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Tendencies towards integration and disintegration of the entrepreneurial ecosystem: an institution-based view of the dynamics

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ABSTRACT

This empirical study adopts an institutional theory framework to analyze the interactions and complex dynamics of entrepreneurial ecosystems. While previous research investigated interactions between the different actors of the entrepreneurship ecosystem, little attention has been dedicated to understanding the impact of the interactions upon the ecosystem dynamics. Adopting a case study approach based on interviews with actors of the Lund University ecosystem, the paper shows that when depending on a specific set of formal and informal rules, the interactions can have differentiated impact on both integrative and disintegrative dynamics of the ecosystem. More specifically, a particular set of informal institutions, promotes the drivers of integration, while formal institutions in some situations can lead to the isolation of ecosystem actors and organizations, contributing to disintegration dynamics.

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Entrepreneurial ecosystem; institutions; dynamics

1. Introduction

The entrepreneurship ecosystem literature aims at explaining the attributes, processes and situations that affect entrepreneurial endeavors and new venture creation in a specific context (Acs, Autio, and Szerb 2014, 2017; Alvedalen and Boschma 2017; Audretsch and Belitski 2016; Auerswald and Dani 2017; Autio et al. 2018; Isenberg 2011; Kang et al. 2019; Mack and Mayer 2015; Motoyama et al. 2014; Spigel 2016; Stam 2015; Spigel and Harrison 2018). Recent studies have called for more qualitative and context-sensitive investigation of ecosystems and their empirical reality (Wurth, Stam, and Spigel 2021), in order to allow for a better understanding of both the interaction processes and the dynamics of ecosystems (Spigel 2020; Vedula and Kim 2019; Alvedalen and Boschma 2017).

The 'context' in the entrepreneurship ecosystem literature is usually considered as a dynamic, complex environment in which the ecosystem's actors 'interact' in a non-

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linear way (Roundy, Bradshaw, and Brockman 2018; Cao and Shi 2020) and in a manner that is often not replicable in other environments (Isenberg 2010, 2011; Roundy, Bradshaw, and Brockman 2018).

The concept of interactions is crucial also to understand whether there is something that distinguishes the entrepreneurship ecosystem concept from more established theories coming from entrepreneurship and innovation studies (Wurth, Stam, and Spigel 2021). According to Autio (2016), ecosystems are 'fundamentally interaction systems', and it is precisely this interaction logic that differentiates ecosystems from clusters, innovation systems and other forms of systems (Spigel 2020). Interactions lead to the creation of formal and informal networks and as such represent a critical ingredient of the interdependence of ecosystem actors (Spigel and Harrison 2018; Ferrary and Granovetter 2009; Sullivan and Ford 2014). Interdependence has been investigated in light of its attributes and principles (Spigel 2017; Feld 2012), or pillars (Isenberg 2010, 2011; Mason and Brown 2014). Since the interactive element is a distinctive feature of entrepreneurship ecosystem research, it is important to acknowledge that interactions, as forms of behavior, also depend on the institutional context in which they are embedded. In turn this suggests the relevance of adopting an institutional perspective to analyze them, since interactions can be considered on the basis of the type of institutions that are involved (North 1990; Scott 2013; Baumol 1990).

The second area of interest has been the evolutionary and life-cycle dynamics of entrepreneurial ecosystems, which may eventually help explaining their emergence or decline (Mack and Mayer 2015; Brown and Mason 2017; Auerswald and Dani 2017). In this respect, a relevant perspective on the dynamics of entrepreneurial ecosystem is related with the forces that drive towards integration or disintegration of the actors involved. Integrative dynamics are those that lead to a more collaborative nature of relations and interactions between the ecosystem actors and disintegrative ones are instead those that lead to the isolation of the ecosystem actors. These two contrasting forces can have a powerful impact on the evolution of ecosystems over time. For example, increasing levels of disintegration may at some point erode the main distinctive feature of ecosystems, which is the interdependence between its actors, stemming out of their repeated interactions. Indeed the few contributions in this area have shown that the ability of entrepreneurs to actually obtain the resource needed for their business strongly depends on the level of integration of the ecosystems in which they are embedded (Scheidgen 2021).

Although they represent important avenues for future research, little attention has been devoted to linking these two perspectives: i.e. the extent to which the 'interactions' between the ecosystem actors may influence the 'dynamics' of the ecosystem (Autio 2016; Alvedalen and Boschma 2017; Brown and Mason 2017; Motoyama and Knowlton 2017; Hausberg and Korreck 2020; Cao and Shi 2020; Spigel 2020). This perspective could on the one hand contribute to the studies that investigate the complex interactions of each ecosystem and their effects on how the ecosystem changes over time. On the other hand, such a perspective can contribute to the literature that studies the life-cycle and the evolution of ecosystems by showing that an analysis of ecosystem dynamics could benefit from an understanding of the interactions that lead to such changes.

