4 University Dynamic Capabilities to Boost Innovation Ecosystems

The Case of a University Alliance in Brazil

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Abstract

This chapter unpacks how universities' dynamic capabilities are mobilized to take on the role of fostering and orchestrating regional innovation ecosystems. Increasingly, universities are applying strategic and entrepreneurial management practices to be able to expand themselves into governance structures to deal with dynamic and changing environments. Different phases of an innovation ecosystem (initial stage, development, and renewal) require different key dynamic capabilities. We found that there is a fourth phase, the boost stage, in which an existing but declining innovation ecosystem requires an agent to be the propellant and revitalizer for its development cycle to be resumed and expanded. We address this issue with a unique Brazilian case study, an Alliance founded by three universities to develop the region into an environment conducive to innovation and entrepreneurship. This case study shows the role of universities as an orchestrator agent when there is a need to boost an ecosystem that is experiencing difficulties, by organizing, motivating, and supporting a network of stakeholders to drive the regional ecosystem. The research found that universities in declining ecosystems need to combine three dynamic capabilities at the same intensities in several actions to lead the local initiative.

Introduction

A common feature in Latin America is the lack of society's trust in their governments due to the history of corruption cases, public policies discontinuities, and lack of preparation for public management, which have occurred over the past decades (Altenburg, 2009; World Bank, 2020). This is further accentuated by the need to deal with the accelerated pace of technological advance and the reduction of globalization barriers. In this scenario, universities take roles that can go far beyond the classic (research and teaching) becoming fundamental actors in the economic development of regions. The concept of an "engaged

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university" (Trippl et al., 2015; Uyarra, 2010) considers the university's participation in a broader vision of regional development, with social and political contribution expressed by the formal integration of regional needs into university priorities, coordination of regional networks, and policy advice.

Among several regional outreach activities, universities can lead innovation ecosystems towards becoming an environment conducive to the development and transfer of disruptive knowledge and technologies (León, 2013; Thomas et al., 2020). However, universities are still "finding their feet" in these highly dynamic activities. Heaton, Siegel et al. (2019) suggest that universities, in order to contribute to the development of local innovation ecosystems, should evolve different dynamic capabilities compared to the capabilities enabling the missions of teaching and researching or even of collaborating with the industry to generate applied technologies. Dynamic capabilities are "the firm's ability to integrate, build, and reconfigure internal and external competences to address rapidly changing environments" (Teece et al., 1997, p. 516). These capabilities enable organizations to identify asset configurations and valuable skills to orchestrate them in an agile and innovative way (Schoemaker et al., 2018). Although the study by Heaton et al. (2019) presents an important advance in this theme, the results are driven from developed countries and emphasize the functions of the university in each stage of ecosystem development without discussing universities' capabilities when the ecosystem needs to be recovered or boosted, as in places where the ecosystem already exists, but it needs to be recreated because it is in a complete decline. This is the lacuna our chapter contributes to, looking into universities' dynamic capabilities that allow them to build governance structures to foster the recovery of regional innovation ecosystems, by asking, "How do universities mobilize dynamic capabilities and what are dynamic capabilities needed to allow universities to orchestrate the recovery of regional innovation ecosystems?"

In this context, we chose a unique case study that exemplifies how universities have been using capabilities to take on the role of fostering and orchestrating regional innovation ecosystems. The case studied is in the south of Brazil, where an alliance formed by three universities was founded to recreate an innovation ecosystem that is in decline. The city of Porto Alegre, capital of the state of Rio Grande do Sul, has always been one of the most thriving and developed regions in Brazil. Even today it is one of the urban centres with the highest numbers of human resources' training and is home to the most recognized and awarded structures and environments for the promotion of innovation in Brazil (Zen et al., 2018). However, despite these characteristics, in recent years it has been difficult to retain talents trained in the ecosystem, entrepreneurs have rare interactions, the number of start-ups does not advance as in other regions, and the local stories told by people about public safety and the ability to innovate are very negative (Zen et al., 2018). It is in this scenario that we unpacked the critical role played by dynamic capabilities of the alliance of universities, based on the practices employed to boost the regional innovation ecosystem.

