative support, or consonance with relevant rules or laws."*
Kaplan and Ruland (1991: 370)	*"Underlying organizational legitimacy is a process, legitimation, by which an organization seeks approval (or avoidance of sanction) from groups in society."*
Zelditch (2001: 33)	*"Something (...) is legitimate if it is in accord with the norms, values, beliefs, practices, and procedures accepted by a group."*

Zimmerman and Zeitz (2002) suggest that legitimacy is key to survive and consider it as a resource that allows a new entity to acquire other resources, crucial to its growth. In the Fab Lab context, Mérindol et al. (2016: 52) explain that the "sustainability of open labs mainly depends on their capacity to earned legitimacy according to what is concretely done and according to the perception of the utility of what is done by individuals". More precisely, top-management support and employees involvement support legitimization process of internal Fab Labs (Mérindol et al., 2016; Méindol and Versailles, 2017).

An organization is perceived as legitimated when it is accepted by its environment (Meyer and Rowan, 1977) and when it conforms to values, social norms and expectations (Oliver, 1991; Deephouse, 1996; Palazzo and Scherer, 2006). However, if an internal Fab Lab tries to conform to the adopting firms, its legitimization process can face difficulties related to the internal Fab Lab's own characteristics and related to a rational perspective.

1.2.2. Difficulties to the internal Fab Lab's legitimization process

In line with the institutional literature, it seems that legitimization process implies to conform to an organization environment. However, in the internal Fab Lab context, given its characteristics, conformity seems to be double-edged sword. First, one of the objectives of the internal Fab Lab is to "think out of the box" and to overpass firms' norms (Mérindol et al., 2016). To do so, it involves both the formal and informal spheres of an organization (Lô, 2017). Second, unlike most firms' cultures, internal Fab Labs' culture relies on trial error (Lô, 2017). Finally, as a third place for innovation, the implementation of an internal Fab Lab requires a dedicated space and geographical separation (Lhoste and Barbier, 2016; Mérindol

et al., 2016), and even in some cases dedicated teams (Mérindol et al., 2016). The separation between space and teams can thus complicate the creation of a common identity, which is nevertheless required to be legitimate (Kraatz and Block, 2008; Battilana and Dorrado, 2010; Pache and Santos, 2010).

Table 3: legitimization process vs. an internal Fab Lab's characteristics

Legitimacy	Internal Fab Lab
An entity is perceived as desirable, proper, or appropriate (Suchman, 1995), seeks approval (Kaplan and Ruland, 1991) accepted by a group (Zelditch, 2001).	Business units are not closely involved and there are organizational gaps between teams (Capgemini, 2016). Geographical distance can create a gap (Mérindol et al., 2016).
It conforms with norms, values, beliefs, definitions, cultural alignment, in accord with practices, and procedures (Suchman, 1995; Deephouse, 1996; Oliver, 1991; Zelditch, 2001; Palazzo and Scherer, 2006).	The internal Fab Lab "think out of the box" (Mérindol et la., 2016), call for both formal and informal spheres of an organization (Lô, 2017), has a trial-error culture (Lô, 2017) and explore innovation (Capdevila, 2015; Mérindol et al., 2016; Lô, 2017).

In addition, the legitimization process of the internal Fab Lab can be hindered by a rational actor perspective. The innovation management literature shows than the rational perspective deals with costs, benefits, efficiency, immediate gains and profit (Stang and Macy, 2001; Volberda et al., 2014). In the internal Fab Lab context, Laborde (2017) explains that an internal Fab Lab can face difficulties because it is perceived as costly by a firm's employees and top managers, as the objective of the internal Fab Lab is not always to create direct value to the implementing firm. More precisely, Mérindol et al. (2016) specify that value creation remains an important question for internal Fab Labs, although difficult to evaluate. It is also expected that the internal Fab Lab fit with the strategy of the implementing firm.

Overall, the literature (Mérindol et al., 2016; Mérindol and Versailles, 2016) show that the internal open lab should be legitimate to sustain. However, we suggest that both internal Fab Lab's characteristics and rational actions and expectations of adopting firms can hinder it. This leads us to investigate the legitimization process of internal Fab Labs in order to better understand how to sustain it and benefits from its many advantages.

2. Methods

To answer our question, we adopted a case-study design and consider the single case of the i-Lab, the internal Fab Lab of Air Liquide. In line with the studies looking at the intra-organizational level of legitimacy analysis (e.g. Benet et al., 2017), this article focuses on the way the i-Lab builds its legitimacy within Air Liquide.

2.1. Research setting

Created in 2013, the i-Lab is the exploration entity of Air Liquide. Air Liquide is a large French firm founded in 1902 and currently employing more than 68,000 people. The firm supplies industrial gases and services to various industries such as medical, chemical and electronic manufacturers. Air Liquide is a multinational firm that operates in over 80 countries. With innovation as its core value, Air Liquide's top management decided to create a Fab Lab in 2012 in order to implement new innovation methodologies.

Since the 2010s, Air Liquide decided to focus on open innovation, with various actors such as start-ups, the crowd etc. through a team dedicated innovation. In 2012, this team organized a trip to California during which the company Chief Executive Officer and the Vice President (VP) of Innovation discovered the Silicon Valley firms and methodologies. They realized that innovation was faster, as a result to the more flexible and agile structures. In July 2012, the idea of creating the i-Lab was acted, with the idea to "get around Air Liquide's rules".