In this paper, we aim to contribute to the above-mentioned streams of literature by investigating whether the interactions between ecosystem actors exert an impact on

the integrative and disintegrative dynamics of the entrepreneurial ecosystem. The actors of the ecosystem are those that have a strong presence or exhibit an active interest in interacting within that specific ecosystem. The actors of the ecosystem might also be engaged within multi-level contexts (Welter 2011) that are outside of the spatial boundaries of the specific ecosystem here in question. This is typically the case of policymakers, who have a strong presence in a local environment, but also outside the local environment (Dupuis and de Bruin 2003).

An institutional theory framework was adopted to investigate the types of institutions, i.e. formal and informal rules of the game, that lead the actors of the ecosystem to interact in ways which may lead to integrative or disintegrative dynamics of the ecosystem (Baumol 1990; North 1990). Indeed, institutions impact the behavior of the actors, and have been recognized as potentially useful mechanisms for both conceptualizing and understanding the dynamics of the system rather than merely portraying static frameworks (Geels 2014).

The paper represents a case study approach to qualitative data analysis and it is based on 27 interviews with different actors in the entrepreneurial ecosystem around Lund University in Sweden. The results highlight the existence of different types of institutional factors that foster integration or disintegration processes within the ecosystem. Integration drivers, i.e. elements that induce actors to collaborate and cooperate, are mainly 'informal' rules, such as those that promote the idea of openness in sharing ideas and information, dedication to entrepreneurship processes and tendency towards upward comparisons. In contrast, the study revealed that specific 'formal' institutions drive the system towards disintegration, i.e. behaviors by which actors and organizations work in isolation with other actors of the ecosystem. These formal institutions are for example public support programs that omit local ecosystem realities and can give rise to ecosystem disintegration.

The paper is structured as follows. In section 2 the literature review is presented, touching upon the theory related to the entrepreneurial ecosystem and the relevance of institutions. Section 3 contains the method, which encompasses the empirical setting, data collection and the analysis process. After this the results are presented, followed by the discussion and conclusion that contain implications for both theory and policy.

2. Literature review

2.1. Complex interactions and dynamics in entrepreneurial ecosystems

The entrepreneurship ecosystem stream of literature has at times been criticized for lack of scientific rigor and overall 'theoretical confusion', which in turn leads to lack of a shared definition of what the ecosystem is and how it works (Spigel 2020; Wurth, Stam, and Spigel 2021). Other authors also noted that the lines between the entrepreneurial ecosystem and similar concepts, such as innovation systems and the business ecosystem, have been somewhat blurred (Alvedalen and Boschma 2017; Pugh, Soetanto, and Jack 2021), a criticism that was similarly levelled in the past at the concepts of industrial clusters and innovation systems (Spigel 2020; Markusen 1999; Martin and Sunley 2003).

Previous studies have highlighted the fact that while ecosystems coordinate organizations and actors that are autonomous yet interrelated (Jacobides, Cennamo, and Gawer 2018), entrepreneurial ecosystems support business model development, which facilitates the growth of new ventures (Autio et al. 2018). University-based entrepreneurship ecosystems have also been discussed in the literature (e.g. Fetters, Greene, and Rice 2010; Mason and Brown 2014; Rice, Fetters, and Greene 2014) as context embedded and related to both the institutional and industrial regional setting (Wright, Siegel, and Mustar 2017; Miller and Acs 2017; Carayannis, Campbell, and Rehman 2016; Autio et al. 2014; Mustar et al. 2006).

Similar to entrepreneurship, which is conceived as dependent on social interactions (Chell 2000; Gaddefors and Anderson 2017), ecosystem functioning also depends to a high degree on the interactions between its pillars and the entrepreneurs (Isenberg 2010). In this respect, the interaction logic has been described as fundamental for the entrepreneurial ecosystem (Spigel 2020; Autio 2016) and as crucial for successful ecosystems (Feld 2012) as well as for their resilience (Roundy 2017). Combining this perspective with the context-dependence of the ecosystem processes, outcomes and developments (Autio et al. 2014; Isenberg 2010; Pocek 2020; Stam and Welter 2021) it becomes clear that ecosystems are highly complex, dynamic environments (Isenberg 2011; Roundy 2017).

Entrepreneurial dynamics most commonly have been investigated in relation to the life cycle of startups (Kazanjian 1988) and authors argued that precisely interactions of the ventures with their environment may explain entrepreneurial dynamics (Gartner 1985; Pena 2004; Alaassar, Mention, and Aas 2020). The dynamics of the entrepreneurial ecosystem on the other hand, have been less investigated so far by focusing on the interactions of its actors. The evolutionary dynamics of entrepreneurial ecosystems have been investigated in a case study from Phoenix, Arizona, that relied on both qualitative and archival data in order to explain the evolution of development cycles across lower-tier ecosystems (Mack and Mayer 2016). The findings suggested that entrepreneurs are more likely to receive attention to help grow their ventures in lower-tier ecosystems compared to high-tier ecosystems, such as the Silicon Valley one (Mack and Mayer 2016). Cantner et al. (2020) discuss the inherent dynamics of the entrepreneurial ecosystem cycle that follows its different stages, from birth to decline and re-emergence. Brown and Mason (2017) attempted to 'unpack the dynamics' of the ecosystem concept by performing a critical literature review, which concluded that the entrepreneurial ecosystem requires tailored-made policy interventions.

