CONSTRUIRE UNE LÉGITIMITÉ DURABLE ET RÉSILIENTE POUR DES ÉCOSYSTÈMES DURABLES

Moratal, Nuria

Nantes Université

Laboratoire d'Economie et Management de Nantes-Atlantique (LEMNA)

Nuria.Moratal@univ-nantes.fr

Résumé :

Pendant la phase d'émergence, les écosystèmes d'innovation doivent convaincre leurs membres de contribuer collectivement à un objectif commun. Pour cela, l'écosystème doit acquérir une légitimité, c'est-à-dire qu'il doit établir l'acceptabilité, la plausibilité et la crédibilité de l'objectif commun, qui est souvent une proposition de valeur. Nous postulons que, si l'acquisition de la légitimité est difficile, la persévérance dans le processus d'émergence est plus difficile. La plupart des écosystèmes perdront probablement leur légitimité à un moment donné et si cette légitimité doit être durable, l'écosystème doit faire face à cette perte et trouver des moyens de la récupérer. À partir d'une étude de cas longitudinale d'un écosystème de mobilité hydrogène, cet article examine empiriquement le phénomène d'acquisition et récupération de la légitimité de l'écosystème. Nos résultats sont construits autour de trois types de processus en interaction qui se produisent au sein de l'écosystème et qui contribuent à la construction d'une légitimité durable : se préparer à une légitimité résiliente, surveiller l'affaiblissement de la légitimité et récupérer la légitimité. Nous montrons que la recherche d'une légitimité résiliente est clé et que l'orchestration devrait aborder non seulement la coordination des actions et des ressources pour répondre à la demande des consommateurs, mais aussi les perceptions des membres de l'écosystème quant à son objectif et les changements dans ces perceptions.

Mots-clés : Légitimité, écosystème, innovation, hydrogène

BUILDING DURABLE AND RESILIENT LEGITIMACY FOR SUSTAINABLE ECOSYSTEMS

1   INTRODUCTION

Firms increasingly need to materialise complex value propositions to face the challenges of the environmental transition (Bocken et al., 2014). The lens of innovation ecosystems has been highlighted by the literature as an appropriate one to study this phenomenon (Adner, 2017; Jacobides et al., 2008; Kapoor and Lee, 2013; Wareham et al., 2014). Following Adner's (2006, p. 98) definition, we understand ecosystems as "collaborative arrangements through which firms combine their individual offerings into a coherent, customer-facing solution". Several studies indicate that, to achieve alignment, an emerging ecosystem, which faces considerable uncertainty, needs to acquire legitimacy to convince prospective ecosystem members of the acceptability, plausibility, and credibility of its common goal (Ansari et al., 2016; Dattée et al., 2018; Thomas and Ritala, 2021). Although the search for legitimacy is collective, ecosystem research suggest that there is sometimes an ecosystem leader, often referred to as a keystone, in charge of orchestrating an ecosystem and aligning interdependent actors to contribute to the ecosystem's collective goal (Adner, 2017; Barnett, 2006; Kapoor and Lee, 2013). Thomas and Ritala (2021) show that ecosystems acquire legitimacy through two distinct processes: discursive legitimation and performative legitimation. Discursive legitimation processes motivate and convince participants to accept participation in an ecosystem by building a shared understanding of the ecosystem's purpose. Performative legitimation processes aim at demonstrating the economic viability of the ecosystem and its potential to reach individual and collective success. .

Collective alignment in ecosystems may be weakened by internal and external changes that cause internal conflicts (Vasudeva et al., 2020), frustrate participants (Wareham et al., 2014) or weaken the attractiveness of participation in the collective action (Dattée et al., 2018; Hargrave and Van De Ven, 2006). This implies that an ecosystem may face situations where its legitimacy is fading and it needs to recover it to maintain actors' alignment and continue their commitment into the collective action and toward the common goal (Thomas and Ritala, 2021). Previous research does not, however, explain the processes through which an ecosystem can recover legitimacy once it has faded. This paper contributes to this debate by conducting a longitudinal analysis of an ecosystem that aims at developing hydrogen mobility. Specifically, we analyse

how the ecosystem recovers legitimacy in the eyes of (current and prospective) participants after its legitimacy faded. This paper contributes to the existing literature on innovation ecosystems by conducting an empirical analysis of the processes through which an ecosystem builds, loses, and recovers legitimacy over time. We identify and discuss three processes through which an ecosystem can build durable legitimacy: preparing for resilient legitimacy, monitoring weakening legitimacy, and recovering legitimacy. This paper also contributes to ongoing scholarly discussions of ecosystem emergence and growth in the context of high uncertainty as well as ecosystem orchestration.

The remainder of this paper is organised as follows. After presenting the conceptual development in section 2 and our research method and data collection procedure in section 3, we elaborate the main findings in section 4 in reference to processes aimed at building durable i) discursive legitimacy and ii) performative legitimacy. In section 5, we discuss the contribution of our results to the literature on legitimacy, uncertainty and the orchestration of ecosystems. Finally, in section 6, we propose a research agenda.

2   CONCEPTUAL DEVELOPMENT

Borrowed from biology, the term "ecosystem" refers to a group of interdependent actors, generally but not limited to firms, who depend on each other to materialise a joint value proposition (Adner, 2017). Ecosystems appear when no single actor has the necessary assets, expertise or skills to offer a product or a service to end-users and the applicable market structure does not allow for sufficient coordination to enable the collective value proposition to materialise (Jacobides et al., 2018). While ecosystems may be collectively orchestrated (Gurses and Ozcan, 2015), there is often a focal or keystone actor who coordinates the action to ensure agreement regarding the common goal and the most effective governance forms to realize it (Adner, 2017; Barnett, 2006; Dedehayir et al., 2018). Because uncertainty is high when an ecosystem is emerging, particularly in ecosystems that aim at offering sustainable solutions, the ecosystem must acquire legitimacy to achieve alignment and convince actors to contribute to realising the joint value proposition (Thomas and Ritala, 2021).

Legitimacy reflects the acceptability, perceived plausibility, and credibility of the ecosystem's purpose (Suchman, 1995; Thomas and Ritala, 2021). Thomas and Ritala (2021) show that legitimacy results from two interrelated processes, discursive and performative legitimation, and argue that these processes are especially important for aligning actors in the early phase of an ecosystem's life cycle. Indeed, while they are emerging, ecosystems must overcome the

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liability of newness (Singh et al., 1986), that is, the difficulty of gaining credibility in the absence of information or evidence indicating viability (Aldrich and Fiol, 1994; Autio and Thomas, 2018). Moreover, during the early phases of their development, ecosystems are also confronted with a chicken-or-egg problem (Caillaud and Jullien, 2003), as value creation depends on the ecosystem's capacity to generate same-side and cross-side network effects.

Previous literature also stresses that, as ecosystem grow, internal and external changes may weaken participants' alignment (Adner, 2017). Evolving customer preferences may weaken the attractiveness of the ecosystem's value proposition (Dougherty and Dunne, 2011), new technological development can create unprompted opportunities (Gruber et al., 2008) or lead to disagreement regarding the common goal (Vasudeva et al., 2020), changing regulations may change individual expectations (Garud et al., 2010), and increased competition may make the ecosystem less valuable to potential participants (Dattée et al., 2018). These factors imply that an ecosystem may lose legitimacy over time and have to work to recover it to continue operating (Thomas and Ritala, 2021). In the following sections, we introduce the processes of discursive and performative legitimation, discuss why legitimacy may fade over time and identify challenges an ecosystem may have to overcome to recover its legitimacy.

2.1 DISCURSIVE LEGITIMATION PROCESSES: CREATING ALIGNMENT THROUGH SHARED UNDERSTANDING

An ecosystem keystone seeks legitimacy through processes of discursive legitimation that aim at motivating and convincing actors to participate in the ecosystem and creating a common understanding of its purpose and the desirability of that purpose from a societal and business point of view (Phillips et al., 2004; Thomas and Ritala, 2021). Discursive legitimacy contributes to making the ecosystem's collective goal comprehensible to users and participants (Aldrich and Fiol, 1994; Suchman, 1995). Acquiring discursive legitimacy can enable alignment of actors through framing and sensemaking (Thomas and Ritala, 2021). The keystone frames a vision or a blueprint that highlights the salient issues the ecosystem addresses and presents compelling arguments for the adequacy of the ecosystem's proposed solutions to those issue to motivate actors to participate (Adner, 2006; Eisenmann, 2008; Iansiti and Levien, 2004a; Williamson and De Meyer, 2012). Through sense making processes, the keystone encourages participants to develop a shared understanding of the ecosystem's final goal: what is feasible and technically desirable and how actors should collectively (Autio and Thomas, 2018; Cattani et al., 2018; Thomas and Autio, 2015; Weick et al., 2005). This process includes experimenting

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and searching for good practices to improve how actors comprehend the technology on which the ecosystem bases its value proposition and the type of value the ecosystem is able to create for participants and users (Autio and Thomas, 2018; Eggers and Kaplan, 2009).