Described by Air Liquide as "the laboratory of new ideas", the i-Lab has two goals. In the short term, the i-Lab has to create value by accelerating innovation. In the long term, the goal is to identify new growth markets for the firm. The lab has various resources. In terms of material resources, the i-Lab has a dedicated building located in downtown Paris (30 kilometers away from the main R&D French site in Saclay). The i-Lab is also equipped with a fabrication workshop allowing developing prototype ideas for preview tests, thanks to innovative tools such as 3D printers and scanners, laser cutting, numerical modeling, etc. The i-Lab currently employs about 30 people with various profiles (from doctoral students to entrepreneurs, men and women of 8 different nationalities) and skills (from both social and hard sciences). Two teams work in the lab. A first "think-tank" team is working on the long-term goal of the group. This team maps and explores new markets in which the company is not yet present. The second experimental team tests the ideas of the lab, and more generally of the firm, with end users and consumers, using new methodologies like crowdsourcing. If the

i-Lab is now sustained within the firm, it faced many difficulties and still faces challenges to achieve its goals.

Table 4: Characteristics of the i-Lab

Type of internal Lab	Entrepreneurship
Approach	Top down
Structure	Structurally differentiated (different teams and place)
Location	Out of the firm headquarters and R&D sites (after a transition period of few months at the R&D site)
Creation - implementation	2012 - 2013
Reporting line	R&D (from 2013 to 2016) Digital Transformation (since 2016)
Organization	Think tank (ideation etc.) and do tank (prototype etc.)
Human resources	30 (among 20 permanents). Varied profiles: hired from Air Liquide (70%) or external (30%), 8 nationalities.
Material resources	Visio conference room, creativity room, 3D screen, various tools (3D printers, laser cutting etc.)
Financial resources	Independent, 6M€ in 2015 for the entire structure (incubation projects included)

Table 5: key dates

2012	Silicon Valley trip
	Decision to create the i-Lab
2013	Implementation of the i-Lab at the R&D site (Les Loges)
	Moving to their own place in Paris (30 kilometers)
2016	Moving from the “R&D” to the “Digital Transformation” business unit

2.2. Data and analysis

Our qualitative research is based on a unique case study (Yin, 2013). Hence, we selected Air Liquide for this exploratory, qualitative study because it constitutes a theoretically relevant context (Eisenhardt, 1989). The choice of a unique case is justified by Yin’s recommendations (2013). It is primarily a case whose theoretical foundations are well defined. In addition, the i-Lab case is revealing because it allows to study a recent phenomenon which is also relatively inaccessible, as only few of them succeed (Capgemini, 2016).

Data collection

We collected data from multiple sources including semi-structured interviews, non-participant observation and secondary data. The use of multiple data sources is required to increase construct validity and to allow triangulation (Yin, 2013).

The case is mainly based on 13 semi-structured in-depth face-to-face interviews, conducted between October 2015 and March 2017. Two types of actors have been interviewed: 5 i-Lab employees (manager and co-founder, project managers etc.) and 6 employees from corporate, especially from R&D teams and top management. The interviews were all recorded and transcribed.

Table 6: data sources and interviewees' profile

Date	Function	Duration
October 2015	Open innovation manager (i-Lab)	45 min.
October 2015	Technical manager (i-Lab)	45 min.
January 2016	Open innovation manager (i-Lab)	60 min.
January 2016	Technical manager (i-Lab)	77 min.
January 2016	R&D manager	57 min.
January 2016	R&D director 1	45 min.
January 2016	Project leader (m-Lab)	93 min.
January 2016	R&D director 2	30 min.
January 2016	Project leader (i-Lab)	45 min.
January 2016	Strategic development Director	60 min.
January 2016	Project leader (i-Lab)	32 min.
January 2016	R&D director 3	37 min.
March 2017	Co-founder and director (i-Lab)	35 min.

The same interview guide was used to conduct these interviews. First, we asked general questions about innovation at Air Liquide and at the i-Lab, and about global innovation processes. We then asked specific questions about the i-Lab's adoption and implementation. Finally, we addressed questions about the i-Lab's integration and legitimation within Air Liquide. All the interviews lasted between 32 and 77 minutes. All the data has been recorded and fully transcribed, as recommended by Eisenhardt (1989).

In addition, in 2016, we conducted a non-participant observation of 5 days within the i-Lab. The observation is a relevant additional data source (Garreau et al., 2015), yet underestimated in management science. Using the "camera cachée" technique (David, 1999), we observe i-Lab employees and teams working during a week. We observe places and events such as collaborative meeting rooms, the open space and the kitchen. This type of observation is particularly relevant here, given the key role of space in the internal Fab Lab legitimation process. We took various notes during this period that we summarized, transcribed and coded.

We also collected secondary data in order to triangulate the data (Patton, 2002) and reduce the perception bias of our interviewees. We collected various internal and external reports, communication documents and press interviews in order to fully understand the creation and the implementation of the i-Lab[10]. To strengthen the internal validity of this research, we used both data and methodological triangulation to deal with saturation, presenting our findings to experts, other researchers and interviewed individuals (Miles and Huberman, 1994).

Data coding and analysis

The data coding was based on an iterative content analysis following a three-step process, following the recommendations of Miles and Huberman (1994): data reduction, data display, and conclusion drawing and verification. We read all the interviews and observation notes several times to thoroughly master the data. Then, textual data were cut and categorized into units of meaning using an abductive approach (Eisenhardt, 1989). This process was based on a continuous comparison of the emerging categories of the data and the literature regarding legitimization process. To do so, we performed two round of coding, using the NVivo 11 software. Following prior literature, we coded the data as either institutional or rational perspectives, as "these two perspectives are often presented as contrasting given the different theoretical logics" (Walker et al., 2015: 410). The literature (Volberda et al., 2014; Walker et al., 2015) operationalizes the rational perspective as related to cost, benefits, performance, profit, efficiency and evaluation. On the contrary, the authors operationalize the institutional perspective as related to legitimacy, acceptability or social approval. We distinguished the effect of each category on the i-Lab sustainability. We then identified the solutions implemented by the i-Lab to legitimate without conforming too much to the rational expectations of the firm to support exploration innovation. Finally, we coded the secondary data according to this framework too. During the analysis process, emerging code appeared in each category. The data was coded[11] according to an analysis grid and the framework we used for the interview guide.