The integration dynamics in the entrepreneurial ecosystem have been studied by Scheidgen (2021), who concluded that ecosystems are characterized by different degrees of integration that can impact entrepreneurs' resource acquisition practices. Other authors wrote about the evolutionary dynamics of entrepreneurship ecosystems and how the ecosystem evolves (Cho, Ryan, and Buciuni 2021; Mack and Mayer 2015). Mack and Mayer (2015) discuss how institutions, such as culture, impact the evolutionary dynamics of the ecosystem and develop the framework that could be used in order to understand the ecosystem's stage of development. Other than the aforementioned study, there seems to be a lack of how the interactions of the ecosystem actors induce integration or disintegration dynamics of the entrepreneurial ecosystem.

2.2. The institutional theory perspective

Overall, to date, there is little evidence of the impact of the actors' interactions on the dynamics of a given ecosystem. In this respect, institutional theory provides a useful perspective in order to understand both the role of interactions and their potential system-level impact, as it enables comprehension of the behavior and perceptions of the parties involved in the process (Scott 2013). Consequently, in this study, we suggest that the way in which the ecosystem actors interact and behave in relation to each other depends on the 'rules of engagement' (Jacobides, Cennamo, and Gawer 2018), or rules of the game (Baumol 1990). According to institutional theory the rules of the game in a given context, which can be both formal and informal (North 1990), have great potential to constrain and impact the behavior and perceptions of actors and organizations (North 1990; Scott 2013). However, whilst institutions are considered as one of the key components of the ecosystems (cf. Isenberg 2011), there is relatively little work unpacking their role and function in driving the interactions of the ecosystem actors and the consequences this poses for the ecosystem dynamics.

Formal institutions refer to the formal regulative rules in a given context (North 1990; Scott 2013). As such they involve formally established rules, compliance with established rules and the ability to follow up compliance (and impose sanctions or provide rewards). These rules are usually shaped by policy makers or other authority, through laws and regulations, or at the organizational level by the management board of organizations. Informal institutions are rules concerning culture, social norms and values (North 1990), which are typically established over a longer period of time.

The abundant literature on institutions and entrepreneurship shows the strong interest of scholars in investigating these two concepts (Bruton, Ahlstrom, and Li 2010). The existing literature has acknowledged that both formal and informal rules are part of the ecosystem itself (Autio et al. 2014): they impact each other in the interplay (North 1990; Tonoyan, Strohmeyer, and Perlitz 2010; Estrin and Prevezer 2011; Pocek 2020) and they also impact entrepreneurship outcomes and quality (Baumol 1990; Acs, Desai, and Klapper 2008). Previous studies have shown that the institutions' control is strongly dependent on informal rules: depending on their mutual complementarity they have the potential to support or weaken the effect of formal institutions, (North 1990; Tonoyan, Strohmeyer, and Perlitz 2010; Estrin and Prevezer 2011; Pocek 2020). In line with this, Isenberg (2010) suggests that in order for the formal rules to support the ecosystem they should be designed 'in line with', rather than as an exogenous shock to the informal rules (Isenberg 2010). In addition, Walsh and Winsor (2019) argue that informal institutions do not only impact the formal rules but 'other elements of the Entrepreneurial Ecosystem', such as rates of business start-up and business failure. Finally, the development of the entrepreneurial ecosystem has been found to be susceptible to the interplay between informal rules, such as culture, and individual agency (Spigel 2016).

In summary, the existing literature on entrepreneurial ecosystems has started to focus not only on the elements that make up an ecosystem, but also on the dynamics of the ecosystem over time, such as its emergence or decline. These dynamic properties cannot be analyzed without acknowledging the important role played by the interactions between actors, which are considered relevant features of entrepreneurial ecosystem functioning. When it comes to understanding the impact of interactions on the

dynamics of ecosystems, institutional theory helps define which types of institution affect the reciprocal behavior of agents and their interactions. However, in available studies there is still no answer to the question of how ecosystem interactions impact the dynamics of the ecosystem. Therefore, the present paper aims to fill this specific gap by using institutional theory to identify the types of institutions that affect the interactions of the ecosystem actors and as such the dynamics of entrepreneurial eco-systems, those that lead towards integration of the actors involved, as opposed to those that lead to disintegration.

3. Case introduction and research methods

3.1. Lund University entrepreneurship ecosystem context

The empirical setting of the study is the entrepreneurial ecosystem around Lund University in the southern Swedish Region of Scania. Lund University's entrepreneurial ecosystem has already been analyzed in previous studies: as a corollary to our study in Table 1 we reproduce the findings of Karlsson, Kristofferson-Wigren, and Landtröm (2015), who provided insights about the historical development of entrepreneurship in Lund university.

Lund University ecosystem looks like an appropriate context for understanding the differentiated role of institutions on integrative and disintegrative dynamics. First, this is due to the fact that it is a relatively old ecosystem, with a quite established informal institutional culture developed over the years. Moreover, it is a very heterogeneous ecosystem that includes large multinational companies, century-old leading universities, young start-ups, academic-backed spin-offs and a rich number of support organizations.

Table 1. Development of entrepreneurship around Lund university (Karlsson, Kristofferson-Wigren, and Landtröm 2015).