To achieve discursive legitimacy, the keystone needs to facilitate framing and sensemaking processes at both the individual and collective levels (Wareham et al., 2014). To align participants, the keystone needs to be able to convince them that it can protect both their self-interest individually and the collective interest of the ecosystem as a whole (Dhanaraj and Parkhe, 2006; Kapoor and Lee, 2013). At the individual level, alignment depends on participants' capacity to frame and make sense of the ecosystem's overarching objective in line with their own self-interested goals, including financial rewards (Kazan et al., 2018; Wareham et al., 2014) and other strategic goals such as emotional or symbolic value (Benford and Snow, 2000; Kaplan and Tripsas, 2008). At the same time, framing and sensemaking at the collective level are crucial for ensuring that participants form shared views and justifications regarding the ecosystem's objectives and are willing to coordinate their actions towards attaining a common goal (Adner and Kapoor, 2010; Iansiti and Levien, 2004a; Williamson and De Meyer, 2012). Scholars have highlighted that process this can be facilitated by constructing a collective ecosystem narrative (Dhanaraj and Parkhe, 2006; Golant and Sillince, 2007; Thomas and Ritala, 2021).

2.2 PERFORMATIVE LEGITIMATION PROCESSES: CREATING ALIGNMENT BY CREATING VALUE INDIVIDUALLY AND COLLECTIVELY

In addition to showing that an ecosystem's objective is worth pursuing, the ecosystem can also acquire legitimacy by through performance signals (Thomas and Ritala, 2021) that demonstrate the viability of the specific value proposition (Aldrich and Fiol, 1994). Acquiring performative legitimacy can facilitate alignment of actors through processes involving strategic action and value realisation (Thomas and Ritala, 2021). By undertaking strategic actions that address technical design (Jacobides et al., 2008, 2006) and ecosystem governance (Bridoux and Stoelhorst, 2020; Wareham et al., 2014), a keystone can enhance the ecosystem's performance, thereby signalling viability (Thomas and Ritala, 2021). The keystone can also signal performance by allocating dedicated resources (e.g. marketing capabilities) to the ecosystem to simplify alignment of participants and users (Uzunca et al., 2018). The ecosystem can also demonstrate its viability through value realisation, which demonstrates it capacity deliver on its

value proposition and create greater value for users and participants than competing ecosystems (Autio and Thomas, 2020, 2018).

To achieve performative legitimacy, the keystone needs to ensure that it can signal performance at both the individual and collective levels (Oskam et al., 2021; Wareham et al., 2014). First, the keystone needs to design governance mechanisms (e.g. selection criteria) to align participants that are capable of providing the complementary assets needed to materialise the collective value proposition (Wareham et al., 2014). The capacity to contribute to the materialisation of the ecosystem's value proposition depends on actors' resource endowments, their knowledge base (Moeen and Agarwal, 2017), and the capabilities they can mobilise (Teece et al., 1997). Finding the right participants is fundamental because the ecosystem's future depends on the performance of each of the actors that constitute it (Adner, 2006; Cennamo and Santalo, 2013).

At the same time, the keystone also needs to ensure that the ecosystem participants are able to work together and that the ecosystem as a whole creates value. This can be done by designing a blueprint indicating what the ecosystem should look like: its value proposition, and the set of skills and activities needed to achieve the value proposition (Iansiti and Levien, 2004a). The keystone may then signal collective performance through a technological design that fosters modularity and complementarity and enables participants to coordinate their actions without requiring direct coordination (Jacobides et al., 2018, 2006). Standardisation can also signal the potential for economies of scale and scope which can in turn enhance the ecosystem's economic performance (Farrell and Saloner, 1985). The keystone also needs to define procedures that ensure a fair distribution of value across ecosystem members (Tsujimoto et al., 2018) and resolve internal conflicts when they emerge (Bridoux and Stoelhorst, 2020; Wareham et al., 2014). This capacity is crucial to ensuring that actors continue to create value over the long term (Lepak et al., 2007).

2.3 ECOSYSTEM LEGITIMACY: THE CHALLENGE OF MAINTAINING LEGITIMACY OVER TIME

Ecosystem legitimacy is not an outcome but a continuous process. To maintain alignment over time, an ecosystem needs to be able to identify factors that undermine the legitimacy it has acquired and take action to recover this legitimacy (Adner, 2017; Patriotta et al., 2011; Thomas and Ritala, 2021). Because they aim to offer complex and often new value propositions, this ecosystems often face uncertainty and unexpected changes are likely. Both external and internal

changes can erode an ecosystem's legitimacy and require the ecosystem to show that it is able to adapt and change (Smith and Lewis, 2011). Technological developments may negatively impact the ecosystem's performance by making competing solutions more attractive to targeted customers and participants (Gruber et al., 2008). Changing customer values and preferences (Dougherty and Dunne, 2011) or the emergence of a competing discourse (Suddaby and Greenwood, 2005) may weaken the ecosystem's discursive legitimacy and the attractiveness of its value proposition (Dattée et al., 2018). A failure to send performance signals may also weaken discursive legitimacy (Thomas and Ritala, 2021), frustrate participants and erode their willingness to contribute to the ecosystem (Wareham et al., 2014) or result in internal conflicts (Vasudeva et al., 2020). To cope with internal and external events that erode the ecosystem's legitimacy, the keystone can develop dynamic control points.

When its legitimacy erodes, an ecosystem will face a number of challenges as it seeks to recover/repair its legitimacy. First, by definition an ecosystem is composed of a set of interdependent actors and these actors may sense and interpret environmental changes differently and have diverging ideas about which external signals the ecosystem should respond to (Hahn et al., 2014). Similarly, actors may also have competing interests and diverging opinions about how the ecosystem should respond to these changes and whether it should prioritise short-term or long-term performance (Lepak et al., 2007; Smith and Lewis, 2011). This implies that the keystone must be able to coordinate participants' actions so that they collectively reframe and re-make the sense of the ecosystem, its purpose and its core activities (Thomas and Ritala, 2021). Second, if the ecosystem fails to send performance signals because of technological failures or suboptimal technical design, restoring performance standards will be constrained by scripts (Akrich, 1992) which are embedded in the technological assets already developed by the ecosystem. The concept of a script implies that actions are embedded in a technological framework that prescribes how a given technology can be used (Akrich, 1992). A script can for instance prescribe the type and frequency of vehicles that can refuel at a refuelling station. The technological possibilities and financial implications of changing technological designs will depend on the nature of these scripts.

3 METHODS AND DATA

Given that ecosystem legitimacy remains relatively unexplored in the literature, we adopted a qualitative inductive approach to conduct the empirical portion of the study (Edmondson and Mcmanus, 2007). The aim of our open-ended inquiry (Eisenhardt and Graebner, 2007) is to

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disentangle how the dynamic processes involved in simultaneously building and renewing discursive and performative legitimacy in ecosystems unfold. We rely on an analysis of an embedded case study in which we interviewed multiple organisations that participate in a single ecosystem and we use qualitative data collected through semi-structured interviews.

3.1 DATA COLLECTION

Data collection began in March 2020, with a first round of interviews with ecosystem actors, and lasted until October 2020. During this first round of data collection, we conducted 22 interviews with 18 informants, all representing organizations involved in the ecosystem. Table 1 details the pseudonyms and the description of each of the informants, as well as the length of the interviews.

Table 1: summary of first round of interviews

First round interviews -2020-			
Informer CODE	**Organisation pseudonym**	**Description**	**(Length in minutes)**
HYDRA1	HYRA	Energy supplier & shareholder	100 & 60 & 30
MOB1	MOB	Mobility industry player & shareholder	65
BAN1	BAN	Banc & shareholder	37
REG1	REG	Regional public admin & shareholder	52
HYDRA2	HYDRA	Exploitation of H2 infrastructure	42 & 24
BLUE1	BLUETOWN	Local public administration	58
CARY1	CARY	Car dealer	62
GREENTOWN1	GREENTOWN	Local public administration	55
REDTOWN1	REDTOWN	Public administration	58
FUEL1	FUEL	Fuel cell producer	53
ENE1	ENE	Energy supplier & shareholder	65
STAX1	STAX	Electrolyser and station constructor	62
STAY1	STAY	Electrolyser and station constructor	62
STAZ1	STAZ	Electrolyser and station constructor	27 & 30
IND1	IND	Industrial cluster	54
CONS1	CONS	Consulting company	15

A second round of interviews began in March 2021 and lasted until January 2022. During this round, we conducted 14 interviews: 8 involved informants whom we had interviewed during the first round, 4 involved interviews with different informers from organizations that had contributed interviewees during the first round, and 2 interviews involved organizations that participated in the ecosystem but had not been interviewed during the first round. Table 2 details

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the pseudonyms and the description of each of the informants of this second round, as well as the length of the interviews.

