

ENTREPRENEURIAL SUPPORT ORGANIZATIONS IN THE QUADRUPLE/QUINTUPLE HELIX MODEL: AN INSTITUTIONAL PERSPECTIVE ON THE SPACE CASE STUDY

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Abstract : Even though the literature on entrepreneurial support in entrepreneurial ecosystems towards socio-environmental development has gained an increasing theoretical interest since the mid-2010s, the multiple roles of entrepreneurial support organizations are still under studied. The primary objective of this study is to identify these roles thanks to an institutional perspective on entrepreneurial ecosystems through the Quadruple/Quintuple Helix model. This model enables a broader institutional contextualization of the socio-environmental issues that entrepreneurial ecosystems face. To do so, we conduct an exploratory qualitative study based on the rigorous method developed by Gioia and Corley (2012), enabling us to obtain a synthetic data structure. Our findings present three complementary main roles endorsed by entrepreneurial support organizations, namely funding, following, and opening. These roles allow the development of friendly-socio-environmental entrepreneurial projects (FSEEPs), a concept that we detail in our research. Eventually, such findings aim to help practitioners to better manage ESOs towards EEs’ development.

1. Introduction

Although the literature on Entrepreneurial Ecosystems (EEs) has provided promising conceptual insights on the institutional dynamics of Entrepreneurial Support Organizations (ESOs, Bergman and McMullen, 2021 ; Spigel, 2016) to foster entrepreneurship, their roles regarding their broader socio-environmental context are still not clear in the current state of the art. ESOs play crucial roles in the making of EEs, by structuring their entrepreneurial dynamics and fostering economic development within a community of actors grounded in a territory, an industry -or even in a broader sense- a goal. (Theodoraki et al., 2018 ; Theodoraki et al., 2020). As EEs are facing increasing socio-environmental issues due to climate change pressure, ESOs governance turn upside down by public policies and users' needs calling for more entrepreneurial projects respectful of the civil society and its natural environment, which we call friendly-socio-environmental projects (FSEEPs). Carayannis et al. (2018) offer a new institutional perspective on EEs by characterizing them as helix with socio-environmental issues. Such a theoretical framework -namely the Quadruple/Quintuple Helix model (Q/Q Helix model)- enables the institutional contextualization of EEs' entrepreneurial dynamics in a macro-level perspective to consider the socio-environmental issues of EEs. Even if several studies have focused on the roles of ESOs in the Triple Helix model, there is no research conducted on ESOs in the Q/Q Helix model (Carayannis et al., 2018 ; Etzkowitz, 2005 ; Kreusel et al., 2018). By identifying this research gap, we raise the following research question: How ESOs address socio-environmental issues in EEs within the Q/Q Helix model?

To address this question, we focus on the French space case study, which has been through major institutional changes since the beginning of the 2010s, with the acceleration of the commercialization of space activities and the socio-environmental issues it raises as an emerging EE (Barbaroux and Dos Santos Paulino, 2013). It provides both conceptual and empirical interests, by being highly regulated by institutions and by being constituted of a variety of ESOs across the French territory and abroad (Lamine et al., 2021). Thus, we rely on an inductive qualitative research to explore the roles and interdependencies of ESOs in a macro-level perspective. Our results show a paradoxical trend in ESOs regarding the socio-environmental issues they deal with. While there is an increasing willingness from the government, the industry, and the university to promote FSEEPs abiding by formal institutions such as public policies and legislation, we observed a need for structuring entrepreneurial incentives through ESOs to address these socio-environmental issues. This enables us to develop the concept of friendly socio-environmental entrepreneurial projects (FSEEPs), promoted by ESOs.

This paper is structured in four sections: Section 2 synthesizes the existing literature on ESOs' roles in EEs within the Q/Q Helix model through an institutional perspective and its relevant application in the French space case study. Section 3 details the method provided by Gioia and Corley (2012) on which we base our research, an exploratory qualitative approach based on primary data through semi-structured interviews. Eventually, Section 4 reveals and discusses our findings and conclusions with the implications of this study and perspectives for future research.