Dynamic Capabilities Applied to Universities and Innovation Ecosystems

The management process of companies can inspire the management of universities due to the complexity and multiple roles that universities are currently playing. Changes taken place internally to respond to externalities show the importance of strategic management for these organizations (Benneworth et al., 2016). That is why the management of universities is increasingly closer to the management of other types of organizations; however, universities have a different operating logic, being mainly public and non-profit. Therefore, management concepts need to be adjusted to universities' logic.

Currently, universities play an increasingly important role in regional economic development and in supporting innovation (O'Reilly et al., 2019). Universities are key players in the production and dissemination of knowledge, considering the new challenges of the knowledge-based economy (Bejinaru, 2017). They operate within an innovation system in which knowledge transfer activities are positioned within a triple helix of relations between universities, government, and industry (Yuan et al., 2018). Thus, many academic leaders came to understand modern universities as the nucleus of an innovation ecosystem, including public and private actors (Heaton, Lewin, et al., 2019).

Universities, as part of a continually changing innovation system, need to remain flexible to deal with changes and fluid boundaries between public and private domains (Yuan et al., 2018). They undergo intense transformation processes and are questioned about their ability to face the challenges of technological development, rapid business, and social change (Bejinaru, 2017). Universities can become a central actor for the growth of their ecosystems by applying their intellectual, financial, and reputation capital in a strategic way to establish and maintain a robust environment (Heaton, Siegel, et al., 2019). However, the context in which universities are inserted and the characteristics of the university in terms of resources, recognition, and research skills vary and must be considered when analysing universities' engagement with the regional ecosystem (Benneworth et al., 2016).

Innovation ecosystems are considered environments with dynamic and changing characteristics over time. Ecosystems evolve and are successful when they can adapt to the conditions of regulatory and business environments (Heaton, Siegel, et al., 2019). An innovation ecosystem is the "evolving set of actors, activities, and artifacts, and the institutions and relations, including complementary and substitute relations, that are important for the innovative performance of an actor or a population of actors" (Granstrand & Holgersson, 2020, p. 3). The foundation of ecosystem thinking can be characterized as expanding an actor's capabilities beyond its own limits and transferring knowledge for the purpose of innovating in collaboration with others (Adner, 2006). The main classes of actors evidenced in ecosystem studies are close to the definitions of triple helix from the studies of Etzkowitz and Leydesdorff (2000): university, industry, government. Recently, researchers pointed out to the civil society as a new class of actors involved (Carayannis & Campbell, 2009).

When considering different economic contexts, the role of actors in the ecosystem may differ. Thomas et al. (2020) argue that universities in emerging economies, due to many social challenges, must go beyond their missions of teaching, research, and collaboration with industry for innovation. Their study demonstrates that the role of universities as place leaders could be linked to ecosystem orchestration. The concept of ecosystem orchestration applied to universities comes from the perspective of dynamic capabilities (asset orchestration) and is also related to the concept of network orchestration.

The asset orchestration refers to managerial research, selection, configuration, and coordination of resources and capabilities, especially in dynamic scenarios (Helfat et al., 2009). In the context of innovation ecosystems, asset orchestration includes the notion of building consensus between the parties and persuasion so that actions and investments are channelled towards a growth set (Heaton, Siegel, et al., 2019). Such actions occur, for example, through meetings with interested parties, conferences to create initial impulses, and joint efforts to obtain necessary legislation. This approach combines with the network theory literature, which conceptualizes network orchestration as several actions carried out by a central organization in an intentional and determined way to achieve a common objective to create and extract value from the network (Dhanaraj & Parkhe, 2006; Paquin & Howard-Grenville, 2013; Faccin et al., 2020).

The theoretical lens from dynamic capabilities allows an appropriate understanding of universities' administration by offering a structure developed for strategic management (Teece, 2018) assisting in the analysis of universities' activities in their complex scenario (Heaton, Siegel, et al., 2019). In ecosystems' orchestration carried out by universities, the framework contemplated by dynamic capabilities helps in framing problems and prioritizing the diverse competing demands for resources within universities (Heaton, Siegel, et al., 2019).

Universities that develop dynamic capabilities are placed in an appropriate position to exercise strategic leadership in the innovation ecosystem, allowing innovations generated by the interactions between academia, industry, and government to move from laboratories to the world (Heaton, Siegel, et al., 2019). In this respect, the most relevant dynamic capabilities are contemplated in three clusters that co-occur throughout the organization and constitute continuous processes that support institutional renewal: sensing and shaping opportunities, seizing opportunities, and reconfiguring internal assets in order to maintain competitiveness (Teece, 2018).