Table 2: summary of second round of interviews

Second round interviews -2021-			
Informer CODE	**Organisation pseudonym**	**Description**	**(Length in minutes)**
HYDRA1	HYRA	Energy supplier & shareholder	90 & 59
MOB1	MOB	Mobility industry player & shareholder	60 & 53
BAN2	BAN	Banc & shareholder	68
REG2	REG	Regional public admin & shareholder	35
HYDRA3	HYDRA	Exploitation of H2 infrastructure	40 & 37
BLUE1	BLUETOWN	Local public administration	39
CARY1	CARY	Car dealer	26
GREENTOWN1	GREENTOWN	Local public administration	39
CARX1	CARX	car dealer	41
WHITETOWN1	WHITETOWN	Public administration	55
STAX1	STAX	Electrolyser and station constructor	32
STAY1	STAY	Electrolyser and station constructor	34
STAZ1	STAZ	Electrolyser and station constructor	45

Additionally, we ran a research workshop in September 2021 with representatives from 4 organisations that were involved in the project in which we discussed and made recurrent follow-up phone calls with one top-level executive from the ecosystem keystone firm that aimed at monitoring changes in the ecosystem.

All the interviews were recorded and transcribed verbatim and detailed notes were taken during the research workshop and follow-up phone calls. We thus transcribed 36 interviews and memos from the workshop and 4 phone-calls that were collected over a period of 21 months.

3.2 ANALYTICAL STRATEGY

To carry out our analysis, we iteratively collected and analysed the data in our transcripts with open-ended codes based on detailed descriptions of interviewees' responses. This led to an initial list of over 500 codes. The first and second authors began in-depth analysis of the codes in January 2022 and grouped the codes into first-order concepts. During this process, we discussed our respective interpretations and we returned to the relevant literature and iterated the data, our interpretations, and the existing concepts. This process was carried out a second

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time with the three authors and resulted in 18 first-order codes. We then followed a process of iterative comparison of the first-order codes and grouped them into second-order themes according to the types of processes to which they were contributing. Finally, we grouped these second-order themes into two aggregate dimensions.

3.3   CHOICE OF CASE

The ecosystem we study is one that aims to developing an infrastructure consisting of refuelling stations for fuel-cell hydrogen vehicles in a large region of France. This ecosystem operates under the name "Hyregion". Hyregion was initiated in 2018 when Hydra—a joint venture grouping multiple types of actors (majors in the energy or transport industry, banks, and a regional public entity)—decided to launch a project consisting of the deployment of a series of refuelling stations for hydrogen-powered light commercial vehicles. The creation of such a new infrastructure was motivated by a willingness to improve the air quality in the region: the switch from diesel/gasoline vehicles to hydrogen-powered fuel-cell electric vehicles would reduce emissions of harmful substances for the sake of health and the environment. Light vehicles were chosen as the perfect targets, for two main reasons: first, passenger vehicles were already in the market and a new type of hydrogen-powered van-type commercial vehicle was about to enter the market; second, light vehicles would give greater visibility to the technology than heavy vehicles.

The joint venture knew that developing such an infrastructure would be challenging. It is known across the hydrogen industry that California, where many hydrogen vehicles are in service, faces the problem of not having enough hydrogen refuelling stations for all those vehicles. Germany, the country that has deployed the largest refuelling station infrastructure for hydrogen vehicles, suffers from a lack of vehicles in service, which makes the infrastructure unprofitable. Learning from the problems experienced by the Californian and German experiences with similar infrastructure, Hyregion decided to deploy the infrastructure and the stations simultaneously with a program of public subsidies for hydrogen vehicles, hoping to avoid the "chicken-or-egg" problem. The existence of the infrastructure and the subsidies would reduce the barriers that prospective hydrogen vehicle drivers face when deciding whether to buy a hydrogen car. The joint venture began implementing the project in 2019, with the construction of the first station, after they won European funding dedicated to subsidising automobile purchases. Hyregion members decided, collectively, that the target costumers of the ecosystem would be, at first, small and medium enterprises of the region. Only enterprises were, thus, eligible to subsidies. Several reasons justified this decision. First, the commercial van-type

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vehicles that were about to arrive in the market corresponded to many commercial uses, such as those that require to transport material. Second, it would have been difficult to sell the car to individuals without being able to guarantee mobility outside of the region. Finally, local authorities have good knowledge of who the economic actors of the region are and this would facilitate identification of prospect costumers. The keystone decided, thus, that local authorities would be in charge of convincing prospects to purchase fuel-cell vehicles

First change came when local authorities showed that they were unable and unwilling to be in charge of convincing costumers to purchase cars and Hydra had to assume the sales tasks. Then, in 2020, the COVID-19 pandemic had both positive and negative impacts on the project. On the one side, the lock-downs interrupted the project's dynamic for a few weeks and slowed the infrastructure deployment. In addition to these unforeseeable events, car manufacturers found it difficult to demonstrate their capacity to deliver the fuel-cell hydrogen commercial vehicles. On the other hand, the hydrogen sector benefitted from the French Recovery plan in June 2020, which provided new funding opportunities to Hyregion, enabling the joint venture to consider targeting more costly infrastructure and larger-scale uses such as heavy industrial vehicles.

To further motivate our case study, we posit that, because the ongoing sustainability crisis requires materializing new and complex value propositions, our findings should be particularly interesting in connection with such growing co-creation processes that are driven jointly by a variety of participants who form ecosystems that mobilise existing and novel resources.

4   FINDINGS

We find three kinds of interrelated, yet distinct processes aimed at building a durable discursive legitimacy, each of them present for both, discursive and performative legitimation. These three processes consist of: preparing for resilient legitimacy, monitoring weakening legitimacy and non-performance, and recovering legitimacy. Each processes materializes through a series of actions that we detail in this section. Table 3 represents the code structure resulting from our analysis and, thus, summarizes our results.

Table 3: Code structure

Aggregate dimensions	Second-order themes	First-order concepts

Building durable discursive legitimacy	Establishing resilient discursive legitimacy	• Set an overarching purpose for the ecosystem in the long run • Anticipate changes and let them permeate the narrative • Frame individually for the long term
	Monitoring weakening discursive legitimacy	• Monitor the loss of internal discursive legitimacy • Monitor the loss of external legitimacy
	Recovering discursive legitimacy	• Internally and externally search for opportunities • Gather compelling arguments that can help justify the shift in discourse • Incrementally add discursive elements
Building durable performative legitimacy	Preparing for resilient performative legitimacy	• Design a flexible technical design from the start • Ensure that each member's individual performance is satisfactory • Establish a framework that favours learning
	Monitoring non-performance	• Monitor to identify the incapacity to meet expected requirements (or outcomes, or performance) • Monitor the market to identify performance shortfalls
	Recovering performative legitimacy	• Signal the capacity to change and adapt a technical design and governance structure • Demonstrate the viability of the changes • Progressively change the technical design and governance structure and leverage resilience

4.1 PROCESSES AIMED AT BUILDING DURABLE DISCURSIVE LEGITIMACY

4.1.1 Establishing resilient discursive legitimacy.

We found first that the Hyregion ecosystem established durable discursive legitimacy by preparing for resilient discursive legitimacy through three distinct processes.

First, the overarching purpose of the ecosystem and the salient issue it aspired to solve was constantly framed using a long-term perspective. The collective ecosystem narrative for instance highlights the long-term relevance of the ecosystem by presenting fuel-cell hydrogen

vehicles as an appropriate solution to the longstanding issue of transiting to low-carbon mobility and, thus, a hydrogen-distribution infrastructure as a promising long-term investment. This is illustrated by the following quote: *"This progressive and exciting project for the future is an opportunity for us to show the way towards sustainable mobility" (HYDRA1)*. The long term perspective with large goals prepares the ecosystem members for the eventual short term obstacles, as long as they do not question the ability of the ecosystem to follow its long term goals.