3. Findings

[10] See appendix 1 for the list of external secondary data.
[11] See appendix 2.

Our article aims to study the i-Lab's legitimization process in order to sustain and succeed in supporting exploration innovation. Our findings suggest that legitimacy is key to sustain an internal Fab Lab. However, it seems that legitimization process of such an entity face difficulties related to tensions between (1) the institutional perspective of legitimacy and the internal Fab Lab's characteristics, and (2) the institutional and rational perspectives called by the implementation of an internal Fab Lab. More precisely, we identify challenges regarding the management of geographical distance, the need to create organizational proximity and the necessity for the i-Lab to create value.

3.1. Legitimating the i-Lab to sustain it within Air Liquide

As an innovative firm, Air Liquide decided in 2012 to implement an internal Fab Lab to support exploration innovation. The goal was to create a new open place for innovation. The i-Lab particularly aimed to (1) implement new methodologies in an agile place where risk taking and failure are allowed and (2) identify new business lines for Air Liquide, to be then develop by Air Liquide's R&D teams. However, these goals were unclear to the firm, particularly to the R&D teams and its legitimization process was key.

Implementing new methodology in an agile place

Being on a competitive worldwide market does not give any chance for mistakes and uncertainty. However, when doing exploration innovation, risks and flexibility are part of the journey. The Silicon Valley trip strengthened top management in its idea of being more agile. However, it can be difficult to move from a strong industrial culture, with embedded and heavy innovation processes, to a more agile structure. The objective of the management was not to change the whole firm, but to bring agility for some open innovation projects within a dedicated entity. The idea of implementing a new open innovation space thus emerged, as the firm knew it would be complicated to transform existing business units' cultures.

> *"It is such a paradox… Large firms and teams need security to have resources and survive, but security also stops you when you want to be agile. Today, most of the large firms tell you that they want to be agile, but actually, they can't, because of security. (…) This is exactly the kind of paradox that led top management to the idea of creating a new structure."* (Technical manager, i-Lab)

The need for Air Liquide to dedicate a place to be agile evolved during a few months. During that time, in line with the need to be more flexible, the firm also discovered new methodologies, tools and innovation activities that seemed relevant to implement, such as crowdsourcing. However, an interviewee explained us that the implementation of new methodologies is not easy within a firm that has rigid process and procedures. Moreover, with the open innovation objective, this culture of trial and error inherent to new methodologies for exploration innovation also strengthened the creation of the i-Lab.

> *"Top Managers wanted to create a flexible open lab, agile, that adapt to all new innovation methodologies, like lean start-up, Fab Labs, 3D printing, and here came the idea of creating the i-Lab, because of course, you can't do it in the institution."* (Open innovation manager, i-Lab)

Identifying new business lines for Air Liquide

The top management decided to implement an internal Fab Lab to support exploration innovation, and more particularly to open its boundaries to unusual external stakeholders and to implement new methodologies. In addition, one of our interviewee from top management explained to us that when they decided to create the i-Lab, they were aware that they needed to identify a concrete goal for the i-Lab to make it works. The firm thus anticipated that without a clear goal, with more concrete objective than doing exploration innovation, it would fail. The main purpose of exploration innovation is to explore the unknown. It has been decided that to meet this objective, the main long-run mission of the i-Lab would be to identify new business lines for Air Liquide.

> *"The objective of our R&D teams is not to identify new business lines and growth segment. If we had asked traditional R&D to do so, we would have stayed on our core business, we would have done the same. In giving this particular mission to the i-Lab, we focus much more on uses and trends to define the relevant new growth segments."* (Strategic development Director)

If the objectives were quite clear to the i-Lab's team and top management, it seems that it was not to R&D units. This unclear communication about the i-Lab's goals strengthened the need to build legitimacy. Legitimization process relies on acceptance and approbation by an organization's environment. In the i-Lab's case, Air Liquide needed to perceive the i-Lab as useful to the firm. However, as was recognized by an i-Lab manager, at the beginning the communication was exclusively bilateral between the i-Lab team and top management, giving the impression of doing something confidential with unclear objectives.

> *"At the beginning, the main barrier was to build legitimacy to be accepted. And as we were not clearly identified within the firm, it was even more important to quickly be legitimate, even if it was even more complicated."* (Strategic development Director)

However, these objectives were unclear to the firms. When the i-Lab was created, one of our interviewee explained that the communication excluded R&D teams. The i-Lab teams only communicated with top management. This perception of exclusion remains to some R&D directors:

> *"When I hear about the i-Lab, I get annoyed. It is exactly what I call "created silos" in an organization. This is everything except productive. R&D is disrupting at Air Liquide, and the i-Lab is part of this."* (R&D director 3)

This feeling of exclusion ad separation strengthened the i-Lab's need for legitimacy. R&D teams mainly had a negative perception about it. However, as the main long-un objective of the i-Lab is to identify new business line that will be exploited by R&D teams, they had to be perceived as legitimate since the beginning. However, this legitimization process was difficult to get in and the i-Lab didn't identify why.