In the *sensing dimension*, universities' abilities to discover opportunities are located (Yuan et al., 2018). Universities have a complex and fragmented structure, with diverse elements and interactive units and regulated by structural and social control (Hölttä & Nuotio, 1995), with which they can develop these skills. These capabilities are present in the initial period of the innovation ecosystem, characterized by few connections, a limited identity (the ecosystem does not yet have a well-developed identity and legitimized by the actors

and stakeholders) and marked by the beginning of cooperation between the actors (Heaton, Lewin, et al., 2019). At this stage, universities can contribute to producing and attracting the human capital required for innovation, generating new knowledge within the ecosystem, and creating the preconditions to guarantee the presence of research and dissemination in regional technological fields (Heaton, Lewin, et al., 2019). University formal and informal leaders play an essential role in sensing activities, by detecting opportunities, threats, and soliciting new ideas on and off campus to produce a continuous learning process (Heaton, Lewin, et al., 2019). Leaders can engage partners and teachers to identify promising medium and long-term technologies, allowing the university to take a direct role in orchestrating assets to attract partners to the ecosystem (Heaton, Siegel, et al., 2019).

After identifying opportunities and advancing the innovation ecosystem to the development stage, in which a number of connections, start-ups, and jobs increases, universities start to assist in the activities of the *seizing* dimension (Heaton, Siegel, et al., 2019). Seizing capabilities seek to convert opportunities into actions and involve harnessing the resources of internal and external stakeholders to meet different objectives (Heaton, Lewin, et al., 2019). Adequate seizing requires a systemic view of the university's complexity and its environment, as well as top-down decision-making to ensure the timely selection of alternatives (Teece, 2018). Universities are inserted in a complex and dynamic political environment that exerts pressure and affects university dynamics, requiring resilience to adapt and diversify its mission (Pinheiro & Young, 2017). In this sense, the university can orchestrate the flow of information across the innovation ecosystem, establish connections between the actors, and develop outreach activities (Heaton, Siegel, et al., 2019).

Thus, universities can promote entrepreneurship with training programmes, accelerators, and incubators; assist in accessing tangible and intangible resources; and foster the fluidity of knowledge in several directions within the innovation ecosystem (Heaton, Siegel, et al., 2019). The way universities foster entrepreneurship varies according to the context and to the different roles played in the development of regional innovation ecosystems (Gunasekara, 2006). These roles are shaped according to several factors linked to the university's own history and characteristics such as those related to regional specificities (political economic and industrial conditions).

Finally, the *reconfiguring* dimension includes the ability to recombine and reconfigure organizational resources as markets, technologies, and the size of firms change, that is, its evolutionary fitness (Teece, 2007). In the context of innovation ecosystems, evolution and transformation are necessary. An ecosystem can have high performance over time if it manages to evolve with markets and technologies, renewing its resources and capabilities to face new innovation waves (Heaton, Siegel, et al., 2019). Thus, universities can help transform the ecosystem, leading the process of organizational and institutional change (Heaton, Siegel, et al., 2019). On the other hand, the dynamism of innovation ecosystems can put pressure on universities to change and adapt. So the

development of dynamic capabilities can also help universities to adapt more quickly to address the mutation of innovation ecosystems.

These movements require new leadership in relationships with different stakeholder groups (Leih & Teece, 2016). Place leadership plays an essential role so that different regions can reinvent themselves and branch out on a new path with balanced and sustainable regional development (Sotarauta et al., 2012). Considering the conjuncture of innovation ecosystems and the place leadership role that universities can play in this context, the strategic tools applied to organizations are relevant. Thus, we analyse the dynamic capabilities of universities in the dimensions of sensing, seizing, and reconfiguring and their respective practices to recover an ecosystem that needs to be recreated.

Method

To discuss how universities use dynamic capabilities to take on the role of fostering and orchestrating the recovery of regional innovation ecosystems, we chose a unique case study (Stake, 1995). Three universities in the city of Porto Alegre, in the south of Brazil, are taking a new role in their region: they are organizing, motivating, and supporting a network of stakeholders to drive the regional ecosystem. The project called "Alliance for Innovation" had its official launch in 2019, following discussions initiated in 2017. The project's core aim is to recreate and boost the region into an environment conducive to innovation and entrepreneurship.