1666	• Founding letter for Lund University signed by King Karl X Gustaf of Sweden
1668	• First classes given at Lund University
1700	• Education in technology, law, philosophy and medicine
1800s	• Chairs introduced in mathematics, chemistry, physics, political science, geography
1880	• First female students allowed to study
1944	• Invention of the tetrahedron milk carton by LU Lab assistant
1946	• Invention of the artificial kidney by LU professor
1951	• Incorporation and patenting of Tetra Pak
1953	• Invention of Ultra Sound diagnostics at Lund University
1961	• The foundation of the Faculty of Engineering and the Faculty of Business
1964	• Incorporation of Gambro, the manufacturer of the first artificial kidney
1971	• Development of modern respirator by LU researchers
1981	• The foundation of Science Park Ideon
1983	• Ericson radio systems moves to Ideon
1984	• The foundation of Axis communication
1989–1999	• Appointment of the first professor in entrepreneurship
1990	• The establishment of the Department for Industry collaboration
1998	• Bluetooth communication is introduced to the market
1998–2004	• Business administration temporarily runs its first course in entrepreneurship
2001	• Venture Law, Lund University student lab is founded
2007	• The master programme in entrepreneurship is established
2010	• MAX IV construction begins, a scientific infrastructural investment
2011	• European Spallation Source construction begins
2011	• Sten K. Johnson Center for Entrepreneurship is established
2012	• Lund University Social Innovation Center is Established
2012	• Medicon Village is established

Lastly, the ecosystem is also a successful one, with world-famous products and technologies originated here, such as the inhalator for asthma medicine in 1987, the Bluetooth technology in 1994 (named after a famous Viking chief), but also less famous products such as invisible cycling helmets (Hövding) or modems allowing gadgets connected to the Internet to communicate wirelessly (Mistbase company).

The university's vibrant entrepreneurial ecosystem is facilitated by a number of support organizations, such as technology transfer offices, incubators and science parks, as well as private-public partnerships working to support new venture development. The nearby incubators have traditionally had connections to large multinationals, such as Ericsson and Sony, (previously Sony-Ericsson), Tetra Pak, Ikea, or life sciences companies such as Astra-Zeneca. The vacant space left by Astra-Zeneca when it moved to another Swedish region is now called Medicon Village – a new Science park with approximately 150 companies, which promotes life-science commercialization and development (Karlsson, Kristofferson-Wigren, and Landtröm 2015). The student incubator (Venture Lab) is part of the university's technology transfer office. The Region of Scania is represented by its public office and by public-private companies that promote innovation and the region's interests. There are also active relationships with incubators around other universities within the same region, such as in the nearby city of Malmö. The central government is also present and provides funding to the ecosystem actors and organizations. One of the oldest science parks in Northern Europe is the Ideon Science Park, built-in geographical proximity to the two universities of Lund and Malmo in 1983. The aim of the Science Park was to increase collaboration between academia and industry (Karlsson, Kristofferson-Wigren, and Landtröm 2015): the park currently hosts more than 400 companies with a total of about 10,000 employees. The collaboration with the Lund community and local government is active and aims to promote sustainable economic and technological development of the region (Park 2002).

3.2. Data collection analysis

The case study approach involves the collection and analysis of rich data from different sources with the aim of developing understanding (Chetty 1996; Siggelkow 2007; Eisenhardt and Graebner 2007) rather than testing hypothesis by employing quantitative methods, (Gummerson 2000). While recognizing that some of the concepts developed in this paper may be challenging for statistical analysis, previous studies discussed that even with these draw-backs, the advantages of case study approach outweigh its weaknesses (Chetty 1996; Siggelkow 2007; Eisenhardt and Graebner 2007; Yin 2012).

In addition to being a location with many high growth new ventures, Lund University entrepreneurial ecosystem was chosen for this study because it was accessible to the author due to the geographic proximity and familiarity with the professional networks (Miller and Acs 2017). Indeed, this allowed accessibility to key ecosystem actors and organizations as well as participation in networking events that helped the author to better understand the context of some of the interactions but also of the ecosystem itself. The existing familiarity with ecosystem organizations enabled the in-depth qualitative approach, which was then triangulated with secondary sources of information (Denzin and Lincoln 2005).

This case study draws on 27 semi-structured interviews conducted with representatives of different organizations in the Lund University entrepreneurial ecosystem from September 2019 to January 2020. The list of interviewees is presented in Table 2. Participants for the interview were chosen based on a purposive sampling method (Mason 2002; Robinson 2014) combined with the snowballing method. The majority of interviews were conducted in person, and the average duration of the interviews was approximately 40 minutes. The questions posed to the informants aimed at stimulating their perception related to the policies and regulatory environment pertaining to their work and how these impact their relationships with other actors in the ecosystem. Another set of questions was related to gaining insights into their understanding of the informal 'rules of the game' of the ecosystem they were part of. Finally, the semi-structured interview also targeted the informants' perception of their goals, values and the main obstacles with respect to their work and ecosystem-level collaboration. All informants covered the above-mentioned dimensions and were encouraged to be explorative and open in their replies in order to deepen their understanding of the institutional context.