> *"Today, we are not begging anymore for our legitimacy, for the right to being part of Air Liquide. But we had to and it has been a long way full of misunderstanding."* (Technical manager, i-Lab)

3.2. From difficulties to legitimate the i-Lab to solutions to sustain it

The legitimization process of the i-Lab has been key to support its implementation. However, in the i-Lab's context, it seems that the legitimization process had been complicated. We identify three main challenges the i-Lab had to overcome to succeed in its legitimization process. While the two first challenges are related to the i-Lab characteristics, the last one is related to rational actions and expectations of the firm. Overcoming these difficulties thanks to adapted solutions finally helped the i-Lab in its search for legitimacy.

3.2.1. Being perceived as appropriate and desirable: tensions between the institutional perspective and the i-Lab characteristics

Managing geographical distance

Once the decision to implement the i-Lab was taken, Air Liquide quickly decided to move it into an alternative space, located in the heart of Paris, 30 kilometers away from the main R&D center (located in Saclay). The question of the location had been carefully addressed. At

the beginning, during the decision stage, the i-Lab was located in Saclay too. But the decision to move into Paris was already acted. As explained an interviewee, it had been decided in order to balance distance and proximity with the R&D site:

> *"We took the time to think about the location. Everything was possible: staying in Saclay in a different building, moving somewhere else, at the core of our innovation ecosystem, going abroad etc. Finally, we decided to go in Paris, to stay closed to R&D, but not too close to do whatever we wanted."* (Open innovation manager, i-Lab)

Beyond the question of the location, the firm took the time to find the right place. As explained another of our interviewee, implementing an open innovation space is not insignificant. As the i-Lab is supposed to receive many external stakeholders, it is an essential mean of communication and a "showcase" site. The strategic development Director explained that the success of the i-Lab depended on the space[12], and the focus was more on being perceived as legitimate and known by Air Liquide's external environment rather than its internal one.

> *"Our place must be open. People must feel free to act when there are at the i-Lab. Our space here is the symbol of what we do in here. It is important to communicate a coherent value with the objective of the i-Lab. As a symbol, the place has to be open and collaborative."* (Strategic development Director)

Both the location and the place of the internal Fab Lab matter and influence the implementation and success of such a place. However, the geographical separation involved by a separate structure and the choice to move away from the R&D site located in Saclay also bring difficulties to the i-Lab. The geographical distance mostly created a rupture with R&D employees, even with R&D employees interested in the i-Lab. For example, the R&D units' members that we interviewed all explained that they don't have the time to go to Paris, to meet the i-Lab team and to discuss innovation project with them. One of them qualified the geographical separation as a "constraint", pointing that it kills spontaneous meetings with the i-Lab, while the objective is to be agile and flexible.

> *"It is too far away from our R&D site. I can't spend half a day in transportation. I feel uncomfortable to say it but if they were closer, not on the same site as us, but closer, it would be better. This geographical distance is a barrier to me."* (R&D Director 3)

This feeling of unknown perceived by R&D teams once again hinders the i-Lab's legitimization process. Unlike our interviewee, other people from R&D developed a negative

[12] See appendix 3.

opinion about the i-Lab because of the geographical distance. It is interesting to point out that this distance is not perceived as negative by the i-Lab. For instance, the manager of the i-Lab explained to us that he was surprised to hear that geographical distance could be problematic, as it is necessary to support exploration innovation. Finally, for the i-Lab employees, it seems that time and communication helped reduce this feeling of distance, supporting legitimacy.

> *"It takes time for R&D units to integrate our objective, what we do in here, to know us, and only when this is clear for them, that geographical distance is no longer a problem."* (Co-founder and director, i-Lab)

Creating organizational proximity

In line with the geographical distance between the i-Lab and the R&D site, an organizational distance appeared at the beginning. First, this organizational distance could be explained by the lack of link between R&D employees and the i-Lab. As R&D employees were discouraged by the distance, they did not go to the i-Lab, they did not know people and thus, they did not know their missions.

> *"Honestly, I don't really know the i-Lab, I don't know their purpose, as I assume they don't know what I do. I think I can say that there is kind of gap between us."* (R&D Director 2)

This lack of relationships between the i-Lab and the R&D site makes R&D employees indifferent to the i-Lab, even critical. The i-Lab is managed according to a "top down" approach. The top management is thus very involved and particularly cares about its success. This support concretely means that the i-Lab benefits from many resources, compared to most of the internal Fab Lab of other French firms (see Mérindol et al., 2016: 119). For instance, in addition to the open space located at the heart of Paris, the i-Lab fully employs 20 people, benefits from financial resources to experiment, organize many events, etc. This resource allocation and the top management's support can create misunderstandings that are amplified by the fact that most R&D employees don't know the exact purpose of the i-Lab. For instance, one of our interviewee explained:

> *"Here, no one knows what they do there. All we know is that when we need budget for an innovation project, we don't get it, and meanwhile, they have a lot of funding to play with 3D printers. Of course, I guess they don't only play with it, but it is very frustrating and opaque."* (R&D Director 2)

In order to reduce the widening gap between the i-Lab and the R&D site, the top managers decided to add another transitive purpose, at the beginning of the i-Lab's implementation. In order to support legitimacy, they decided to dedicate the i-Lab to support R&D innovation projects. While the i-Lab was supposed to be an independent exploration innovation structure in the end, it was finally depending on R&D units. If it was clear for both the i-Lab and top management that this organizational design was temporary, it was not for R&D units. This supported the misunderstanding regarding the objective of the i-Lab.

> *"At the beginning, in order to beg for our legitimacy, the i-Lab was temporarily depending on R&D. So we used to support their innovation projects, bringing the exploration side of innovation to them etc. But at some point, we were not able to do it for them and do our own and true missions. It has been so confusing: when we stopped working for them, some R&D managers didn't understand why, and it was worse…"* (Technical manager, i-Lab)

A year after its creation, the future of the i-Lab was uncertain. Both top managers and the i-Lab Director have been critical and determinant in the i-Lab's survival. Step by step, with managers' support, the i-Lab has been able to support less the R&D units to focus more on its own missions.