The three universities are research-oriented and have a large experience in projects with the industry and government. All of them host technology parks and start-up incubators. Universidade Federal do Rio Grande do Sul (UFRGS) is a public university founded in 1934. Pontifical Catholic University of Rio Grande do Sul (PUCRS) is a private non-for-profit university founded by Marist Brothers (religious congregation) in 1948. And Universidade do Vale do Rio dos Sinos (UNISINOS) is a private non-for-profit university founded by the Jesuit Network (religious congregation) in 1969.

The data collection included interviews, participant observation, and secondary data such as websites, newspaper, and magazine reports during 2019 and 2020. We interviewed 41 people in two distinct stages. The interviewees are divided into four stakeholder groups, made up of (a) university staff (pro-rectors, managers, students, and professors – 11 respondents); (b) local government (7 respondents); (c) local entrepreneurs (12 respondents); and (d) representatives of civil society (industry associations, NGOs, and so on, – 11 respondents). There are over 20 hours of recorded interviews and a total of over 100 pages of transcripts. In addition, one of the authors spent approximately 100 hours involved in the planning steps of the Alliance's actions (an average of 4 hours per week for the first 6 months of the project), gathering important details to ensure the triangulation of the research. In addition, the researchers built an inventory of more than 100 web links with reports and interviews about the case.

Data were analysed using the content analysis technique (Hsieh & Shannon, 2005) and was developed around a framework of dynamic capabilities using the following categories, according to Teece (2007, 2018): sensing and shaping opportunities, seizing opportunities, and reconfiguring.

Findings and Analysis: The Case of Alliance for Innovation from the Perspective of Dynamic Capabilities

Porto Alegre is the capital of Rio Grande do Sul, the southernmost state in Brazil. Porto Alegre is among the top three cities in the country with the greatest impact on the formation of qualified human resources, being home to the best science parks in Brazil, in addition to a set of start-up incubators (Zen et al., 2018). Yet, despite its apparent economic condition, Porto Alegre has been suffering a series of recurring problems linked to public safety, quality of life, talent retention, and creation of start-ups (Zen et al., 2018). These characteristics present a very particular situation related to the process of development of innovation ecosystems: in Porto Alegre, the efforts committed by universities are largely linked to the process of *recreating* the ecosystem, reflected in the development of start-ups, retention of talents, increased interactions between the members of the ecosystem, boosting established sectors through collaboration with start-ups, creation of a new local identity and the stimulation of an environment that encourages talents to think in creative ways.

Sensing DC to Boost the Innovation Ecosystem

In January 2017, the mandate of a new city government in Porto Alegre started with the plan for the future of the region. Discussions were expanded among other regional actors such as firms, industry associations, start-up incubators, universities, and civil society organizations. All actors agreed that Porto Alegre and its metropolitan area needed not only to solve long-lasting social issues, such as unemployment, inequality, and crime, but also to develop an ecosystem towards innovation and entrepreneurship based on the already recognized characteristics from the past.

Firstly, the three universities actively contributed to identify opportunities and initiate the cooperation among the few actors present in mid-2017. The previous involvement of universities in innovation projects allowed the identification of needs and opportunities to be addressed within the scope of an innovation ecosystem. It became the force for the establishment of the "Alliance for Innovation". This initial scenario already shows us the presence of dynamic capabilities in universities, as according to Schoemaker et al. (2018), these capabilities assist in the identification and orchestration of skills and configuration of assets to act in an agile and innovative way.

At the beginning of 2018, large local entrepreneurs and industry associations came together and stated that they would financially support a project for the development of the region. However, they did not wish the project

to be coordinated by the government (for several reasons that go beyond the scope of this chapter, mainly the reputation and long-term compromise). Proactively taking that role, the universities signed the agreement titled "Alliance for Innovation" on April 9, 2018. Then, with the mayor of the city, the Alliance signed its first large project, titled "Pacto Alegre", nominating 16 people, from 3 universities and government, to run and support the activities. A Spanish consultant with large experience in developing innovation ecosystems in Brazil and in other countries was hired, and the universities started to engage local stakeholders into the movement.