2. Literature review

2.1.Theoretical literature

2.1.1. ESOs in EEs

The current state of the art on ESOs in EEs provides a wide range of conceptual studies presenting in-depth analysis of ESOs' characteristics (Audretsch et al., 2019), resources (Sardeshmukh et al., 2019) and strategies (Theodoraki, 2020). According to Bergman and McMullen, (2021:3), ESOs can be defined as “an organization whose primary purpose is to support individuals and collectives, through (in)direct and (im)material assistance, as they seek to initiate and progress through the stages of the entrepreneurial process.” They are considered as “hybrid organizations [...] created by synthesizing elements of different institutional spheres” (Etzkowitz et al., 2005). Thus, ESOs cover a large panel of organizations, as incubators, science parks, accelerators, maker spaces, and co-working spaces (Bergman and McMullen, 2021), but also financial support network, as venture capitalists (van Rijnsoever, 2022). Moreover, some studies show promising results on institutional factors shaping the embedded interactions of the diversity of actors and the institutional context of EEs. These studies point out which institutions characterize EEs and how entrepreneurial firms have an influence on their territory through ESOs (Audretsch et al., 2019; Cohen, 2006; Urbano et al., 2019). van Rijnsoever (2022) highlights how ESOs can introduce entrepreneurial projects to other actors thanks to a sufficiently dense financial support network. Even though policymakers are trying to encourage the development of entrepreneurial projects which simultaneously sustain the natural and the social environment - FSEEPs, making these projects successful “is a high-risk endeavor” regarding market and profitability constrains (van Rijnsoever, 2022).

2.1.2. EEs as Q/Q Helix

The state of the art on EEs developed since the 2010s provides precise theoretical insights on EEs characteristics, processes and resources (Stam and van de Ven, 2021; Torres and Godinho, 2022). However, even if EEs have become a well-known theoretical concept in the study of entrepreneurial dynamics, their structure and institutions are still under-studied in the literature (Alaassar et al., 2022; Theodoraki and Messeghem, 2017). According to, Cho et al. (2022):732, “entrepreneurial ecosystems represent a renewed interest in localized conditions for entrepreneurship aligned with a focus on the agency of entrepreneurial actors to create and transform their own contexts.” Carayannis et al. (2018) supplement this approach with the Q/Q Helix model, which is a macro-level model of innovation made of various spheres. More precisely, they explain how EEs are made of three traditional spheres -the government, the industry and the university- which are supplemented of a fourth and a fifth spheres -the civil society and the environment, respectively. These two spheres added in the Q/Q Helix model focus on a more democracy-based and ecologically-sensitive knowledge regarding the civil society and the respect of its natural environment (Carayannis et al., 2012 ; Rosenlund et al., 2017). The Q/Q Helix model enables the understanding of the dynamic interplay of these three spheres within their socio-environmental context, which enables the investigation of the socio-environmental issues that EEs deal with. These socio-environmental issues that can be assessed in the Q/Q Helix model dealing with the challenges and constrains due the climate change regarding its impacts both on society and environment to think about sustainable solutions in the innovation process: “[...] there is rising demand for ‘new green’ knowledge solutions and know-how in order to utilize resources innovatively for society and the economy in an environmentally conscious manner.” (Carayannis et al., 2012). More precisely, climate change encourages EEs' actors to adapt their knowledge production system

governance towards sustainable development objectives to combine value creation with socio-environmental protection. (Bertello et al., 2022; Crecente et al., 2021). Indeed, the knowledge production system is at the heart of the conceptual discussions of helix models, as it fuels innovation and thus, entrepreneurship (Hülsbeck & Pickavé, 2014). This model is characterized by a Mode 3 of knowledge production system, which emphasizes on ecosystems as helix consisting of “multi-layered, multi-nodal, and multi-lateral systems” (Carayannis et al., 2018:149). This Mode 3 of knowledge production provided by the Q/Q Helix model focuses on a society and a democracy-based knowledge as well as an ecologically sensitive knowledge (Carayannis et al., 2012), which allow the consideration of socio-environmental issues in EEs.