The long-term adequacy of the ecosystem was also justified by arguing that it makes it possible to overcome a salient problem faced by other emerging hydrogen mobility ecosystems worldwide: the chicken-or-egg problem. The keystone for instance mentioned California, where (as noted above) there are more hydrogen cars circulating than the infrastructure can handle; and Germany, where a large network of refuelling stations exists but is underused as because so few cars are in service. These experiences were used to justify the ambition to develop the infrastructure and finance the vehicles at the same time. During our interviews, this chicken-or-egg metaphor appeared repeatedly and was mentioned by many ecosystem members, as illustrated by the following: "*We are facing the chicken and the egg problem; people don't buy cars and since people don't buy cars, nobody wants to install stations. So there, the idea of Hyregion: We are ready to put on a hydrogen station, provided that you find us the users that will benefit from regional subsidies [to purchase the vehicle]" (BLUETOWN1)*.

Second, because the ecosystem emerged under high supply-and-demand uncertainties, actors in the ecosystem were conscious that the system's discursive legitimacy was fragile and that the discourse might lose credibility if the actors were to change how they value and make sense of the technology that is being commercialised. We observed that ecosystem actors anticipated some of these changes and let them permeate the common ecosystem narrative. Interviews for instance revealed that the value proposition focusing on light-weight hydrogen mobility had been chosen because the technology was available and this market would help give visibility to hydrogen solutions. As one interviewee explained: *Mobility is the sector that has the most visibility regarding new solutions in the transition" (STAY1)*. From the beginning, however, actors were aware that other forms of mobility, notably heavier vehicles, may become more relevant in the future. We observed that future possibilities were included in the discourse early on and presented as positive factors to ecosystem participants. One interviewee for instance explained: *"There are also possibilities to add buses later, add garbage collection vehicles,*

add large transport equipment" (REG1). Similarly, another interviewee stated: *The day when there will be trucks and garbage collection vehicles that can run on hydrogen, the ecosystem economy will work much better [because their consumption is higher]" (BAN1).*These early references to heavier vehicles can be interpreted as a way to prepare ecosystem participants for the possibility of shifting the value proposition to favour other forms of mobility.

Finally, discursive legitimacy in an ecosystem is also built by adopting a long-term vision when framing the system, that is, selecting what would be a compelling argument to convince actors to participate. When interviewees explained what convinced them to participate in the ecosystem, they explained how the ecosystem could contribute to fulfilling their organisation's strategic, medium-to-long-term objectives. One interviewee explained that what convinced them, as a commercial bank, was the "*innovation and all the investment activity that will be created around the project*" *(BAN1).* Similarly, one of the station manufacturers explained that, as a regional small-to-medium enterprise, participating in the ecosystem is of "*strategic interest"* as "*the Hyregion project is one of the largest region-wide projects*" that will "*give* [us] *visibility in the sector*" (STAZ1). Finally, a local authority explained that the ecosystem can help them prepare for future demand from local citizens and entrepreneurs. This is illustrated by the following quote: "*Today what we are doing with hydrogen, it costs us a lot. But we do it because we are activist and because we have the profound conviction that there will come a time when hydrogen will be the energy vector that allow us to meet our needs* (WHITETOWN1). Finally, another discursive strategy that can be deployed to convince actors to take part in an ecosystem is to frame them as pioneers, meaning those who are on the front lines of changes that the broader society will soon undergo. When explaining his efforts to convince shareholders to join the joint venture, one interviewee stated: *"They were really benevolent, supportive, visionary in their approach, pioneers you see."(HYDRA1)*

4.1.2 Monitoring weakening discursive legitimacy.

We find that the ecosystem in our case built durable discursive legitimacy by monitoring changes to identify when it was losing that legitimacy, making it necessary to take action to recover it. The objective is to understand when sensemaking about hydrogen technology, especially its societal purpose and value, changed and how this affected the ecosystem's discursive legitimacy among both current and prospective actors in the ecosystem.

Since the creation of the ecosystem, public discourse around hydrogen mobility has changed considerably and this has contributed to weakening the ecosystem's discursive legitimacy for actors who were already involved. For instance, interviews revealed an increasing awareness

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among ecosystem participants that hydrogen is a contested solution when it comes to lightweight vehicles and may be outcompeted by electric battery vehicles in this segment. During an interview, a car dealer said, *"I think, unfortunately, hydrogen has fallen a bit behind [of battery electric cars] and we see that the [network of charging stations] is starting to strengthen well, so battery has taken the lead, even if it doesn't fit all uses." (CARX1)*. Later, the same interviewee *insisted, "I believe hydrogen will have a place in the future but it needs to develop an infrastructure faster. Right now it is lagging behind"*.

Similarly, we observed some pessimism among some ecosystem actors concerning the adequacy of the ecosystem's value proposition and we observed this increasing pessimism also discussed during steering committee meetings. These meetings helped ecosystem actors collectively understand why the ecosystem lost discursive legitimacy, as illustrated in a quote from the head of the joint venture: *"We tell each other collectively, we feel that light vehicles are not the magnificent target, because the magnificent is heavy mobility and industry" (HYDRA1)*. As the ecosystem's internal discursive legitimacy eroded, there were two important consequences. First alignment of the actors was affected negatively, leading to a loss of motivation among ecosystem members to allocate resources to the ecosystem and contribute to the realisation of common objectives. Moreover, misalignment of actors can also further erode legitimacy, notably because participants, through their discourse, contribute individually to the ecosystem's discursive legitimacy by spreading the common ecosystem narrative. Their unwillingness to continue doing so may negatively influence the discursive legitimacy of the ecosystem in the eyes of external, protective actors.

Interviewees also stressed the increasing difficulty of selling the ecosystem's discourse to prospective users. The following quotation from one of the local authorities is quite revealing of the difficulties encountered in selling the ecosystem's discourse to prospective buyers of hydrogen cars: *"It's still hard to sell something, to tell someone. Here, we sell you something, but we have no idea when it will be delivered to you" (REDTOWN1)*. Similarly, trying to explain why finding actors interested in buying hydrogen vehicles has been slower than expected, one interviewee explained: *"Even though we talk more and more about hydrogen in the media, it is not easily understandable for everybody, it is not concrete" (GREENTOWN1)*. This lack of discursive legitimacy in the eyes of users results from a lack of performative legitimacy linked to delays, unexpected problems related to the materialisation of the value proposition or growing uncertainty. The following quotation from a car dealer concerning the lack of visibility of the advancement of the infrastructure development illustrates the problem

well: *"We can't keep promises. Me, I cannot make promises to my customers by saying: buy a hydrogen vehicle, you will have X stations, etc. because [the infrastructure] does not follow, [. . .]. (CARX1).* If the ecosystem loses its legitimacy in the eyes of users, ecosystem members will end up discouraged and the ecosystem will lose legitimacy in their eyes as well.

4.1.3 Recovering discursive legitimacy.

We also find that the ecosystem built durable discursive legitimacy by taking actions that helped it recover its legitimacy after it weakened. Recovering discursive legitimacy is necessary to maintain alignment of ecosystem members and remain attractive to new actors who might consider joining the ecosystem. This happens through three processes.

First, ecosystem actors sense emerging discourses from external and internal audiences that signal opportunities to change the ecosystem's discourse. While the ecosystem found it difficult to convince users to adopt lightweight hydrogen vehicles, the discourse promulgated by experts, authorities and vehicle manufacturers began singling out heavy vehicles as more appropriate targets for green hydrogen, especially because technological developments associated with these vehicles accelerated. This made it possible for the ecosystem to identify opportunities to recover discursive credibility. The following quotation from the fuel-cell manufacturer shows how actors made sense of the changing discourses: "*All truck manufacturers are realizing that they will never meet CO_2 gas emission targets without hydrogen. Volvo, which refused to talk to us two years ago, has just set up a JV with Daimler to make hydrogen trucks. They have completely reversed their strategies.[FUEL1]"* Moreover, ecosystem actors also sense the salient issues that current actors face and make sense of how the ecosystem could provide a response to these concerns. For instance, local authorities play a central role in the ecosystem and regular meetings are organised to discuss progress and difficulties. These meetings also enable actors to identify new opportunities for the ecosystem. As explained by one of the shareholders: "*There is a strong implication of local authorities because the model of Hyregion is based on steering committees with local authorities. What do we do of their demands about clean heavy mobility?" (MOB1).*

Moreover, we observed that ecosystem actors mustered compelling arguments to justify the shift in discourse and convince actors that the new value proposition the ecosystem wanted to materialise was credible at both the collective and individual levels. These justifications also contributed to convincing the members who might have lost faith in the ecosystem that the new way of framing its objectives was feasible and technically and economically desirable.