Between July and November 2018, the universities' pro-rectors held more than 80 meetings with local entrepreneurs to present the Alliance's aim and the project Pacto Alegre. Also, a major media company joined the project and started publishing a weekly chronicle in the newspaper highlighting the importance of a functioning ecosystem where several stakeholder groups are actively engaged. The purpose was to raise awareness in the region and actively engage with key actors from industry and from civil society.

Three banks joined the project and provided funds to pay the consultant. Around the same time, Alliance representatives joined visiting missions to the United States and Colombia, to learn about ecosystem development and to identify opportunities for the city of Porto Alegre. According to the some of the Alliance representatives they "*asked each institution to dedicate time to work for the Pacto and to put good people in it*" (I5).

The initial public movement was represented by a seminar with the involvement of the government, companies, and universities and the maturation of the ideas that emerged in this meeting. Based on that, at the beginning of the following year, it became possible to establish the union of these different parts to structure the Pacto Alegre with the management of the universities. This shows how universities become central players in fostering a robust innovation ecosystem and asset orchestration, by building consensus for an action strategy to boost initial activities (Heaton, Siegel, et al., 2019), as pointed out by the interviewers: "*[W]e received extraordinary support from the universities, it was fundamental to face challenges*" (I1). This movement shows the ability of universities to sense the opportunities, identifying possibilities for action in line with the needs and developments that occurred in their socio-economic environment (Teece, 2007).

The next step was to formalize a Board of Directors with the main stakeholders from the movement. Representatives from the universities visited each of the organizations, from November 2018 to March 2019, to discuss roles and responsibilities. The Board of Directors is composed of 75 organizations: 6 universities, 5 other educational organizations, 1 start-up incubator, 5 start-ups, 15 large companies, 33 business associations, 1 non-governmental organization, and public administration agencies. Based on an ecosystem mapping made by the Alliance members, regional needs were catalogued into six "grand challenges": city identity, public administration modernization, talents and knowledge, business environment, urban transformation, and quality of life.

In this initial stage of ecosystem boost, we also perceive other processes of dynamic capabilities in the dimension of the sensing of universities regarding the ability of their leaders to engage and attract partners and teachers to identify technologies and solutions (Heaton, Siegel, et al., 2019). The three universities, after establishing the Alliance for Innovation agreement, signed the broader Pacto Alegre project, engaging consultants, financial organizations to provide funds for the project, several entrepreneurs, and a large media company. During the interviews, some people highlighted that "*some people are very important in the governance board, like the rectors, because they have very broad relationships with many actors and they trust them. So, we were able to access these people very quickly*" (I13). Thus, universities began the regional coalition building (Normann, 2013) in the innovation ecosystem and allowed interaction between academia, industry, and government as referred by Heaton, Siegel, et al. (2019) as the sense dimension.

Seizing DC to Boost the Innovation Ecosystem

In order to plan how to solve the six grand challenges and improve the innovation ecosystem, the executive group of the Board of Directors invited people from civil society, universities, government, and companies for workshops that took place at one of the universities in 2018. From the workshops, the participants created 29 projects. Each project has a different coordinator organization and time span, and the groups are self-organized. According to one of our interviewees, "*from the workshops, a series of projects emerged, which were filtered, and the Table meetings were reached*" (I10). From these initial movements, we realized that universities developed processes to take advantage of the opportunities and challenges identified in the region. With the formalization of the Board of Directors, universities visited the different organizations that became part of the project to discuss and establish roles and responsibilities. This movement shows that the university, as a strategic actor in the ecosystem, orchestrates the flow of information, activities, and connections between the actors, linked to what Heaton, Siegel, et al. (2019) term "capabilities of seizing opportunities". Thus, with these university-oriented movements, it was possible to bring together 75 organizations, define the 6 most prominent challenges, and create a total of 23 separate projects – "*bringing together 75 entities to debate innovation projects, with a focus on innovative entrepreneurship, is the first major achievement of this university project*" (I8). All the 75 organizations involved have the same power of decisions and actions and represent universities, industries, different levels of government (state, city), and civil society. It shows the universities' ability to build trust and commitment together with external actors, which is in line with the capability to seize opportunities (Teece, 2007).