> *"G.* (ex i-Lab Director) *understood perfectly top management's expectations. His past experience within Air Liquide also helped to communicate internally and break the ice, especially when everything was unclear for R&D units. The current success of the i-Lab depended a lot on G."* (Project leader, i-Lab)

In order to create an organizational proximity between the i-Lab and the R&D units, the firm encourages internal turn-over between the teams to support cross-functional projects. For instance, an interviewee from the m-Lab[13], explained to us that before she started to work on the m-Lab's project, she first worked at R&D and then at the i-Lab. In addition to this internal turn-over, some i-Lab employees are part-time and have a dual role within Air Liquide.

> *"I currently work both for the i-Lab and for R&D. It is very convenient because even if I have two offices and spend lots of time in transportation, I know lots of people within the firm and I can be a facilitator."* (Project leader, i-Lab)

Finally, in order to dissipate any confusion, it has been decided to move the i-Lab from R&D organizational supervision to a new business unit created in 2016, Digital Transformation. It was decided that Digital Transformation's location would be in Paris, close to the i-Lab. Two

[13] The m-Lab (molecule laboratory) is another entity of Air Liquide integrated to the R&D team. It manages a scientific contest organized by Air Liquide.

factors influenced the decision to move the i-Lab from R&D to Digital Transformation. First, the original i-Lab founder used to be R&D VP before he became Digital Transformation VP in 2016. Regarding his implication and support to the i-Lab, it seemed relevant to put the i-Lab under his supervision. In addition, as the i-Lab's missions deal with transformation and digitalization, it made sense to be in line with this new business unit.

3.2.2. Conforming the i-Lab to legitimate: the key role of value creation (rational perspective)

Almost five years after its creation, the i-Lab reaches its main objectives. As an open place for innovation, it hosts many challenges and contests, leads different collaborative projects, included various external stakeholders and is known as an internal Fab Lab reference. This allows Air Liquide to work with unusual partners. For instance, in 2013, the i-Lab managed an architectural crowdsourcing contest, "*Rock my plant*", leading to collaborations with Architecture students, designers, ergonomists etc. Furthermore, it is important to mention that the i-Lab reached its main goal and identified two new business lines for the firm.

The i-Lab meets its requirements and is sustained within Air Liquide in order to explore new business lines and achieve its goals. However, sustaining such a structure is not an easy task. Even if the i-Lab is nowadays known as an internal Fab Lab success story, its "top down" approach often questions its implementation and sustainability. Despite the support from top management, it is clear that the question of performance is constantly asked, especially through value creation.

> *"Air Liquide does not need such a structure to think. Marketing or Business teams and units can do the same. A structure like the i-Lab must create concrete value, not only think."* (Strategic development Director)

Concretely, in order to create value, the i-Lab must be able to transform the identified ideas. However, even if the i-Lab has two sides -like a "think tank" organization- one to think, the other to do, transforming ideas coming from external insights into concrete products or services is complicated. In addition, it seems that the i-Lab organization hinders that transformation.

> *"We face difficulties when trying to transform our ideas into something concrete. We are not always able to aggregate the huge amount of data we collect. Here, we all have a piece of data, and thus of solution. We have to find our organization."* (Open innovation manager, i-Lab)

Even when the i-Lab succeeds in transforming ideas into concrete products and services, it does not always mean that the firm will then create value. The main objective of the i-Lab is to identify new business lines for the firm. It involves transformation and integration of the innovation process by R&D and marketing units to then exploit the ideas identified by the i-Lab. However, despite the solutions implemented by the i-Lab, both geographical and organizational distances make this transformation and integration of the innovation process complicated. The i-Lab thus identified that it missed a skill within its team. As a consequence, the i-Lab created a new "intrapreneur" job, in order to promote the i-Lab's outputs within Air Liquide. An interviewee explained to us that until recently, even though the i-Lab's employees had various profiles, they were mainly "project managers". There was thus a lack of sales oriented profiles. However, in order to sustain itself and to keep exploring new business lines for Air Liquide, the i-Lab must care of about the transformation and integration of the ideas, products and services it identifies and creates.

> *"We hired more intrapreneur profiles to move on. That was exactly what we needed to do."* (Co-founder and director, i-Lab)

4. Conclusion and discussion

The objective of this article was to study the legitimization process of an internal Fab Lab to better understand how to sustain it. Studying the case of the i-Lab (Air Liquide), we suggest that legitimization process is key, but difficult to reach because of (1) the internal Fab Lab characteristics and (2) rational actions and expectations. In conclusion, our study suggests that an internal Fab Lab's legitimacy can't be earned but has to be granted. In other words, internal Fab Labs have to deal with both institutional and rational tensions to succeed.

While the literature mainly focuses on defining the internal Fab Lab and pointing out its benefits (Capdevila, 2015; Mérindol et al., 2016; Lo, 2017), the present paper contributes to fill the gap between the many benefits of implementing an internal Fab Lab and the low numbers of successful cases, by bringing empirical evidence. This article also makes several theoretical and practical contributions.

Theoretical implications

Our study provides a number of theoretical contributions to the Fab Lab emerging literature. First, by studying the i-Lab case, this article addresses recent calls regarding the need to develop the existing knowledge on spaces for innovation (Lô, 2017). In particular, Ben Mahmoud-Jouini (2016) suggests that the literature on innovation management should investigate more deeply the way firms integrate entities supporting exploration innovation. We extend these studies by providing empirical evidence and a better understanding of this integration, which we argue can be difficult and requires many efforts and resources. We suggest that the integration of the internal Fab Lab relies on its legitimacy within the owning firm. Our study also suggests that the support of top management alone is not sufficient to guarantee an internal lab's integration within the firm, even if it follows a top down approach (Capdevila, 2015). Finally, while most of the studies point out the objective of supporting exploration innovation, our findings suggest that the internal Fab Lab is part of the entire innovation process, in line with Capdevila (2015). If the internal Fab Lab explores, then its outputs have to be integrated and exploited by other entities of firms. In this respect, its integration within the owning firm is even more important.