First, at the collective level, ecosystem actors were for instance well aware that being able to produce green hydrogen cost-efficiently depends heavily on opportunities to achieve economies of scale and frame the renewed purpose of the ecosystem as a means achieving these economies of scale. This is illustrated by the following quote: "*It is always easier to have a profitable revenue model in the short term with large consumers than with a multitude of small consumers*" (REG2). The new discourse was framed by highlighting that focusing on heavy vehicle mobility opens opportunities to reduce the number of vehicle types that the ecosystem can target. This is illustrated by the following quote from one of the shareholders: *"This dynamic that is settling around hydrogen mobility is now also in the process of bringing what we call heavy mobility, that is to say buses, trucks, dumpsters, household waste, even snow groomers or construction machinery" (REG2).*

Second, justifications were also sought to convince individual actors that it would be in their interest that the ecosystem was changing direction. A recurring discursive strategy involves framing the ecosystem as a strategic asset that individual actors can use to experiment with their own innovations. For instance, one of the shareholders explained that the group in which his firm operated created a new (external company) that is experimenting with new types of hydrogen storage and that "*the joint venture could ask this (external company) to create their first commercial offer for mass storage of hydrogen*" (*HYDRA1*).

Finally, another process that help an ecosystem recover discursive legitimacy involves incrementally adding discursive elements. The change in Hyregion's discourse did not happen overnight but was instead a long process through which the discourse was changed slowly, step by step. As one shareholder explained: "*We slid progressively from a little bit of heavy mobility, a little more of heavy mobility, a little bit more of heavy mobility, to reverse the model and say we do heavy mobility and will welcome, of course, light-weight vehicles*" (BAN2). Interviews also revealed the importance, especially for shareholders, of making and agreeing upon these changes collectively. Specific working groups of shareholders who could share their vision were organised, enabling actors to make sense of how they could best recover discursive legitimacy collectively. A two-day strategic workshop was also planned to "*discuss which are the individual forces of each of the shareholders, what do we want to do with the joint venture? What is our vision?*" (HYDRA1). This event was presented as a key turning point in collectively agreeing to move from "*light mobility to heavy and light mobility* (HYDRA1)".

4.2 BUILDING DURABLE PERFORMATIVE LEGITIMACY

Previous research has highlighted that, to build performative legitimation, an ecosystem needs to be able to signal performance (Thomas and Ritala, 2021) by demonstrating the viability of the ecosystem's technical design and governance structure. For such performative legitimation to be durable, we find that an ecosystem needs to put in place a range of processes to foster durability through strategic actions, monitor signals of non-performance, and recover performative legitimacy.

4.2.1 Preparing for resilient performative legitimacy.

To build durable performative legitimacy the ecosystem prepared by adding resiliency through strategic actions. More specifically, we found that the ecosystem designed a flexible and evolvable technical design, designed governance mechanisms aimed at ensuring that the individual performance of each of the participants was satisfactory and established a framework that enabled ecosystem members to collectively improve the processes and create value while minimising risk-taking.

To foster resilience, the ecosystem signalled viability by ensuring that it was designed to be flexible and evolvable, in terms of both its technical design and its governance structure. The objective was to enable the ecosystem to take into account future technological and market developments that might call for a change in the value proposition. This would enable the ecosystem to show externally and internally that it would be able collectively to adapt and change when needed. In Hyregion, we observed that the keystone achieved this by scripting hydrogen stations with characteristics that make them easily upgradable to accommodate larger vehicles. As an informer explained: "*We try to be clever in the implementation, that is to say there are ways of anticipating a possible evolution. We are going to choose a place among several possible locations which is bigger and will perhaps be more easily upgradeable to accommodate heavy mobility, so we anticipate future changes when choosing the locations of our stations.*"(MOB1).

Similarly, aspects related to ecosystem governance are also considered, with the idea of allowing for experimentation and evolvability. For instance, when launching a call for tenders for stations, the keystone tried to find a balance between allowing the manufacture of stations to start while reserving the possibility of adapting some technical specifications later. This was explained by the head of the joint venture: "*So we committed ourselves without segmenting the flow to buying 1,600 kg of electrolysis capacity from them, and we have to come back to them*

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very quickly with an electrolysis plan. In fact, we have a very precise schedule with them to have gates, we say to them: 'For the moment, you size it like this. And if I decide on such and such a date, you can still change. If I decide after this date, I have a time penalty because you will have hired a design which will have become obsolete'" (HYDRA3).

To foster resilience, the ecosystem designed governance mechanisms aimed at ensuring that the individual performance of each of the participants was satisfactory and that the ecosystem could align participants who would be capable of providing the necessary assets to participate. The goal of the ecosystem was to construct an efficient governance structure that minimised risks for the ecosystem. This was achieved through two processes. First, the ecosystem rationalised resource allocation to minimize costs and secure returns for each investment. Shareholders for instance co-developed strict criteria that had to be met before building a station. The objective was to make sure that sufficient quantities of hydrogen would be consumed by local fleets and so that each station could generate sufficient revenue. As explained by one interviewee: "*50 vehicles does not mean anything because if 50 vehicles traveling 5,000 km/year versus 50 vehicles traveling 250,000 km, we will not have the same turnover at the station*" (HYDRA2). Second, the keystone deployed a strategy of gatekeeping through which it established strict criteria for the identification and selection of actors to ensure that only those with the capacity to contribute to the materialisation of the joint value proposition were aligned. One example of gatekeeping involves collaborating with local authorities that will host stations and coordinate the various actors at the local level. Following this strategy, the keystone looked for cities where, among the local authorities, *"there is a willingness, a political commitment which is manifest and well presented" (HYDRA2)*.

Finally, to foster resilience in performative legitimacy, the keystone also needed to establish a framework that would enable ecosystem members to test their ability to contribute to the ecosystem and collectively learn how to exploit their abilities to improve processes and generate value. Through these processes, the ecosystem demonstrated its capacity to continuously improve performance and create value. This was for instance achieved using the first stations as a basis for learning and by sharing best practices. Thierry Raevel explains, in the following sentence, that the first two stations provided crucial feedback for the development of those that followed: "*And what we experienced in Bluetown and Redtown was for us extremely important feedback on how we do to [coordinate actors]*". We observed, for instance, that all of the station project managers were asked to keep and update shared documents that could be useful for the development of other stations. For example, they shared documents that they used to promote

the technology and search for users, as they could easily be copied and adapted from one station to another: *"I took the Bluetown brochure from the very beginning to adapt it to Greentown and communicate about the project"*.

4.2.2 Monitoring non-performance.

To build durable performative legitimacy, the ecosystem needed to identify when its performative legitimacy was fading. To do so, the keystone needed to develop processes that could be used to monitor signals of non-performance. These processes would have to involve two kinds of non-performance signals—signals of divergence between planned and effective performance and signals of divergence between ecosystem performance and market expectations.

To monitor non-performance, the ecosystem developed processes that signalled internal divergence between planned and effective performance, meaning the difference what was expected members would deliver and what they actually delivered. The ecosystem achieved this by monitoring the performance of the ecosystem blueprint, namely its technical design and governance structure, and identifying anything that compromised value realisation. This internal monitoring occurred during frequent meetings around each station, as explained by the project manager for one of the stations: "*Everyone can be involved and everyone is at the same level [. . .] it's two hours a week and there are real fundamental issues that are addressed. It's really a place where people work and there are only people who are strongly involved.*" *(Bluetown1)* Steering committees enable ecosystem actors to identify technological problems or difficulties experienced by some actors in fulfilling their assigned roles. For example, in the studied ecosystem, the keystone and constructors of the electrolysers and stations agreed on building one electrolyser for each station and later realised that this made for very small electrolysers with production costs for hydrogen higher than expected. Hydra1 explains this realisation as follows. "*The feedback from Bluetown enabled us to see that we were promised things that were unattainable in terms of operating costs. [. . .] We understood that they learned at the same time as us. We thought they had a bit of a lead. But finally we had to solve a lot of problems that we thought they had solved beforehand.*" Similarly, the ecosystem's first station encountered many functional problems, as explained by the top manager of HYDRA: "*For the Bluetown station which was politically inaugurated [6 months ago] we are still in an industrial phase, the station does not yet have the reliability that we are aiming for*" (HYDRA3).

These regular exchanges between ecosystem participants also enabled them to signal when they thought task allocation has not functioned well. For instance, interviewees representing local

authorities mentioned difficulty in finding and convincing companies (e.g. taxi drivers) to buy hydrogen vehicles. As one interviewee explained: "*You have to have the soul of a salesman and I am not a salesman. Hydra often talks about a pioneering spirit, but it's hard to convince. It's hard to carry this message you see"(Greentown1)*. Identifying signals of technological non-performance or the incapacity of an actor to fulfil the role it has been assigned allowed the ecosystem to look for effective solutions that enabled it to recover legitimacy.