Members of the executive group from the Pacto Alegre project act as project managers, helping project coordinators to achieve partial milestones and to present them to the community.

Table 4.1 Universities' practices and the clusters of dynamic capabilities

Practice employed by universities	*Associated dynamic capability*
Speeches for mobilizing regional stakeholders and consultant speeches	SENSE
Creation of a Board of Directors	
Ecosystem mapping workshops	
Missions to other regions and abroad	
Documenting official actors' commitment to participate	
Mobilization meetings by pro-rectors	SEIZE
Document officializing actors' commitment to participate	
Projects' co-creation workshops	
Voting to approve projects and partners involved in each project	
Universities named people to facilitate activities with the network of stakeholders	RECONFIGURING
Each of the 29 projects has one coordinator	
Universities transferred responsibilities to the community to boost the ecosystem	

Reconfiguring DC to Boost the Innovation Ecosystem

Based on the projects created by the community, the Alliance was able to organize a set of initial actions to promote the restart of the ecosystem. The reconfiguring dimension includes the ability to recombine and reconfigure organizational resources as markets, technologies, and the firms change over time. The universities can help transform the ecosystem, leading the process of organizations' change that is active in the ecosystem. In order for the transformation to be possible, the university appointed a leader for each of the co-created projects. One of the project leaders highlighted that "*the strategy was to always appoint a member to monitor and facilitate these projects . . . volunteers from the universities and the city hall*" (I4). This leader is responsible for managing the project, maintaining the objectives, and achieving the planned activities. The responsibility for the results is shared with the entire local community. It is at this stage that the transformation of the territory begins. The Pacto projects "*are developing over the years . . . in my perception, some are still immature and some projects are long-term . . . they are not expected to happen in the short term*" (I8).

The identification of universities' practices in the Alliance of Innovation and their relationship with each of the three clusters of dynamic capabilities (the processes of sensing, seizing, and transforming) are summarized at Table 4.1.

Discussion and Conclusions

Universities can lead the transformation of the innovation ecosystem; however, this change does not always occur through technological renewal, as suggested by Heaton, Siegel, et al. (2019). The evidence from the Alliance for Innovation case presents a different logic, in which the ecosystem has been renewed

through universities' orchestration of a stakeholders' network. The local ecosystem has characteristics such as few start-ups, rare interactions between the members of the ecosystem, stagnation of established sectors, and negative environments. Thus, in order to carry out these processes, universities were configured as orchestrator agents in the innovation ecosystem and needed the combination of the three key clusters of dynamic capabilities (sensing, seizing, and transforming). With that, universities acted to lead local initiatives to revitalize its neighbourhoods; to enhance communication and cooperation among ecosystem participants; and to organize, motivate, and support a network of stakeholders to drive the ecosystem boost. Universities use the reconfiguration capability to make these key decisions and transform the city's innovation ecosystem.

In this sense, we have discovered a new stage of development for innovation ecosystems, expanding the phases proposed by Heaton, Siegel, et al. (2019). The boost stage is a phase in which an existing innovation ecosystem requires an agent to be the propellant and revitalizer for its development cycle to be resumed and expanded. Thus, as shown in Table 4.2, on the boost stage, the three key dynamic capabilities need to be combined to enable universities to foster and orchestrate the innovation ecosystem.

As demonstrated in the study by Heaton, Siegel, et al. (2019), different stages of development and evolution of an innovation ecosystem require different key dynamic capabilities. In this study, we propose to expand these steps, including an additional stage for the innovation ecosystem, as shown in Figure 4.1. When an existing innovation ecosystem needs to be leveraged to reconnect the different parts, to revitalize the region (after the decline), and to allow the creation of new companies, the three key dynamic capabilities need to be present. With this, the orchestrating agent will be able to manage the different actors and needs, reconfiguring the ecosystem and allowing the resumption of its development and growth.