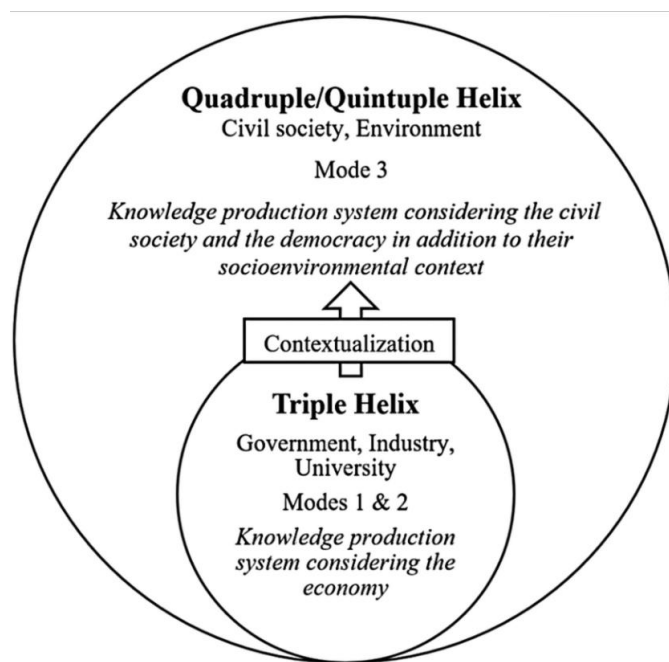


Figure 1. From the Triple helix model to the Q/Q helix model. Source: Cloitre et al. (2022).

2.1.3. Institutional perspective on ESOs

From an institutional perspective, ESOs refer to the diversity of organizations which aim to foster entrepreneurship and to connect all the other institutions of EEs, in accordance with their performance objectives (Bergman and McMullen, 2021 ; Mack and Mayer, 2016 ; van Rijnsoever, 2022). Various concepts have been mobilized to describe the main factors responsible for the roles of ESOs, such as institutional theory (Bosma et al., 2018 ; Urbano et al., 2019), which help to have a better understanding of the dynamic interplay of the various institutional spheres of EEs (Carayannis and Campbell, 2021 ; Carayannis et al., 2018). These studies also point out the main co-opetition strategies chosen by ESOs (Theodoraki, 2017), by bringing together the actors involved in the entrepreneurial dynamics in EEs (Cohen, 2006; van Rijnsoever, 2020), as angel investors, corporations, territorial development agencies among many others (Ap da Costa Mineiro et al., 2021; Carayannis et al., 2005; McAdam et al., 2016). Thus, institutions constitute core concepts both in the EE literature and the Q/Q Helix literature by enabling the understanding of their actors' interdependencies in the innovation process. According to North (1990,1991) and (Chowdhury et al., 2019) there are

two different types of institutions structuring the entrepreneurial dynamics. On the one hand there are the formal institutions, corresponding to public policies and law, and on the other hand there are informal institutions referring to sociocultural norms and practices : “Both formal and informal institutions provide a macrolevel context for the various spheres of the Q/Q helix model and how they interact (Chavance, 2008). Institutions constitute a well-known framework used in entrepreneurship and in helix models (Carayannis, 2008; Garud et al., 2013; Eesley et al., 2018; Liu & Cai, 2018). They aim to improve the interface and exchange of knowledge between the actors of one EE to foster innovation (Meijer et al., 2006). Moreover, it has been shown that institutions constitute a relevant theoretical perspective for contextualizing and examining sociocultural norms that can directly impact the entrepreneurial culture in entrepreneurial activity (Hayton & Cacciotti, 2013).” (Cloitre et al., 2022).