To monitor non-performance, the ecosystem also developed processes that signalled divergence between ecosystem performance and market expectations. The goal was to identify performance shortfalls, that is, to compare ecosystem performance with that of competitors, state-of-the-art technology or market expectations. In Hyregion we observed that at some point ecosystem members began understanding that the competing ecosystem for electric light vehicles, which is the electric battery ecosystem, has enhanced its performance, which put the credibility of their own ecosystem at risk. A car dealer explained: *"If battery-powered electric vehicles continue to increase autonomy, reduce charging times and put in place a real infrastructure, that's for sure going to make the hydrogen vehicle in the short, medium term less interesting than one could have imagined. [. . .] It is true that, myself, I did not think that developments in batteries could delay the interest in hydrogen for passenger cars, for individuals" (CARY1)*. Identifying performance shortfalls in this area, Hyregion's ecosystem understood that focusing exclusively on light vehicles might not improve performance sufficiently and therefore directed its path towards other kinds of uses.

4.2.3 Recovering performative legitimacy.

The third and last set of processes aimed at building durable performative legitimacy aim to recover performative legitimacy after it weakens. These processes were crucial for maintaining alignment of ecosystem members. For this purpose, the keystone needed to implement changes in both the technical design and the ecosystem governance structure and this was achieved through three processes.

First, the ecosystem signalled its capacity to change and adapt its technical design and governance structure. The keystone deployed strategic actions to upgrade the technical design and achieve economies of scale and scope as a way of signalling performance improvement. For instance, to be able to produce hydrogen more efficiently, the keystone decided that hydrogen production would be centralised, with several large electrolysers, instead of deploying one small electrolyser at each station. We observed that ecosystem members saw this as a sensible improvement that demonstrated the ecosystem's capacity to successfully signal

enhancement of performative legitimacy. One of the station constructors explained: "*A station below a certain size is , for a private actor, even with subsidies, uneconomical. These are very complex objects. The rationality will be that if you have very very big systems with a high refuelling ratio, you can manage to cover your costs*".

At the same time, the ecosystem also had to show its capacity to align additional types of complementary assets that were unnecessary before, notably tube trailers to enable it to transport hydrogen from centralised units of production to the refuelling stations. Similarly, to recover performative legitimacy we observed that the ecosystem deployed strategic actions to minimise transaction costs for its members and increase their efficiency individually. For instance, the keystone allocated additional resources to internalise commercial activities so that local authorities could focus on activities they were more closely linked to their core capabilities (e.g. local organisation events). This was illustrated by the following quote from the CEO of Hydra: "*The joint venture did invest a lot from a commercial point of view because we have two persons that do commercial activities 100% of their time on top of the teams of one of the shareholders and myself*" (HYDRA3). This also signalled that the keystone was dedicated to making sure the ecosystem performed well.

Second, the ecosystem also provided signals to justify the viability of the changes it was attempting to put in place. The ecosystem developed an asset-intensive infrastructure, which is very costly, and demonstrated viability by showing that it was able to leverage external resources to facilitate ecosystem value realisation. For instance, the ecosystem mentioned the announcement by the national government of a post-COVID crisis-recovery plan, which allocated a large budget to fund hydrogen projects. This enabled the ecosystem to externalise the funding of additional infrastructure, which would, in the end, improve performance. As HYDRA 1 explained: "*And basically I have an accelerating phenomenon in this area; it is precisely the recovery plan and the implementation of the recovery plan*".

Similarly, the keystone actively sought opportunities to benefit from complementary assets developed outside of the ecosystem and that could help to enhance performance. Similarly, the keystone also sought opportunities to align actors who can finance part of the infrastructure themselves to reduce the CAPEX that the joint venture needed to finance internally. They for instance convinced a local authority to build a new waste incinerator with an electrolyser attached to it and sell the hydrogen to the joint venture. As explained by the head of the joint venture: "*The strategic committee that allowed me to contract with them. He undertakes to*

deliver a minimum quantity of hydrogen to us at cheap price and I undertake to extract this quantity of hydrogen" (HYDRA 1).

Finally, the ecosystem also sought external validation to demonstrate the adequacy of the proposed changes and to show ecosystem members that the changes were doable. Confronted by difficulties involved in aligning users, notably because of a lack of vehicle availability, ecosystem members rightfully questioned the feasibility of moving to heavier vehicles. The following quotation from the head of the joint venture reveals how they responded to these concerns: "*We were asked . . . 'wait, you're nice, the light vehicles haven't arrived yet and you're saying it's the heavy vehicles that we should target, what makes you think that the heavy vehicles are going be there? Really really completely there' . . . so we had to outsource the subject, we outsourced subject doing studies on the uses of mobility*" (HYDRA1). Similarly, the ecosystem also sought external validation to help demonstrate the viability of targeting heavier and more diverse types of vehicles and use this as a positive sign for future performance. As the CEO of Hydra explained: "*In fact, the whole theme of hydrogen is the maturity of the market. I think the buses are ready. For the coaches, the new trucks, we're going to say it's more like 2025-2026 and for commercial vehicles there will be Master vehicles or variations from 2022, so we have a supply which should accelerate in 2023*" (HYDRA3).

The third process through which the ecosystem recovered performative legitimacy involved progressively changing its technical design and governance structure and leveraging the resilience. We observed that the ecosystem took advantage of these changes by making the new technical design even more attractive for the various ecosystem partners. First, changes in the target (from lightweight and commercial to heavier vehicles) asked the consortium to resize and upgrade the production (electrolysis) and distribution (fuelling station size) infrastructures. Second, this came close to optimising the entire value chain (from decentralised to larger, centralised production sites) and making it stronger in the sense that primary customers were switching from disparate and private clients to local authorities that would buy hydrogen coaches directly for the ecosystem (e.g. guaranteeing hydrogen consumption at high volumes). Lastly, the ecosystem would now be able reduce the need for new assets as the production sites would supply new end users.

5   DISCUSSION

We set out in this study with the premise that, to align participants, that is, to convince them to contribute to a joint value proposition, an ecosystem needs to acquire legitimacy. In this paper,

we postulate that an ecosystem will likely lose legitimacy at some point and that, for legitimacy to be durable, the ecosystem needs to face that loss and find ways to recover it. While previous research has recognized the importance of considering ecosystem legitimacy-acquisition processes as a dynamic phenomenon through which ecosystems build and maintain legitimacy over time (Thomas and Ritala, 2021), it has not specifically addressed the challenges linked to disturbances that may invalidate or weaken ecosystem legitimacy. This paper contributes to this literature by providing empirical evidence indicating how an ecosystem can build durable legitimacy.

5.1 THREE INTERACTING TYPES OF PROCESSES TO BUILD DURABLE LEGITIMACY:

This paper's first contribution to the literature lies in its showing that building durable ecosystem legitimacy depends on three interrelated yet distinct processes: preparing for resilient legitimacy, monitoring weakening legitimacy, and recovering legitimacy, which we observed for both discursive and performative legitimacy. Preparing for resilient legitimacy is crucial because ecosystems that emerge under high uncertainty will most likely encounter external or internal factors that require them to change course. Our results suggest that it is important to prepare ecosystem members cognitively for the future arrival of changes, to script technologies so they can be adjusted more easily, and to design ecosystem governance that can facilitate these adjustments. Monitoring weakening legitimacy is necessary for an ecosystem to be able to sense external and internal changes and understand how ecosystem actors make sense of these changes. Finally, recovering legitimacy depends on an ecosystem keystone's capacity to orchestrate change by responding to losses of legitimacy and leveraging built-in resilience.

5.2 TACKLING UNCERTAINTY BY PREPARING FOR RESILIENT LEGITIMACY

Our second relevant contribution consists of introducing the concept of resilience to the legitimacy literature. We reveal legitimacy resilience as one of an ecosystem's means of fighting uncertainty. Ecosystem research has addressed the topic of uncertainty extensively. Traditionally, such research has found that, to reduce perceived uncertainty among ecosystem members, the ecosystem keystone presents a blueprint of the future ecosystem (Iansiti and Levien, 2004b). This blueprint provides detailed comprehension of the value proposition and the technical design of the ecosystem, which reduces perceived uncertainty.