Our findings also contribute to the Fab Lab knowledge by exploring the question of geographical distance. According to a Gretha report (2009)[14], "geography matters" for innovation. However, little is known about it. If an internal Fab Lab involves a third space, the question of the geographical distance remains unanswered. On the one hand, it seems that internal Fab Lab should benefit from a spatial proximity with firms. In other words, firms should keep their internal Fab Lab close to their core entities. On the other hand, a significant geographical distance seems to be required to let internal Fab Labs support exploration. Mérindol et al. (2016) call attention to this question and claim that the distance should depend on each firm's objective. Our study contributes to answering this question, and suggests that even if distance is important to support exploration innovation, long distance involves more efforts to build legitimacy and integrate the internal Fab Lab within the firm. Overall, it seems that if internal Fab Labs should involve a geographical distance with the firm's core entities, the creation of organizational proximity is required. Lô (2017) suggests that an internal Fab Lab directly contributes to knowledge creation, transfer and absorption. Our study suggests that to do so, integration and organizational proximity are keys.

[14] Source : http://cahiersdugretha.u-bordeaux4.fr/2009/2009-21.pdf

Second, by studying the institutional perspective, we contribute to the current emerging Fab Lab studies by framing the discussion about legitimacy. Despite its relevance, the question of legitimating an entity such as an internal Fab Lab has not been addressed. The literature suggests the necessity to legitimate the internal Fab Lab to sustain it (Mérindol et al., 2016; Mérindol and Versailles, 2016). However, the role of legitimacy and the legitimization process of such an entity is unknown. Our choice to use a framework based on an institutional perspective contributes to the Fab Lab literature. Usually, most studies on exploration vs. exploitation tensions use ambidexterity literature (Tushman and O'Reilly, 1996). In addition to the interest of using ambidexterity frameworks to understand an internal Fab Lab's implementation (Ben Mahmoud-Jouini, 2016; Lô, 2017), the neo-institutional literature allows to discuss and point the importance of legitimization process for such entities (Greenwood et al., 2011). Using the neo-institutional approach, our findings suggest that even if internal Fab Labs support exploration, legitimacy is key to the integration process. However, this implies that firms face challenges such as the management of geographical distance, the need to build organizational proximity and finally the necessity to create value and to redefine value creation.

Finally, we contribute to the institutional perspective. First, our study considers the intra-organizational level of analysis for legitimacy, while most of the studies deal with inter-organizational legitimacy, investigating an organization and its external environment. Unlike the neo-institutional literature (Kraatz and Block, 2008; Greenwood et al., 2011), our study also suggests that dealing with different logics (i.e. exploration and exploitation) does not support an entity's legitimization process. On the contrary, it seems that the conciliation of different logics hinders it because of the tensions it brings, in accordance with Pache and Santos (2013). In line with Zimmerman and Zeitz (2002), we suggest that legitimacy is key for the sustainability of a new entity. In line with their recommendation, our study provides a better understanding of factors that influence the acquisition of legitimacy. Finally, if some studies on managerial innovation (Volberda et al., 2014; Walker et al., 2015) study the tensions between the institutional and the rational perspectives, our research contributes to the neo-institutional literature by using it in this field of research.

Managerial implications

This article provides potentially relevant guidelines for managers and firms currently implementing or interested in implementing an internal Fab Lab.

First, our findings point out that an internal Fab Lab is a relevant way to support exploration innovation. Such an entity allows firms to think out of the box and to fail in order to innovate. However, even if our findings support the implementation of internal Fab Labs, firms and managers interested in doing so should be aware of the many organizational challenges they can face in order to benefit from internal Fab Lab implementation. Specifically, it appears that firms should take care to balance geographical distance and organizational proximity in order to be able to create value.

Second, our study offers directions to support the balance between geographical distance and organizational proximity. If our findings point out the importance of geographical distance between an internal Fab Lab and R&D, it also highlights solutions to create organizational proximity. The use of half time employees with R&D and the creation of "intrapreneurs" jobs within the internal Fab Lab seem like interesting ways to coordinate the lab within the owning firm. In line with Laborde (2017), we suggest that the sole involvement of top management is not enough and that firms should include other people in the internal Fab Lab projects.

Finally, to create the required organizational proximity, our findings suggest that owning firms should take the time to position the internal Fab Lab within the global organization and teams. It is very important for the firm to link the internal Fab Lab with the right business unit. For instance, the first organizational design of the i-Lab (i.e. when it was subordinated to R&D units) ended up increasing ambiguities. In addition, in line with Laborde's (2017) suggestions, our study claims that firms should involve employees from various business units as much as possible in the creation and the implementation of the internal Fab Lab. If firms also hire new employees to the i-Lab, they should be aware of their integration and socialization process within the organization (Battilana and Dorado, 2010), in order to share the Lab's culture and in fine support organizational proximity.