The case of the Alliance for Innovation provides an interesting example of how universities can become central players in the regional change, discussing the dynamic capabilities that enable them to orchestrate relationships to boost an innovation ecosystem. Figure 4.1 shows the representation of the contribution of this chapter. It is possible to find the three stages of ecosystem development pointed out by Heaton, Siegel, et al. (2019), with the appropriate capabilities that are mobilized in each stage. Heaton, Siegel, et al. (2019) demonstrate that in the early stages of the ecosystem, the university acts as an attractor of companies, talents, and resources and in the formation of the necessary structure to foster innovation, where sensing is the essential dynamic capability; while in the stages of ecosystem development, the university functions as a consolidator, where seizing is essential. Besides, the authors emphasize that the capacity "transforming" is essential to promote changes in the activities developed in an ecosystem, when there is stagnation, and it is necessary to explore new areas – what they call the "renewal stage".

Table 4.2 Dynamic capabilities to boost innovation ecosystems

Stage of the innovation ecosystem and university functions	*Initial stage*	*Development stage*	*Renewal stage*	*Boost stage*
Characteristics	⋆ Few enterprises ⋆ Rare interactions between the members of the ecosystem ⋆ Low identity	⋆ Supporting agencies and organizations become active participants ⋆ Inter-firm and professional networks become well established	⋆ Stagnation of established sectors ⋆ Patenting activities shift towards new domains	⋆ Few start-ups ⋆ Rare interactions between the members of the ecosystem ⋆ Stagnation of established sectors ⋆ Negative environments
University functions	Attractors	Consolidators	Change agents	Orchestrator agent
Key dynamic capabilities	Sensing	Seizing	Transforming	Combination of three key dynamic capabilities: sensing, seizing, and transforming
Key decisions by universities	⋆ Identified key fields for new research programmes ⋆ Placed new emphasis on research and entrepreneurship ⋆ Provided infrastructure for collaboration with private technology companies	⋆ Fostered generation of new ventures ⋆ Enhanced level of communication and cooperation among ecosystem participants ⋆ Built linkages between university and local firms	⋆ Developed a strategy that transforms its external environment ⋆ Lead local initiatives to revitalize its neighbourhoods ⋆ Reoriented its culture	⋆ Lead local initiatives to revitalize its neighbourhoods ⋆ Enhanced level of communication and cooperation among ecosystem participants ⋆ organizing, motivating, and supporting a network of stakeholders to drive the regional ecosystem

Source: Adapted and expanded from Heaton, Siegel, et al. (2019)