After the data collection, the interviews were immediately transcribed and the data were analyzed as a case study through a thematic analysis process (Braun and Clarke 2006; Kent 2007). The case study method used in this paper adheres to the logic that the analysis is an inductive process closely related to deductive theory testing (Eisenhardt and Graebner 2007), hence inductive and deductive are 'two sides of the same coin' (Gehman et al. 2018), where what prior research has said and what informants have said is combined (Gehman et al. 2018).

Table 2. The list of interviews.

Interviewee	Organization	Position	Mode
1.	Incubator 1	CEO	Face to face
2.	Incubator 1	Business developer	Face to face
3.	Incubator 1	Junior project coordinator	Face to face
4.	Incubator 2	CEO	Face to face
5.	Incubator 2	Business developer	Face to face
6.	Incubator 2	Project coordinator	Telephone
7.	Incubator 3	CEO	Face to face
8.	Incubator 3	Incubator manager	Face to face
9.	Incubator 3	Junior Business Developer	Face to face
10.	Incubator 4	CEO	Telephone
11.	Incubator 4	Business developer	Telephone
12.	Incubator 5	Incubator manager	Telephone
13.	Public agency	Programme manager	Telephone
14.	Public-private partnership	CEO	Face to face
15.	Technology Transfer Office	CEO	Face to face
16.	Technology Transfer Office	Coordinator	Face to face
17.	Technology Transfer Office	Legal officer	Face to face
18.	Science Park	First CEO of the Science park	Face to face
19.	Start up tenant of the incubator 1	CEO	Face to face
20.	Start up tenant of the incubator 1	CEO	Face to face
21.	Start up tenant of the incubator 1	CEO	Face to face
22.	Start up tenant of the incubator 1	CEO	Face to face
23.	Start up tenant of the incubator 2	CEO	Face to face
24.	Start up tenant of the incubator 2	CEO	Face to face
25.	Start up tenant of the incubator 2	CEO	Face to face
26.	Start up tenant of the incubator 2	CEO	Face to face
27.	Start up tenant of the incubator 2	CEO	Face to face

We used Nvivo12 software for the hybrid process of deductive and inductive content analysis (Al-Baimani et al. 2021, Fereday and Muir-Cochrane 2008). The data were read for the purpose of recognizing the patterns, and subsequently coded. These codes were grouped as themes whose labels were chosen from the interview questions but also inductively from the interviews (Al-Baimani et al. 2021; Fereday and Muir-Cochrane 2008). The themes are: 'dedication, openness, upward comparison, formal parameters' and 'public support programs'. Once we identified these themes, we connected again the qualitative evidence to deductive research (Eisenhardt and Graebner 2007). Hence, as a following step, we went back to the literature and, drawing on institutional theory, we grouped the themes into the research centric themes of a higher level of abstraction, namely: formal and informal institutions (North 1990). Finally, we attempted to understand how the interactions impacted by formal and informal institutions are linked to the potential integrative or disintegrative dynamics of the entrepreneurship ecosystem. The thematic analysis process is presented in Figure 1.

4. Results

According to institutional theory, both formal and informal institutions, constitute the context of the place, or the rules of the game, and as such will impact the behaviour of the actors in the entrepreneurship ecosystem context. We start by presenting the

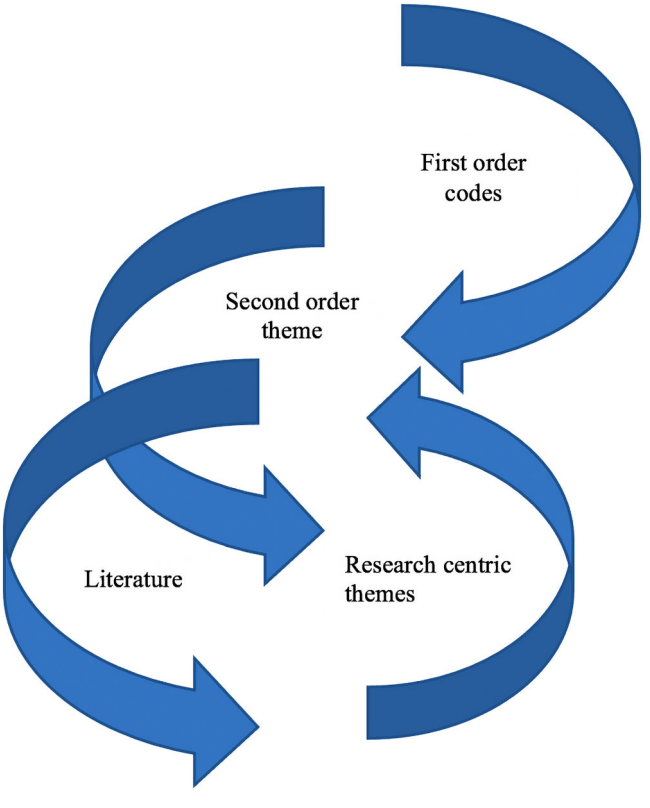

Figure 1. Thematic analysis process.

institutions: the informal and formal rules in Lund University entrepreneurship ecosystem identified through the patterns in our informants' perceptions. We also outline the impact of the institutions upon the interactions that form the integrative and disintegrative dynamics of the ecosystem.