More recent research shows that high technological uncertainty often prevents ecosystems from having visibility into factors that determine which value proposition should be delivered to the market (Dattée et al., 2018) and explains that ecosystems undergo processes of road-mapping,

learning and narrowing down the range of opportunities to reach, in the end, agreement on a value proposition. Ecosystems cannot always proceed in this way, however, and they need to test a joint value proposition on the market to gauge consumer adoption. In this case, high market uncertainty, added to technological uncertainty, will likely lead the ecosystem to choose a suboptimal technological and market path, which will cause loss of credibility that will damage ecosystem legitimacy. We show that an ecosystem needs to build resilience to be capable of responding to that loss of legitimacy. Although a few articles have discussed ecosystem resilience (see (Autio and Thomas, 2019; Cohendet, 2021; Floetgen et al., 2021), it remains a largely understudied topic. Moreover, resilience, in the existing ecosystem literature, concerns only building the capacity to react, from a technological and financial point of view, to unexpected shocks. We argue that building resilience is a conscious, planned process that should also address an ecosystem's credibility among its members.

5.3 A CRUCIAL ROLE FOR ORCHESTRATION EFFORTS IN LEGITIMATION

Our third contribution to the literature consists of showing that orchestration has a crucial role to play in the legitimation processes. This paper also contributes to ongoing discussions of ecosystem orchestration. The ecosystem literature emphasizes ecosystem orchestration as a key to creating and maintaining actors' alignment over time (Adner, 2017; Hurmelinna-Laukkanen and Nätti, 2018; Lingens et al., 2021; Walrave et al., 2018). Previous research has for instance highlighted the importance of the keystone's developing dynamic capabilities to be able to coordinate the actions of multiple actors and the resource flows between them as well as to make it possible for the ecosystem to adapt to external changes (Linde et al., 2021).

This paper contributes to this research on orchestration in two ways. First, we show that orchestration should not only aim at performative legitimacy but also consider discursive legitimacy. For an ecosystem to adapt to external changes, it is important to orchestrate how actors can collectively change how they comprehend the purpose of the ecosystem and when, why, and how this purpose should change. Second, previous research has emphasised the importance of sensing changes in customer demand and adapting or adjusting an ecosystem's value proposition to respond to these changes (Dattée et al., 2018; Linde et al., 2021). Little is known however about how these changes are negotiated within the ecosystem by the various participants so that the ecosystem can maintain legitimacy over time. Findings presented in this paper suggest that the ability to maintain legitimacy over time depends on the keystone's ability to find resonance between external signals of change and the strategic interests of current ecosystem members. While we recognize that finding opportunities to develop new

partnerships is important, we find that the keystone needs ensure that orchestration enables actors to collectively make sense of weakening legitimacy and individually reframe the ecosystem as a strategic asset they can leverage for their own self-interested goals.

6   RESEARCH AGENDA

Our results highlight the crucial role of the keystone in maintaining ecosystem legitimacy so it attracts and retains participants that will contribute to materialising its value proposition, in this way convincing users to adopt that value proposition. While studies often characterise the keystone (Jacobides et al., 2018) of a focal firm as a central player (Lingens et al., 2021), we observe that the role played by the keystone concretely involves the same individual who is engaged in a project from the beginning. This dependency—and thus potential fragility—of the ecosystem should be analysed in future research to find evidence that helps ecosystems identify these limits. Moreover, our ecosystem—like many in the sustainability sector—revealed the importance of the role that public bodies can play in reducing several sources of uncertainty, e.g. by demonstrating a long-term commitment. We also observed that such a commitment helps to build confidence and reduces institutional or financial uncertainties. Additional research should investigate why large private companies seek collaboration with public bodies in such sustainable projects.

REFERENCES

Adner, R., 2017. Ecosystem as Structure : An Actionable Construct for Strategy. J. Manag. 43, 39–58. https://doi.org/10.1177/0149206316678451

Adner, R., 2006. Match your innovation strategy to your innovation ecosystem. Harv. Bus. Rev. 84, 98–107; 148.

Adner, R., Kapoor, R., 2010. Value creation in innovation ecosystems: how the structure of technological interdependence affects firm performance in new technology generations. Strateg. Manag. J. 31, 306–333. https://doi.org/10.1002/smj.821

Akrich, M., 1992. The De-scription of Technical Objects, in: Shaping Technology / Building Society: Studies in Sociotechnical Change.

Aldrich, H.E., Fiol, C.M., 1994. Fools Rush in? The Institutional Context of Industry Creation. Acad. Manage. Rev. 19, 645–670. https://doi.org/10.2307/258740

Ansari, S. (Shaz), Garud, R., Kumaraswamy, A., 2016. The disruptor's dilemma: TiVo and the U.S. television ecosystem. Strateg. Manag. J. 37, 1829–1853. https://doi.org/10.1002/smj.2442

Autio, E., Thomas, L., 2019. Value co-creation in ecosystems: Insights and research promise from three disciplinary perspectives.

Autio, E., Thomas, L.D.W., 2020. Value co-creation in ecosystems: insights and research promise from three disciplinary perspectives. Handb. Digit. Innov.

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Autio, E., Thomas, L.D.W., 2018. Tilting the Playing Field: Towards an Endogenous Strategic Action Theory of Ecosystem Creation, in: World Scientific Reference on Innovation. WORLD SCIENTIFIC, pp. 111–140. https://doi.org/10.1142/9789813149083_0005

Barnett, M.L., 2006. The Keystone Advantage: What the New Dynamics of Business Ecosystems Mean for Strategy, Innovation, and Sustainability. Acad. Manag. Perspect. 20, 88–90. https://doi.org/10.5465/amp.2006.20591015

Benford, R.D., Snow, D.A., 2000. Framing Processes and Social Movements: An Overview and Assessment. Annu. Rev. Sociol. 26, 611–639.

Bocken, N.M.P., Short, S.W., Rana, P., Evans, S., 2014. A literature and practice review to develop sustainable business model archetypes. J. Clean. Prod. 65, 42–56. https://doi.org/10.1016/j.jclepro.2013.11.039

Bridoux, F., Stoelhorst, J. w., 2020. Stakeholder governance: solving the collective action problems in joint value creation. Acad. Manage. Rev. https://doi.org/10.5465/amr.2019.0441

Caillaud, B., Jullien, B., 2003. Chicken & Egg: Competition among Intermediation Service Providers. RAND J. Econ. 34, 309–328. https://doi.org/10.2307/1593720

Cattani, G., Sands, D., Porac, J., Greenberg, J., 2018. Competitive Sensemaking in Value Creation and Capture. Strategy Sci. 3, 632–657.

Cennamo, C., Santalo, J., 2013. Platform competition: Strategic trade-offs in platform markets. Strateg. Manag. J. 34, 1331–1350. https://doi.org/10.1002/smj.2066

Cohendet, P., 2021. Ecosystem – Innovation Ecosystem: Generativity, Resilience and Power of Attraction, in: Innovation Economics, Engineering and Management Handbook 1. John Wiley & Sons, Ltd, pp. 137–142. https://doi.org/10.1002/9781119832492.ch15

Dattée, B., Alexy, O., Autio, E., 2018. Maneuvering in Poor Visibility: How Firms Play the Ecosystem Game when Uncertainty is High. Acad. Manage. J. 61, 466–498. https://doi.org/10.5465/amj.2015.0869

Dedehayir, O., Mäkinen, S.J., Roland Ortt, J., 2018. Roles during innovation ecosystem genesis: A literature review. Technol. Forecast. Soc. Change 136, 18–29. https://doi.org/10.1016/j.techfore.2016.11.028

Dhanaraj, C., Parkhe, A., 2006. Orchestrating Innovation Networks. Acad. Manage. Rev. 31, 659–669. https://doi.org/10.5465/amr.2006.21318923

Dougherty, D., Dunne, D.D., 2011. Organizing Ecologies of Complex Innovation. Organ. Sci. 22, 1214–1223. https://doi.org/10.1287/orsc.1100.0605

Edmondson, A.C., Mcmanus, S.E., 2007. Methodological fit in management field research. Acad. Manage. Rev. 32, 1246–1264. https://doi.org/10.5465/amr.2007.26586086

Eggers, J.P., Kaplan, S., 2009. Cognition and Renewal: Comparing CEO and Organizational Effects on Incumbent Adaptation to Technical Change. Organ. Sci. 20, 461–477.

Eisenhardt, K.M., Graebner, M.E., 2007. Theory Building From Cases: Opportunities And Challenges. Acad. Manage. J. 50, 25–32. https://doi.org/10.5465/amj.2007.24160888

Eisenmann, T.R., 2008. Managing Proprietary and Shared Platforms. Calif. Manage. Rev. 50, 31–53. https://doi.org/10.2307/41166455

Farrell, J., Saloner, G., 1985. Standardization, Compatibility, and Innovation. RAND J. Econ. 16, 70–83.