2.2. Empirical literature

Roundy et al. (2018), and Audretsch et al. (2018) have highlighted the theoretical importance to study the emergent phase of EEs, in order to go beyond EEs’ elements listing by analyzing their dynamic interdependencies instead. They call for more empirical testing in high-technological EEs, which are characterized by complex evolutive interplay among their actors and key societal impacts for both organizations and territories (Hocheberg, 2016). In response to this issue, there is a need to study emergent high-technological EEs which can constitute relevant case studies to do so. Therefore, the space case study can be considered as an emerging high-technological EE (European Commission, 2016:6) with promising empirical insights regarding entrepreneurial dynamics (Lamine et al., 2021). This EE is going through major structural changes since the 2010s with the arrival of new entrants enabling an increasing commercialization of space activities, called the “New Space” era (Dos Santos Paulino, 2020). The acceleration of commercialization of space activities has led to the emergence of numerous ESOs in the space EE, which challenge its traditional institutional structure, mainly made of large public-private actors, as space agencies and historical space manufacturers (OCDE, 2019). More precisely, the traditional actors governing the space EE need to adapt the institutional specificities brought by the democratization of space activities towards a more horizontal governance process (Lamine et al., 2021). Space agencies and historical space companies are implementing numerous entrepreneurial incentives to better structure the emerging entrepreneurial dynamics charactering the New Space era through institutions (Dos Santos Paulino, 2020; Lamine et al., 2021). While this institutionalization through ESOs aims to encourage and to manage space entrepreneurial dynamics for value creation, it also plays a rising role in addressing the rapid growth of space activities and the socio-environmental issues they raise in a worldwide context worried about climate change. In this context, ESOs are perceived as catalysts to disseminate best practices among the entrepreneurial community of EEs (Bertello et al., 2022; UNOOSA, 2021). The exponential growth of space activities in the New Space era raises crucial socio-environmental issues among the actors of the space EE, such as space pollution caused by human intervention, space debris or rockets’ fuel. From a broader perspective, the space case study is relevant, as it enables researchers to investigate the importance of socio-environmental issues in emergent EEs through the Q/Q helix model. The space case study also offers interesting conceptual perspectives regarding the literature on the Q/Q helix model, as it is strongly regulated by institutions (Carayannis and Roy, 2000 ; Dabrowska et al., 2019) and faces increasing needs

coming from civil society and the environment since the mid-2000s (OECD, 2019 ; Dos Santos Paulino and Gudmundsson, 2021).

3. Method

3.1. Research design

To conduct this study, we rely on an inductive qualitative approach in order to explore the roles of ESOs in EEs within the Q/Q Helix model relying on the rigorous method provided Gioia and Corley (2012). This method is relevant for studying phenomena that have been underexplored in the previous literature (Bansal and Corley, 2012; Goswami et al., 2018). We aim to study the institutional interdependencies of the various actors involved in ESOs activities by relying on the influence of the institutional environment has on entrepreneurial practices (Gephart, 2004 ; Lamine et al., 2021). According to Dana and Dana (2005) and Gioia and Corley (2012), it is possible to generalize from a case study if the case generates concepts or principles with obvious relevance to some other cases. It is also important to emphasize that our corollary intent is to generalize to theory. Regarding the systematic review conducted by Bergman and McMullen (2021) on ESOs, there is a need for more studies focusing on the roles and relations linking entrepreneurs, ESOs and external stakeholders that can be involved in the entrepreneurial support process. As it has been pointed out by Cohen (2006), an EE should embrace a panel of entrepreneurial actors, as support, research, and funding actors. Such a vision is compatible with the vision as ecosystems as Helix within the Q/Q Helix model. Therefore, we focus on one typical case study which is the French space EE to have a better understanding of ESOs in the Q/Q Helix model regarding their socio-environmental context. We mainly base our qualitative inquiry on primary data, but we supplement it by external secondary data to deepen our research and to have a triangulation of the data useful for inductive qualitative research (Yin, 2009).

3.2. Data collection

Regarding the collection of our data, we follow the method of a ten-year longitudinal study of a space start-up's creation in France (Lamine et al., 2021). We extend this research by conducting interviews with the various stakeholders involved in the entrepreneurial support process by selecting ESOs helping start-ups in the French space EE to emerge. The theoretical sampling of different groups of actors provides an optimal description of ESOs within the space EE. We rely on six groups of actors involved in entrepreneurial dynamics' governance: ESOs, but also the other groups of actors we identified in the support ecosystem, which are funders, government, industry, start-ups, and university. While the government, the industry and the university directly refer to the core actors of the Q/Q Helix model (Carayannis et al. 2018), funders and start-ups are added to the model in order to better capture the institutional interdependencies of ESOs and their start-ups within a dense financial support network (van Rijnsoever, 2022). Hence, snowball sampling was performed to reach theoretical saturation (Aguinis & Solarino, 2019). The replication design of the method of Gioia and Corley (2012) enables knowledge gathering for each group of actors. This approach allows a deep study of each group of the space EE and thus increases the generalizability of the results (Yin, 2018). We rely on the network provided by the academic and industrial chair we belong to, which enables us to reach actors coming from the government, industry and university who own and interact with French ESOs related to the space EE. In the initial Triple Helix model, the different types of actors involved in ESOs activities are very large. This includes ESOs teams