4.1. Informal rules

Informal rules are defined as a set of norms and values identified in a given context (North 1990; Scott 2013). Norms embody rules about the 'correct', normal and expected behavior in a certain situation, they hence represent external rules that individuals feel they have to comply within a given environment. Values are instead beliefs about what is appropriate and important in a given situation (North 1990) from an intimate standpoint, representing personal convictions about what is right or wrong.

4.1.1. Dedication

'Dedication' is what is considered as normally accepted behavior in the ecosystem: it stands for a norm expected from others and from oneself. Dedication is reflected broadly in the commitment of ecosystem actors to supporting entrepreneurship and processes of importance for ecosystem's good functioning. In this manner the dedication, which indicates a specific course of action and is characterized by agility, leads to both fast access to resources and redistribution of resources in the entrepreneurship ecosystem. Dedication is also recognized in actors' eagerness to inspire as well as to encourage others to an action-oriented type of behavior. As one business developer said:

> I really like the model of empowering. That's like the core thing we do, we empower, we inspire, and we try to help in all of the ways we can, so they keep an entrepreneurial spirit.

Dedication is also recognized in the commitment of actors, such as business incubators, to match the needs of the entrepreneurs. One of the coaches stated:

> I try to help them (start-ups), to connect them with people, and give a business perspective. And I try to help them to look at the opportunities when it comes to business.

Dedication of the ecosystem actors towards providing the entrepreneurs with different resources fosters collaboration among different members of the ecosystem. This is because not all of the resources are at the immediate disposal of a particular ecosystem actor. In order to obtain the resources or to obtain rich resources, the actors of the ecosystem may have to refer to other ecosystem actors, or to act as intermediaries between the entrepreneur and the resource provider. This type of interaction is of collaborative nature, it fosters interdependence and leads to the integrative dynamics of the ecosystem.

As one said CEO of an incubator:

> We're also building a large network of investors around ourselves, which the small companies cannot do themselves. That's a service we offer. Another service we offer is a number of the coaches has a specialty of developing a network with the industry. And we've gotten quite far when it comes to the industry. (…) Within that, we are actually inviting the industry to come here. We set up meetings with the companies.

4.1.2. Openness

The informal rules of the Lund University entrepreneurship ecosystem are also characterized by perceptions that being open in terms of sharing information or considering different ways of working are important rules of the game in the ecosystem environment. Openness is an informal rule that is about encouraging ecosystem actors to share their ideas, their thoughts in order to get feedback, other kinds of information or so as to get to know other players in the ecosystem. As one project coordinator said:

> We encourage entrepreneurs: Share your thoughts. Share your ideas. Share what you're doing because that's an entrepreneurial spirit which will help you grow your company here.

Another CEO said:

> You need to understand that you have to be open-minded and also share your experiences with others here around.

The propensity to being open is perceived as valuable by the companies in the ecosystem. Openness in this regard is twofold, it is about sharing your ideas and knowledge but also about asking questions and being open to receive opinions of others. In this manner, openness represents a stimulus for knowledge acquisition. As the CEO of a start-up said:

> We get a lot of advice from others on marketing, on sales, on recruitment, on hiring new staff, on priorities, good investors, bad investors, good deals, bad deals, sort of conditions, complications that came out of the process. An overall perspective. You can always meet someone who's been there, who's done it before. And you can learn from their experience if you can get yourself to ask those questions.

Resistance to openness in sharing ideas and collaborations on the other hand is perceived as a characteristic of the academia, and as such something that separates the entrepreneurial and the academic world within the entrepreneurial ecosystem. Many of our informants stressed that in contrast to academia, in entrepreneurship you don't advance unless you share your knowledge with others. One business developed said:

> In academia they all keep all their research secret because they don't want someone to steal their brilliant ideas and turn your papers over. In entrepreneurship we have to be open.

4.1.3. Upward comparisons

The tendency towards upward comparisons, i.e. comparisons with other ecosystems that are perceived as better, is another component of informal rules and indicates that the ecosystem is perceived as advanced, but that the actors also keep on thinking about how it could be improved. The tendency to make comparisons with other ecosystem that the parties consider well-functioning ones is driven by the belief that their own ecosystem is good enough and even perceived as superior. As one start-up CEO said:

> This does not exist at this level (like/as in the country X) anywhere else in Sweden, unless you are within North Big Pharma or the University. It does not exist at such a level. So that's quite unique.

The CEO of another start-up said:

> So that's transformative as opposed to the (country X and Y), where technology transfer offices take up a large percentage of the intellectual property and dictate the process of technology transfer and translation. So Sweden has been phenomenal just as a baseline.

The upward comparison denotes the belief that some things can be improved if adapted to the local circumstances, by gaining inspiration from the object of comparison. As the CEO from a public-private partnership said:

> We had a delegation from X here today. And there they have much more finances. They have much more. And they always, when they start a company in X, they always build a clone in B. They work and they get B country investors. So on this side – from the public sector – I think we should put much more emphasis on this.