Limitations and future avenues

This article also has limitations that open avenues for future research. First, this article is based on a single case study, which questions the generalizability of our findings. Future research could investigate whether the identified challenges to build legitimacy extend to other cases. Second, we investigate the i-Lab, which is a top-down structure. As shown by

Mérindol et al. (2016), the structure of such entities, whether top-down or bottom-up, differ. It would be interesting to study the legitimization process of an internal bottom-up Fab Lab. Third, our study suggests the key question of geographical distance in the legitimization process of internal Fab Lab. Future research could investigate more deeply this question, with respect to ambidexterity, e.g. using the "spatial ambidexterity" framework (Geerts et al. 2017), or using neo-institutional theories, e.g. investigating geographical management of hybrid organizations (see Pache and Santos, 2013). Finally, future research should investigate the question of identity. Despite the importance of creating a common identity to build legitimacy (Kraatz and Block, 2008; Battilana and Dorrado, 2010; Pache and Santos, 2010), our study doesn't point out this factor. More mature cases should bring insights about it. Still, despite these limitations, our study contributes to the emerging Fab Lab literature by highlighting the importance of legitimacy to sustain the lab within the firm and to succeed in supporting exploration innovation.

References

Battilana, J. and S. Dorado (2010), Building sustainable hybrid organizations: The case of commercial microfinance organizations. *Academy of management Journal*, *53*(6), 1419-1440.

Benet, N., Deville, A. and S. Ventolini (2017), La question de la legitimite intra-organisationnelle: une approche par les systemes de mesure de la performance.

Capdevila, I. (2015), Les différentes approches entrepreneuriales dans les espaces ouverts d'innovation. *innovations*, (3), 87-105.

de Vaujany, F.-X. and N. Mitev (2013), Materiality and Space: Organizations, Artefacts and Practices. Houndmills, Basingstoke, Hampshire: Palgrave Macmillan.

Deephouse, D. L. (1996), Does isomorphism legitimate?. *Academy of management journal*, *39*(4), 1024-1039.

David, A. (1999), Logique, épistémologie et méthodologie en sciences de gestion. In *Conférence de l'AIMS* (pp. 1-23).

Eisenhardt, K. M. (1989). Building theories from case study research. *Academy of management review*, *14*(4), 532–550.

Fabbri, J., Glaser, A., Gaujard, C., and O Toutain (2016), Espaces collaboratifs d'innovation: au-delà du phénomène de mode, de quoi parle-t-on? *Entreprendre & innover*, (4), 5-7.

Garreau, L., Mouricou, P. and A. Grimand (2015), Drawing on the map: an exploration of strategic sensemaking/giving practices using visual representations. British Journal of Management, 26(4), 689-712

Gershenfeld, N. (2012), How to make almost anything: The digital fabrication revolution. *Foreign Aff.*, *91*, 43.

Geerts, A., Leten, B., Belderbos, R. and B. Van Looy (2017), Does Spatial Ambidexterity Pay Off? On the Benefits of Geographic Proximity Between Technology Exploitation and Exploration. *Journal of Product Innovation Management*.

Kaplan, S. E. and R. G. Ruland (1991), Positive theory, rationality and accounting regulation. *Critical Perspectives on Accounting*, *2*(4), 361-374.

Kraatz, M. S. and E. S. Block (2008), Organizational implications of institutional pluralism. *The Sage handbook of organizational institutionalism*, *840*, 243-275.

Laborde, O. (2017), *Innover ou disparaître : Le lab pour remettre l'innovation au coeur de l'entreprise*. Dunod.

Lô, A. (2017), Un FabLab d'entreprise pour favoriser l'ambidextrie des salariés-Étude de cas chez Renault. *Revue Française de Gestion*, *43*(264), 81-99.

Lhoste, É. and M. Barbier (2016), FabLabs. *Revue d'anthropologie des connaissances*, *10*(1), 43-69.

Mahmoud-Jouini, S. B. (2016), Le numérique au service des entités dédiées à l'innovation de rupture. *Revue française de gestion*, (1), 65-87.

March, J. G. (1991), Exploration and exploitation in organizational learning. *Organization science*, *2*(1), 71-87.

Mérindol, V., and D. W. Versailles (2016), Les laboratoires d'innovation ouverte comme dispositif entrepreneurial. *Entreprendre & innover*, (4), 52-61.

Mérindol, V., Bouquin, N., Versailles, D. W., Capdevila, I., Aubouin, N., Le Chaffotec, A., Thomas, V. et al. (2016), Le Livre Blanc des Open Labs. Quelles pratiques ? Quels changements en France ? (p. 177). Paris: ANRT & PSB.

Meyer, J. W. and B. Rowan (1977), Institutionalized organizations: Formal structure as myth and ceremony. *American journal of sociology*, *83*(2), 340-363.

Miles, M. B. and A. M. Huberman (1994), *Qualitative data analysis: An expanded sourcebook*. Sage.

Oliver, C. (1991), Strategic responses to institutional processes. *Academy of management review*, *16*(1), 145-179.

Pache, A. C., and F. Santos (2010), When worlds collide: The internal dynamics of organizational responses to conflicting institutional demands. *Academy of management review*, *35*(3), 455-476.

Pache, A. C., and F. Santos (2013), Inside the hybrid organization: Selective coupling as a response to competing institutional logics. *Academy of Management Journal*, *56*(4), 972-1001.

Palazzo, G. and A. G. Scherer (2006), Corporate legitimacy as deliberation: A communicative framework. *Journal of business ethics*, *66*(1), 71-88.

Scott, W.R. (1995), Institutions and Organizations. Ideas, Interests and Identities. Sage

Suchman, M. C. (1995), Managing legitimacy: Strategic and institutional approaches. *Academy of management review*, *20*(3), 571-610.

Tushman, M. L., and C.A. O'Reilly III (1996), Ambidextrous organizations: Managing evolutionary and revolutionary change. *California management review*, *38*(4), 8-29.

Volberda, H. W., Van Den Bosch, F. A., & Mihalache, O. R. (2014), Advancing management innovation: Synthesizing processes, levels of analysis, and change agents. *Organization Studies*, 35(9), 1245-1264.