and managers, including territory development organizations and mentors, but also entrepreneurs, the French and European space agencies (Centre National d'Etudes Spatiales, CNES, and European Space Agency, ESA) venture capitalists and researchers (Etzkowitz et al., 2005 ; Stam and Spigel, 2016 ; van Rijnsoever, 2022). All of them deal with socio-environmental issues according to their activities. To have a better overview of these actors, we first explored secondary sources, such as the targeted interviewees' websites, public reports and in-press citations to have a clearer understanding of their status in the EE. Secondly, we do observation in local, national and international events from 2021 to 2022. This allows us to identify potential and relevant interviewees for our research and to collect our primary data. Eventually, we proceed to a series of 40 semi-structured interviews by using an interview guide built on the institutional factors identified in the current state of the art by Lamine et al. (2021). Institutional factors have been largely documented and recommended to study EEs' dynamics (Stam and Spigel, 2016), as well as their functioning within the Q/Q Helix model (Carayannis et al., 2018). Such factors do not directly deal with socio-environmental issues of EEs, but they are useful to better understand how ESOs adapt them according to their institutional governance (Wagner, 2021).

3.3.Data analysis

The secondary data and the observation conducted before the collection of interviews provide us a preliminary understanding of ESOs' roles in the French space EE. Following Lamine et al. (2021) method, we directly began to analyze the data in an inductive manner when we collected it (Corley & Gioia, 2004; Gehman et al., 2018). The data provided explanatory accounts of the roles of ESOs in the French space EE and descriptions of their institutional interdependencies within the Q/Q Helix model. After having fully transcribed the 40 semi-structured interviews, we relied on a thematic data analysis to find key interdependencies between ESOs and the other actors involved in the entrepreneurial support process. We first identified initial concepts linked to the institutions found by Lamine et al. (2021) and we grouped them into categories by comparing the information provided by the interviewees (Gehman et al., 2018 ; Yin, 2009). This analysis helped us to better understand ESOs' roles in EEs within the Q/Q Helix model and with which type of actors they interact.

4. Findings

4.1.FSEEPs

Our findings point out several elements regarding the socio-environmental issues of ESO's within the Q/Q Helix model. Thanks to the institutional approach we relied on to conduct this research, we observed the government, the industry and the university cannot interact without ESOs to reach their shared goals in accordance the socio-environmental issues coming from the civil society and the environment. The importance of informal institutions in ESOs to foster entrepreneurship is directly due to the need for connecting the three traditional spheres of EEs to guarantee entrepreneurship development in the Mode 3 of knowledge production system. The majority of ESOs being publicly funded, they are considered as innovation catalysts to promote friendly socio-environmental projects (FSEEPs) in EEs, in accordance with governmental policies. They need to highlight their socio-environmental outputs for the organizations and territories involved in the fundings, more and more focused on civil society's needs and ecological constrains of the environment. By selecting and accompanying FSEEPs with respect to these needs and constrains, they filter supply and demand for

innovative services in EEs. This directly impact the global innovation strategy of EEs, and thus, EEs' institutions.