Promotion of informal rules such as the ones of openness as well as the tendency towards upward comparisons promote the integration dynamics of the ecosystem. Openness fosters collaboration, creation of networks and leads to the creation of a holistic culture of the ecosystem community. Upward comparisons on the other hand can promote collaborations among the ecosystem actors that aim at improving the elements of the ecosystem, based on the source of inspiration. As one CEO said:

> We did a benchmarking study of very advanced and successful science arenas clusters incubators in (countries X and Y). Which led us to develop our capabilities within industry relations. (…) and I actually employed someone who is responsible to work (only) with industry.

On the other hand, the resistance to openness as a rule of the game, can lead to a lack of collaboration spirit and hence disintegrative dynamic of the ecosystem. In the narratives of our interviewees broadly speaking the academia is perceived as an ecosystem actor that does not share the entrepreneurial mindset, which should be based on openness. This is an obstacle to collaboration that can lead towards disintegrative dynamics of the ecosystem. A business developer said:

> (Academics) know everyone in the world dealing with this item (their research), but they haven't a clue who's next door. No one knows anyone. So it's really hard to get in contact through some sort of hub because there is no hub. And even if they say there is, it's really not working. So it's hard to use (academia) as a network.

4.2. Formal rules

Formal rules are written and/or binding formal instruments or standards, to which different ecosystem actors have to adhere to sometimes also depending on the industry or sector they belong to. Formal rules are most typically laws, statutes of organizations, but also bureaucracy and rules deriving from the public support programs, or any other formal standard that the ecosystem actor has to comply with in order to obtain a resource.

4.2.1. Formal parameters

Formal parameters of the ecosystem include different sets of laws that relate to intellectual property and patenting, public sector regulation associated with the work of the university, the region and government-owned organizations. Intellectual property and patenting laws create a climate in which ecosystem actors must comply with stricter or

easier requirements, depending on the industry to which they belong. This appears to be of particular interest to actors involved in the life sciences. A representative of one incubator said:

> In life sciences compared – yeah, there's other regulated industries. Automotive is one, aerospace is another, but if we talk about life sciences – broadly, medical devices, diagnostics, drugs – of course it's very, very regulated.

The heaviness of regulation within the life science sector has an impact on the speed of their entrepreneurial processes but also on the types of relationships they wish to form in the entrepreneurial ecosystem. They seem to be more prone in bonding with actors that are exposed to similar kind of formal parameters. As one of the informants said:

> Because we do life science (…) I am much more interested in talking to my colleagues that are in similar regulatory space, or life science, or maybe incubators that work with things that take a long time, needs huge amount of money, high-risk– it is quite different.

Formal parameters come also in the form of organizational statutes that are composed out of standards that particular organization respects in their work. For example, these may be composed of regulation concerning how many nationalities are represented in the incubator, or those that concern the promotion of a gender equality in acceleration or incubation programs. But not only, the standards may also concern for example the types of incubated ventures that the incubator program wishes to target. These kind of formal rules are written organization-specific, and their fulfillment serves as provider of legitimacy also in the eyes of its stakeholders. In this sense, different organizational statutes link the ecosystem actors with other public and private sector agencies, who in return for their support requires adherence to some of these standards.

4.2.2. Public support programs

The Lund entrepreneurship ecosystem is rich in public support programs, that come from the municipality, the region or national level policies that relate to the work of the ecosystem actors. These public support programs provide funding, act as financiers in return for adherence of the ecosystem actors to formal rules deriving from the public support programs. Moreover, the support provided by the public agencies is regarded as an excellence award, a sign of prestige and hence there is a perception that it contributes to the higher status of the ecosystem actors.

While the rules from the public support programs guide the behavior of ecosystem actors, who in return for this receive resources, entrepreneurship ecosystem actors dependent on public support programs perceive that they are not consulted in public policy making. As a CEO of an incubator said:

> We are not consulted by the policy makers. If they say something, we need to do it if we want funding for it. We can say, oh no, we don't want to follow your policies. So as a result then we don't get those kind of money. (..) I would say they (policy makers) need to listen to us.

CEO of another support system organization said:

> We are not consulted (unfortunately). We're not asked to give– I'm not asked to give opinion. No. We might be consulted on some specific grant, but that's just how they define what they're giving money for.

On the other hand, the public support programs can lead also to a tension within the entrepreneurship ecosystem if they are in mismatch with how ecosystem actors believe they should behave. As one manager explained:

> That (public rules) also have to do with which companies they think that we should work with or not work with … (the requests imposed by the public) can be different from what is actually locally available to work with or what other stakeholders think is. But if that is not coherent with X (public), then X (the public) will take away the excellence grant that we have, which is quite important within the system that we do have that grant.

Therefore the results show that some of these formal rules, in particular deriving from public support programs, may foster fragmentation leading towards disintegration dynamics of the ecosystem. This tend to occurs in particular if the public support programs that are brought without consultation or information sharing with the ecosystem actors omit the local realities. In this case, the policy may act as a catalyst of disruption of the interactions between the ecosystem actors, leading to exclusion of some entrepreneurship and innovation processes and the disintegration dynamics.