Floetgen, R.J., Strauss, J., Weking, J., Hein, A., Urmetzer, F., Böhm, M., Krcmar, H., 2021. Introducing platform ecosystem resilience: leveraging mobility platforms and their ecosystems for the new normal during COVID-19. Eur. J. Inf. Syst. 30, 304–321. https://doi.org/10.1080/0960085X.2021.1884009

Garud, R., Kumaraswamy, A., Karnøe, P., 2010. Path Dependence or Path Creation? J. Manag. Stud. 47, 760–774. https://doi.org/10.1111/j.1467-6486.2009.00914.x

Golant, B.D., Sillince, J.A.A., 2007. The Constitution of Organizational Legitimacy: A Narrative Perspective. Organ. Stud. 28, 1149–1167. https://doi.org/10.1177/0170840607075671

Gruber, M., MacMillan, I.C., Thompson, J.D., 2008. Look Before You Leap: Market Opportunity Identification in Emerging Technology Firms. Manag. Sci. 54, 1652–1665. https://doi.org/10.1287/mnsc.1080.0877

Gurses, K., Ozcan, P., 2015. Entrepreneurship in Regulated Markets: Framing Contests and Collective Action to Introduce Pay TV in the U.S. Acad. Manage. J. 58, 1709–1739. https://doi.org/10.5465/amj.2013.0775

Hahn, T., Preuss, L., Pinkse, J., Figge, F., 2014. COGNITIVE FRAMES IN CORPORATE SUSTAINABILITY: MANAGERIAL SENSEMAKING WITH PARADOXICAL AND BUSINESS CASE FRAMES. Acad. Manage. Rev. 39, 463–487.

Hargrave, T.J., Van De Ven, A.H., 2006. A Collective Action Model of Institutional Innovation. Acad. Manage. Rev. 31, 864–888.

Hurmelinna-Laukkanen, P., Nätti, S., 2018. Orchestrator types, roles and capabilities – A framework for innovation networks. Ind. Mark. Manag. 74, 65–78. https://doi.org/10.1016/j.indmarman.2017.09.020

Iansiti, M., Levien, R., 2004a. The Keystone Advantage: What the New Dynamics of Business Ecosystems Mean for Strategy, Innovation, and Sustainability.

Iansiti, M., Levien, R., 2004b. Strategy as ecology. Harv. Bus. Rev. 82, 68–78, 126.

Jacobides, M., Knudsen, T., Augier, M., 2008. Benefiting from Innovation: Value Creation, Value Appropriation and the Role of Industry Architectures. SSRN Electron. J. https://doi.org/10.2139/ssrn.1309509

Jacobides, M.G., Cennamo, C., Gawer, A., 2018. Towards a theory of ecosystems. Strateg. Manag. J. 39, 2255–2276. https://doi.org/10.1002/smj.2904

Jacobides, M.G., Knudsen, T., Augier, M., 2006. Benefiting from innovation: Value creation, value appropriation and the role of industry architectures. Res. Policy 35, 1200–1221.

Kaplan, S., Tripsas, M., 2008. Thinking about Technology: Applying a Cognitive Lens to Technical Change. Res. Policy 37, 790–805. https://doi.org/10.1016/j.respol.2008.02.002

Kapoor, R., Lee, J.M., 2013. Coordinating and competing in ecosystems: How organizational forms shape new technology investments. Strateg. Manag. J. 34, 274–296. https://doi.org/10.1002/smj.2010

Kazan, E., Tan, C.-W., Lim, E.T.K., Sørensen, C., Damsgaard, J., 2018. Disentangling Digital Platform Competition: The Case of UK Mobile Payment Platforms. J. Manag. Inf. Syst. 35, 180–219. https://doi.org/10.1080/07421222.2018.1440772

Lepak, D.P., Smith, K.G., Taylor, M.S., 2007. Value creation and value capture: A multilevel perspective. Acad. Manage. Rev. 32, 180–194.

Linde, L., Sjödin, D., Parida, V., Wincent, J., 2021. Dynamic capabilities for ecosystem orchestration A capability-based framework for smart city innovation initiatives. Technol. Forecast. Soc. Change 166, 120614. https://doi.org/10.1016/j.techfore.2021.120614

Lingens, B., Miehé, L., Gassmann, O., 2021. The ecosystem blueprint: How firms shape the design of an ecosystem according to the surrounding conditions. Long Range Plann. 54, 102043. https://doi.org/10.1016/j.lrp.2020.102043

Moeen, M., Agarwal, R., 2017. Incubation of an industry: Heterogeneous knowledge bases and modes of value capture. Strateg. Manag. J. 38, 566–587. https://doi.org/10.1002/smj.2511

Oskam, I., Bossink, B., de Man, A.-P., 2021. Valuing Value in Innovation Ecosystems: How Cross-Sector Actors Overcome Tensions in Collaborative Sustainable Business Model Development. Bus. Soc. 60, 1059–1091. https://doi.org/10.1177/0007650320907145

Patriotta, G., Gond, J.-P., Schultz, F., 2011. Maintaining Legitimacy: Controversies, Orders of Worth, and Public Justifications. J. Manag. Stud. 48, 1804–1836. https://doi.org/10.1111/j.1467-6486.2010.00990.x

Phillips, N., Lawrence, T.B., Hardy, C., 2004. Discourse and Institutions. Acad. Manage. Rev. 29, 635–652. https://doi.org/10.2307/20159075

Singh, J.V., Tucker, D.J., House, R.J., 1986. Organizational Legitimacy and the Liability of Newness. Adm. Sci. Q. 31, 171–193. https://doi.org/10.2307/2392787

Smith, W.K., Lewis, M.W., 2011. TOWARD A THEORY OF PARADOX: A DYNAMIC EQUILIBRIUM MODEL OF ORGANIZING. Acad. Manage. Rev. 36, 381–403.

Suchman, M.C., 1995. Managing Legitimacy: Strategic and Institutional Approaches. Acad. Rev. 20, 571–610. https://doi.org/10.2307/258788

Suddaby, R., Greenwood, R., 2005. Rhetorical Strategies of Legitimacy. Adm. Sci. Q. 50, 35–67. https://doi.org/10.2189/asqu.2005.50.1.35

Teece, D.J., Pisano, G., Shuen, A., 1997. Dynamic capabilities and strategic management. Strateg. Manag. J. 18, 509–533. https://doi.org/10.1002/(SICI)1097-0266(199708)18:7<509::AID-SMJ882>3.0.CO;2-Z

Thomas, L., Autio, E., 2015. The processes of ecosystem emergence, Academy of Management Proceedings. https://doi.org/10.5465/AMBPP.2015.10453abstract

Thomas, L.D.W., Ritala, P., 2021. Ecosystem Legitimacy Emergence: A Collective Action View. J. Manag. 0149206320986617. https://doi.org/10.1177/0149206320986617

Tsujimoto, M., Kajikawa, Y., Tomita, J., Matsumoto, Y., 2018. A review of the ecosystem concept — Towards coherent ecosystem design. Technol. Forecast. Soc. Change 136, 49–58. https://doi.org/10.1016/j.techfore.2017.06.032

Uzunca, B., Rigtering, J.P.C., Ozcan, P., 2018. Sharing and Shaping: A Cross-Country Comparison of How Sharing Economy Firms Shape Their Institutional Environment to Gain Legitimacy. Acad. Manag. Discov. 4, 248–272. https://doi.org/10.5465/amd.2016.0153

Vasudeva, G., Leiponen, A., Jones, S., 2020. Dear Enemy: The Dynamics of Conflict and Cooperation in Open Innovation Ecosystems. Strateg. Manag. Rev. 1, 355–379. https://doi.org/10.1561/111.00000008

Walrave, B., Talmar, M., Podoynitsyna, K.S., Romme, A.G.L., Verbong, G.P.J., 2018. A multi-level perspective on innovation ecosystems for path-breaking innovation. Technol. Forecast. Soc. Change 136, 103–113. https://doi.org/10.1016/j.techfore.2017.04.011

Wareham, J., Fox, P.B., Giner, J.L.C., 2014. Technology Ecosystem Governance. Organ. Sci. 25, 1195–1215. https://doi.org/10.1287/orsc.2014.0895

Weick, K.E., Sutcliffe, K.M., Obstfeld, D., 2005. Organizing and the Process of Sensemaking. Organ. Sci. 16, 409–421. https://doi.org/10.1287/orsc.1050.0133

Williamson, P., De Meyer, A., 2012. Ecosystem Advantage: How to Successfully Harness the Power of Partners. Calif. Manage. Rev. 55, 24–46. https://doi.org/10.1525/cmr.2012.55.1.24