4.2. Multiple roles of ESOs

Our results show a paradoxical trend between the ambitions and the means at the disposal of ESOs to encourage socio-environmental issues in EEs. While we observed there is an increasing willingness from the government, the industry, and the university to foster FSEEPs through ESOs as innovation promoters by opening them to other EEs (see Section 4.2.1), there is still few concrete means to do so. More precisely, we noted that there is a lack of visibility in the uses of the various entrepreneurial incentives existing to encourage FSEEPs. ESOs claim the utility of their FSEEPs regarding socio-environmental issues in their official speeches and documentation, especially regarding climate change. Nevertheless, this utility remains unclear because ESOs lacks means to measure the outputs of FSEEPs in the French space EE. For instance, there is a need to develop selection criteria to identify FSEEPs regarding socio-environmental issues apart from the respect of the legislation regarding space debris. Regarding the government sphere, space agencies as CNES and ESA have worked on the topic by developing environmental index enabling a quantitative measurement of space activities socio-environmental impacts. Private ESOs also tend to be perceived as innovation catalysts by funding FSEEPs on the basis of quantitative criteria judging from socio-environmental impacts of FSEEPs (see Section 4.2.2), but with less institutional pressure due to their funding sources. Thus, they have more facilities to deal with market and profitability. Regarding socio-environmental issues, French space FSEEPs must comply with the French space legislation (Loi sur les Opérations Spatiales, 2008). Such formal institution may impact French attractiveness and competitiveness, conducting entrepreneurs to do to *forum shopping*. In space entrepreneurship, this phenomenon refers to entrepreneurs who try to seize the jurisdiction most likely to give reason to their own interests in private international law. In other words, entrepreneurs may develop their activities where they do not have to comply with numerous formal institutions hindering their commercial development. The same thinking applies to ESOs when supporting entrepreneurs towards FSEEPs. Even though ESOs do not have the power to define formal institutions given by the government, they can influence informal institutions through incentives which counter formal institutions leading to forum shopping as innovation monitors by following FSEEPs in their entrepreneurial support path (see Section 4.2.3).