Walker, R. M., Chen, J., & Aravind, D. (2015), Management innovation and firm performance: An integration of research findings. *European Management Journal*, 33(5), 407-422.

Yin, R. K. (2013). *Case study research: Design and methods*. Sage publications.

Zelditch, M. (2001), Processes of legitimation: Recent developments and new directions. *Social Psychology Quarterly*, *64*(1), 4-17.

Zimmerman, M. A., and G. J. Zeitz (2002), Beyond survival: Achieving new venture growth by building legitimacy. *Academy of management review*, *27*(3), 414-431.

Appendix 1: list of external secondary data used to triangulate the data and reduce interviewee's perception bias

https://www.maddyness.com/innovation/2015/03/18/air-liquide-startup/
https://www.jobteaser.com/fr/companies/air-liquide/newsfeed/company_life-14009
https://www.f2ic.fr/ffci-portal/cms/7317-8232/air-liquide-i-lab-aliad-2-initiatives-pour-soutenir-l-innovation.dhtml
http://www.airliquide-news.com/site/Le_i-Lab_d_Air_Liquide/.html
https://nbry.wordpress.com/2014/05/25/ilab-the-fifth-column-of-innovation/
https://www.alliancy.fr/it_leur_parle/no-theme/2014/03/26/interview-gregory-olocco-et-olivier-delabroy-de-air-liquide-souvrir-de-nouveaux-marches
https://hubinstitute.com/2014/06/lilab-connecte-catalyse-linnovation-lentreprise-hubday-replay/
https://digital-learning-academy.com/le-i-lab-dair-liquide-un-lab-ouvert-et-agile-pour-retrouver-lesprit-start-up-et-accelerer-linnovation/
http://spring-lab.com/innover-autrement-dans-une-grande-entreprise-le-cas-air-liquide/
http://fabbike.campus.ecp.fr/?page_id=264
http://www.c9consulting.fr/2016/06/05/les-accelerateurs-dinnovation-le-i-lab-dair-liquide-et-autres-fablab/
https://www.engie.com/breves/innovation-olivier-delabroy-air-liquide-2/
https://www.usine-digitale.fr/article/cdo-air-liquide-se-dote-d-un-vp-transformation-numerique-qui-connait-la-maison.N378434
https://www.la-croix.com/Actualite/Economie-Entreprises/Economie/Air-Liquide-toujours-en-forme-2015-02-17-1281835
https://www.netexplo.org/fr/veille/innovation/i-lab
http://theinnovationandstrategyblog.com/2014/04/15/innover-cest-trouver-les-marches-de-lavenir-selon-gregory-olocco-directeur-du-i-lab-dair-liquide/
https://www.scoop.it/t/fab-lab/p/4012790560/2013/12/16/air-liquide-inaugure-son-i-lab
https://www.frenchweb.fr/chez-air-liquide-le-digital-transforme-le-coeur-de-metier-et-lexperience-employe/299880
http://design.ensa-nancy.net/bernard-lledos-et-cyril-manscourt-dair-liquide/
https://isabelleboucq.wordpress.com/2014/02/14/li-lab-dair-liquide-un-exemple-de-corporate-garage/
http://bfmbusiness.bfmtv.com/01-business-forum/air-liquide-se-dote-d-un-laboratoire-sur-le-mode-fab-labs-610668.html
http://www.wedostudios.fr/fr/usine-du-futur/
http://metro.paris/fr/place/i-lab-respirer-dans-la-ville-
https://www.usinenouvelle.com/article/air-liquide-inaugure-son-i-lab.N226616
https://business.lesechos.fr/directions-numeriques/digital/transformation-digitale/0211046935174-air-liquide-son-i-lab-et-ses-tests-learn-211760.php
https://www.lesechos.fr/17/12/2013/LesEchos/21586-106-ECH_air-liquide-inaugure-un---fab-lab---a-paris.htm
https://media.digitalarti.com/fr/blog/digitalarti_mag/la_i_lab_d_air_liquide_un_lab_ouvert_et_agile_pour_retrouver_l_esprit_start_up_et_accelerer_l_innovation
https://www.lopinion.fr/edition/economie/l-i-lab-air-liquide-veille-prochains-marches-23729
https://www.optionstartup.paris/lieu-innovant/ilab-air-liquide/

Appendix 2: coding sample (1- legitimization process)

Verbatim	Institutional perspective				Rational perspective			
	INSTIT_LEGITIM	INSTIT_ACCEPT	INSTIT_CONFORM	INSTIT_OTH	RATIO_VALUE	RATIO_COST	RATIO_EVAL	RATIO_OTHER
"(…) A structure like the i-Lab must create concrete value, not only think." (Strategic development Director)					**X**			
"All we know is that when we need budget for an innovation project, we don't get it, and meanwhile, they have a lot of funding to play with 3D printers. (…)" (R&D Director 2)						**X**		
"At the beginning, the main barrier was to build legitimacy to be accepted. And as we were not clearly identified within the firm, it was even more important to quickly be legitimate, even if it was even more complicated." (Strategic development Director)	**X**	**X**						
"It is too far away from our R&D site. I can't spend half a day in transportation. I feel uncomfortable to say it but if they were closer, not on the same site as us, but closer, it would be better. This geographical distance is a barrier to me." (R&D Director 3)		**X**						
"People came to ask for KPI, but KPI about what? It was very terrible, it almost killed us before we really started to exist." (Technical manager, i-Lab)							**X**	
"Even if I support the i-Lab, in the end, the only indicator that matters is the euro." (Strategic development Director)						**X**	**X**	

Appendix 3: i-Lab

(Source: Air Liquide)

(Source: Job Teaser)