5. Discussion and conclusion

Entrepreneurship does not occur in a vacuum, but is rather context-dependent (Stam and Welter 2021; Pocek 2020). The context can be conceptualized through the lenses of the rules of the game (Baumol 1990) or institutions (North 1990). Rules, both formal and informal, are drivers of the behavior of ecosystem actors and organizations (North 1990), and as such they guide their interactions. These interactions in turn impact the dynamics of the ecosystem and the tendencies towards integration or disintegration. In our results, informal rules, in particular concepts of dedication, openness and upward comparisons and centered around helping companies grow, are identified as integration drivers. This is because by dedication to processes of entrepreneurship, sharing knowledge and resources with each other, the organizations and actors of the ecosystem become more interconnected, while the spillover of resources from one organization of the ecosystem to the other is more efficient. This process also foster the creation of an environment in which the role of intermediaries is emphasized (Hargadon and Sutton 1997; Howells 1999, 2006), contributing to the integrative dynamics of the ecosystem.

Formal rules on the other hand can lead towards disintegrative tendencies of the ecosystem. In particular, the public support programs, which are a valuable asset of the entrepreneurship ecosystem, in some cases can contribute to the disruption in communication among the ecosystem actors. For example, policies may lack consideration or direct knowledge of the local ecosystem realities. However, they provide with specific types of regulation that guide the behavior of the ecosystem actors, who in return receive from them resources, such as funds and prestige. This is in line with recent findings by Scheidgen (2021) who found that there is a strong effect of public funding programs on entrepreneurs and entrepreneurship ecosystem of Berlin. While the public support programs can be well suited for some entrepreneurial actors, they may lack consideration of others in the ecosystem, and instead of acting as connectors, the policy may contribute to the fragmentation and disintegration dynamics in the ecosystem

(Scheidgen 2021). This is emphasized in particular when the local ecosystem actors are not consulted at early stages of the policymaking process (Scheidgen 2021).

Therefore, we propose that a set of 'informal' rules – such as dedication, openness and tendency towards upward comparisons – contribute to integrative dynamics of the entrepreneurial ecosystem, more specifically through fostering the creation of interconnections and by emphasizing the roles of intermediaries who connect different kinds of ecosystem resources and deliver those to the entrepreneurs. On the other hand, a set of 'formal' rules can disrupt the ecosystem dynamics by proposing rules that ignore the local realities, due to the lack of consultation between the ecosystem actors and the regulators on shaping the policies (Alaassar, Mention, and Aas 2021; Scheidgen 2021).

Furthermore, the formal rules may impact not only on the behavior of the ecosystem actors towards each other, but also shape their perception of cognitive proximity, through induced disintegration among the organization. And while institutional theory postulates that the impact of informal rules on formal ones is strong, and that compliance with formal rules will depend on the informal ones (North 1990) – also in the context of entrepreneurship – (Williams and Vorley 2015; Tonoyan, Strohmeyer, and Perlitz 2010), at present we lack evidence demonstrating whether formality impacts on the informal aspects. This is especially interesting to study in entrepreneurial ecosystems with a long tradition, because it is the longer ecosystem tradition that leads us to assume that the informal rules have had sufficient time to establish themselves to support a well-functioning ecosystem. Despite this, in our empirical analysis it was possible to detect how certain formal rules, which are often implemented at a relatively higher speed than informal ones, have the potential to disrupt the integrative dynamics and work against integration.

The present study is not free from limitations, the major one being the fact that our findings are based on data from only one entrepreneurial ecosystem that reflects Nordic institutional context (Pocek, Politis, and Gabrielsson 2021), therefore they may not necessarily apply to ecosystems in different regions. Bearing in mind these limitations it is still possible to draw some implications for the dynamics of entrepreneurial ecosystems and suggest possible future research directions. In particular, we believe that policymakers should be aware of the possible impact of formal rules on the cohesion of entrepreneurial ecosystems. This is an important observation, because it indicates that the private sector and the actors from the ecosystem context should be involved to a greater extent and early on in the process of designing the programs that aim at supporting entrepreneurship and innovation in the ecosystem,. This resonates with the study by Pato and Teixeira (2016) and Roundy (2020), who found that inadequate governance may often impede effective entrepreneurial activity and lead to ecosystem fragmentation (Bouncken and Kraus 2021; Scheidgen 2021).

Moreover, institutional theory suggests that formal rules change at a higher speed compared to informal rules, as the latter are established at a deeper cognitive level and as such are formed over longer periods of time (North 1990). The processes fostered by informal rules that lead to integration take a long time and a great deal of effort to develop, while those triggered by formal rules that lead to disintegration seem to occur more quickly. Policy makers should be aware of these differences and in particular they should consider that if the aim is to increase integration, they should be careful about introducing formal rules that may eventually lead to fast disintegration processes.

Our analysis also calls for future studies to analyze the role of formal rules on the dynamics of entrepreneurial ecosystem. Formal institutions are necessary for the successful development of ecosystem, but it seems vital to identify which of these formal rules are beneficial and which may instead introduce tendencies that reduce the cohesion of such ecosystems. Furthermore, future studies should investigate which types of informal institutions are more persistent and less susceptible to formal institutions that can potentially create pressures leading to disintegrative ecosystem dynamics in institutional interplay.

Disclosure statement

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