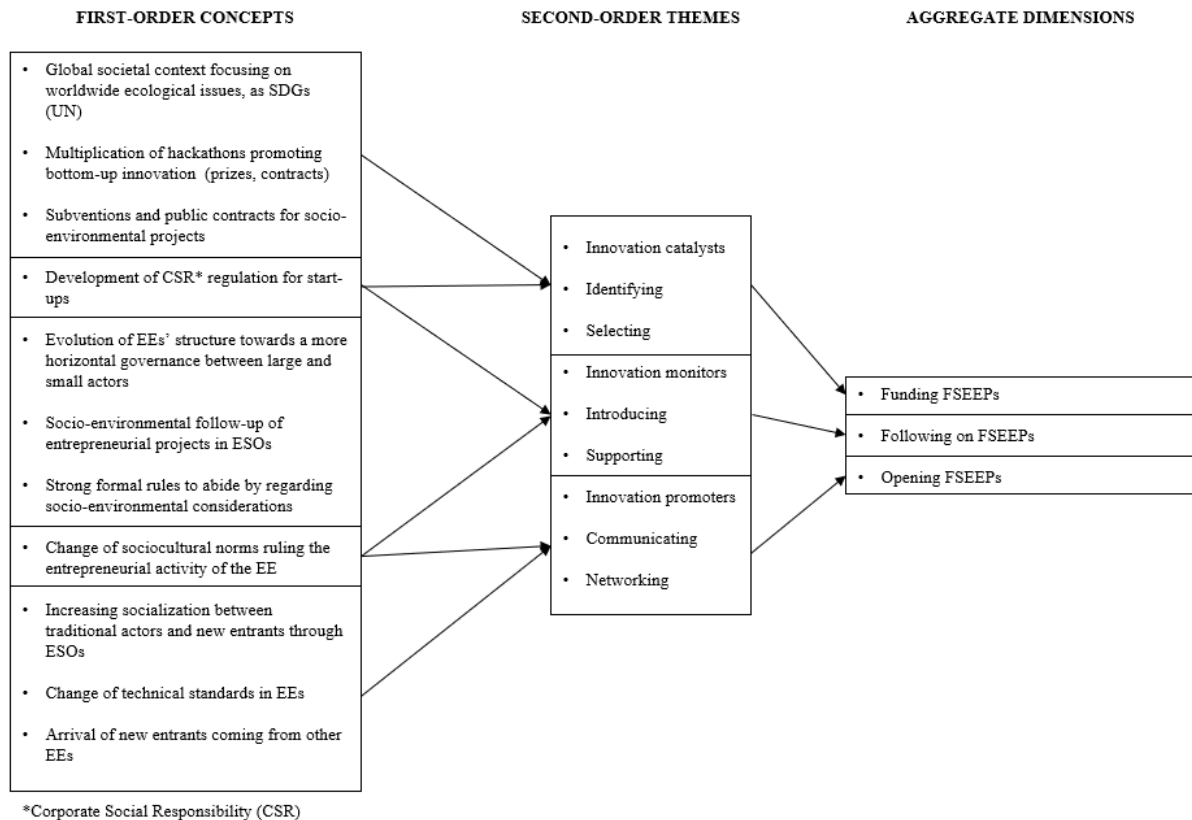


Figure 2. Data structure

4.2.1. ESOs funding FSEEPs

In the context of climate change, more and more institutions are encouraging the development of socio-environmental criteria to promote FSEEPs. The launch of the sustainable development goals (SDGs) of the United Nations in 2015 enables a global awareness of policy makers to promote FSEEPs through innovation catalysts. Such institutional directions encourage ESOs to cooperate with actors coming from the government, the industry and the university spheres in the Q/Q Helix model, in order to develop selection criteria to identify potential FSEEPs in EEs. Still, these criteria are often very difficult to define, making hazardous the selection of FSEEPs regarding their socio-environmental impacts. This is why ESOs mainly rely on technical criteria developed by relevant actors of EEs, as space agencies, which have the knowledge about socio-environmental impacts of space activities. For instance, the CNES requires in-depth analysis of the socio-environmental impacts of the FSEEPs they support. By identifying and selecting FSEEPs which answer CSR regulations, ESOs offer a privileged way to fund FSEEPs through relevant actors coming from the government and the industry. The funding role of ESOs also involves a bottom-up innovation allowed by hackathons, prizes and challenges offering targeted awards to FSEEPs, and thus, the legitimacy to ask for larger amounts to venture capitalists in the early stages of their technical and commercial development.

4.2.2. ESOs following FSEEPs

Following the entrepreneurial support chronology of FSEEPs, ESOs endorse probably their main role in EEs when following FSEEPs from the ideation phase to the acceleration phase, with the first fundings and contracts obtained with ESOs' partners coming from the

government, the industry and the university. In this context, they help entrepreneurs to focus on the needs of end-users in the knowledge production system. More precisely, thanks to a more horizontal governance in the Mode 3 of knowledge production system, ESOs act as innovation monitors by helping and monitoring FSEEPs with larger actors. These actors often refer to historical actors that have developed their own institutions with which FSEEPs need to comply with, such as high technological standards, specific to the space EE. In the French space industry, Airbus Defense and Space, ArianeGroup and Thales Alenia Space are often mentioned as the historical actors driving the knowledge production system. However, due to the recent acceleration of commercialization of space activities, smaller actors are entering this closed network. However, the entrance is very institutionalized through a long process of legitimation, mainly driven by informal institutions, such as cooptation in large trade unions, as the Groupement des industries françaises aéronautiques et spatiales (GIFAS), or even closer associations as the Club Galaxie in Toulouse. Hence, ESOs have a major role to play regarding the follow-up of FSEEPs they support within EEs.

4.2.3. ESOs opening FSEEPs

Eventually, ESOs enable FSEEPs to open themselves to other EEs through emerging market opportunities occurring outside of their own EE. In the French space EE, this occurs at two levels: on the one hand, at a territorial level, and on the other hand, at a sectorial level. At a territorial level, the French space EE can divide or multiply its market opportunities by segmenting itself into sub-ecosystems within France, or by expanding it at an international level to answer the needs of foreigner space EEs. ESOs are key actors in the making of these opportunities, as they constitute the economic development tools of EEs' strategies. In this context, they may address diverse perceptions of socio-environmental issues that they should adapt according to the existing legislation of the considered territory. This is what the ESA tries to address across Europe, by trying to homogenize the multiple socio-cultural norms of the European space EE in its knowledge production system. Such a process of opening FSEEPs is supported by an institutional change through an evolution of socio-cultural norms towards an increasing entrepreneurial culture in the government, the industry, and the university spheres. The change of technical standards in the space EE towards miniaturization and low-cost solutions in the NewSpace era foster the arrival of new entrants attracted by ESOs, perceived as innovation promoters within the space EE. However, it could be thorny for entrepreneurs to have a clear understanding of each ESO' role in the space EE due to the lack of visibility, leading to a slowdown in entrepreneurial activity.

5. Conclusion and discussion

5.1. Theoretical contribution

In terms of theoretical contribution, we actually noted the crucial roles of ESOs in the Q/Q Helix model due to their hybrid nature (Etzkowitz et al., 2005 ; Carayannis et al., 2018) as they constitute the institutional bridges between all the spheres of the model. They are catalysts, monitors and promoters of innovation and thus entrepreneurship (Hülsbeck and Pickavé, 2014 ; van Rijnsoever, 2020). With respect to the findings of Etzkowitz et al. (2005) in the Triple Helix model, we noticed that ESOs cover broader roles within the Q/Q Helix model. Following Carayannis et al. (2018), they are at the heart of the Mode 3 of the knowledge production system, more democracy-based and ecologically-sensitive, by selecting FSEEPs with respect to governmental needs and constrains. This directly impact the global

innovation strategy of EEs (van Rijnsoever, 2022). Our main theoretical contribution deals with the lack of coherence regarding ESOs' objectives and their means within the Q/Q Helix model. While the Mode 3 of knowledge production system emphasizes on a more democracy-based and ecologically-sensitive knowledge to overcome the socio-environmental issues coming from the civil society and the environment, ESOs face major obstacles when helping FSEEPs to comply with the economic expectations coming from the government. More precisely, they cannot implement concrete means to select FSEEPs due to market constraints in highly competitive technological EEs, making them less profitable with respect to other projects which do not have these constraints (i.e. *forum shopping*). Therefore, there is a lack of coherence between the expectations coming from the government and the means provided to ESOs to foster FSEEPs which respect the Mode 3 of knowledge production system within the Q/Q Helix model.

5.2. Empirical implications

From an empirical point of view, our findings induce one major implication that can be addressed to policy makers and ESOs' managers. As we detailed it in our findings, we figured out that ESOs enable the filtering of FSEEPs according to civil society's needs and socio-environmental constraints. However, there is no concrete means to do so. Therefore, we recommend to policy makers to implement more financial incentives towards socio-environmental issues when selecting FSEEPs. We do not recommend increasing pressure on ESOs and FSEEPs by adding more formal rules due to issues of market profitability in highly competitive technological EEs. According to our findings, we believe that is better to encourage than to force ESOs to give more opportunities to projects which already answer socio-environmental issues. For instance, selection criteria regarding these issues can be added to access financial bonus for FSEEPs to encourage their development with EEs' other actors. In addition, we point out that ESOs' roles are still very heterogeneous and difficult to understand for entrepreneurs, especially regarding the roles of each ESO in the EE. Such filtering process and a lack of visibility for entrepreneurs could lead to inadequate selection or rejection of high-potential projects that could have been sooner detected thanks to a better visibility of the several ESOs services of EEs.

5.3. Limitations and further research

Even though our study highlights several key conceptual elements regarding ESOs' roles in EEs within the Q/Q Helix model, there are still some limitations that could be addressed to our research. From a conceptual perspective, we relied on an institutional perspective to gain a better understanding of the interdependencies between formal and informal institutions regarding ESOs' role, however, we do not conduct an in-depth study of the impact of such factors within the Q/Q Helix model. This could be relevant to develop our findings and thus better explain the lack of visibility entrepreneurs may face when looking for a specific ESO' role within EEs (i.e. funding, following, opening). Then, this constitutes an interesting research avenue when studying ESOs' impacts for EEs when supporting FSEEPs. More precisely, our research points out that there is a lack of coherence between the objectives and the means at the disposal of ESOs to reach their goals as innovation catalysts, monitors, and promoters in the Mode 3 of knowledge production system. According to these goals, further research could investigate how to assess ESOs' outputs for EEs within the Q/Q Helix model.

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