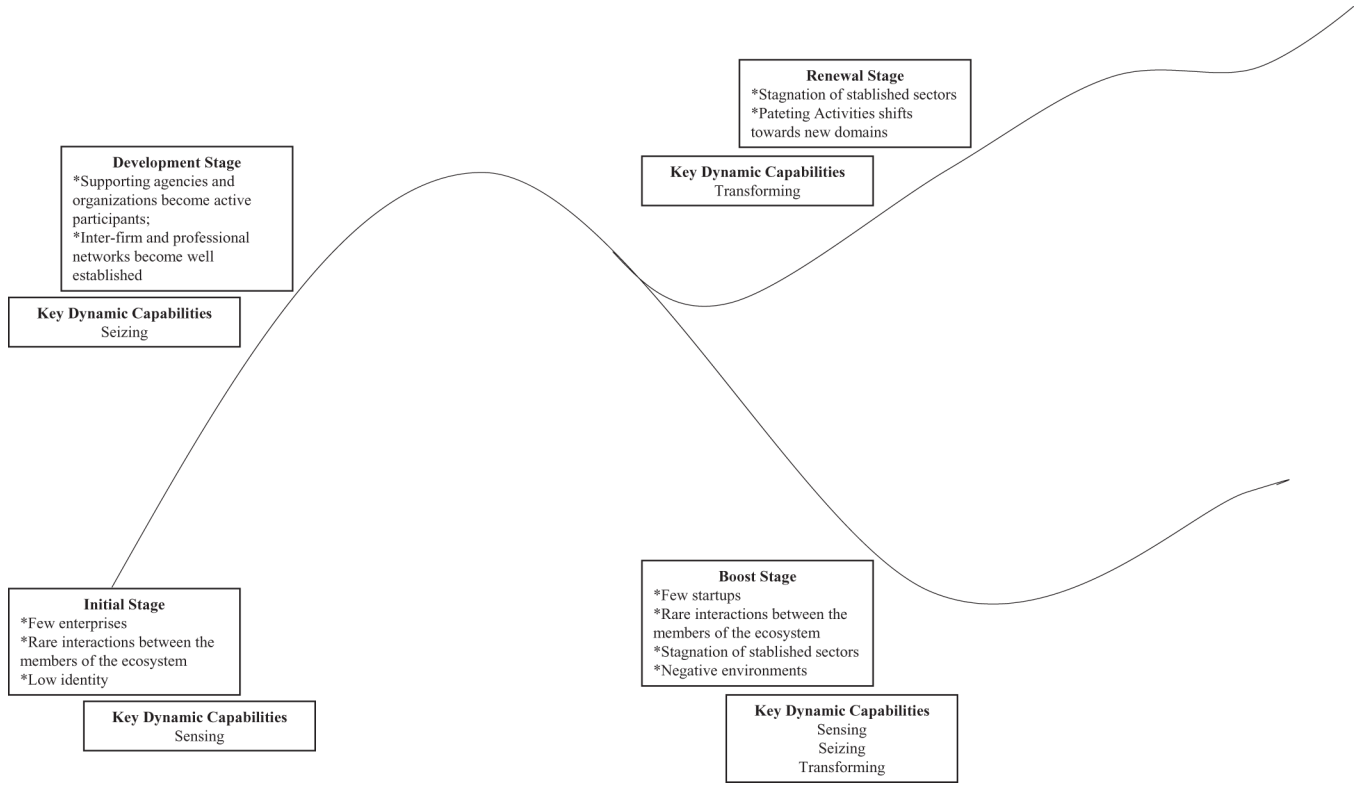

Figure 4.1 Stages of innovation ecosystem

Source: Author based on Heaton, Siegel, et al. (2019)

What we are proposing is a new stage (which you can see in Figure 4.1), which is not linked to the renewal provided by the stagnation of traditional sectors where the role of the university is focused on supporting the exploration of new domains. The Brazilian case allowed us to identify a new stage of ecosystem development, very common in countries of the Global South. This new stage is linked to a situation of economic decline (not stagnation), where it is necessary to recover the links of the regional social capital for a new proposal to emerge together with the actors. For this reason, we demonstrated in our research that to "boost" the ecosystem requires an effort and the mobilization of the three dynamic capabilities. And when ecosystems are in declining stages, universities can act as agents of transformation and lead the ecosystem transformation.

We can summarize the main findings of this study in three points: (a) when studying a Latin American context, we found that there is a stage of ecosystems "development" that was not contemplated by the studies by Heaton, Siegel, et al. (2019) – the boost stage when ecosystems are in a complete decline; (b) in contexts where boosting the ecosystem is necessary, the university assumes an important role – that of orchestrator; (c) as an orchestrator (which implies collaboration and not isolation), the university needs to mobilize its sensing, seizing, and transforming capabilities at different times, given the complexity in which the scenario presents itself. This is different from the finding by Heaton, Siegel, et al. (2019) for the earlier stages where one or another dynamic capacity was more mobilized.

Although the objective of the chapter was to analyse the university, this does not mean that it is possible for an isolated actor to be able to transform the ecosystem. However, the adopted framework allows us to see the potential that this actor has to transform the realities in the territories in which it operates. This consideration is essentially important for scenarios in emerging countries, where confidence in governments and institutions is somewhat eroded by the constant episodes of corruption, for example. That is, it was only possible for the Alliance of Universities to orchestrate the recovery of the ecosystem (boost the ecosystem) because it is part and is embedded in the ecosystem (as a necessary but not sufficient condition) where university's efforts are only leveraged by the presence of other exogenous factors and actors.

The case analysis of the Alliance for Innovation showed us the importance of universities taking on a prominent role in boosting the innovation ecosystem and developing dynamic capabilities to orchestrate this ecosystem. It is aligned with Heaton, Siegel, et al. (2019) argument that when there are elements to form an ecosystem, but they cannot come together, a strong participant can take the lead and orchestrate that ecosystem's resources. In this regard, we found that the study by Heaton, Siegel, et al. (2019) presents the idea that the asset orchestration in the context of the innovation ecosystem already encompasses the notion of network orchestration. That is, universities, in addition to managing resources and assets, also have the role of persuading and creating a consensus among different actors, so that actions and investments are in favour of a common and joint objective. Thus, we suggest that future studies can integrate

the literature of dynamic capabilities and asset orchestration with the concepts and elements of network orchestration more deeply. This will generate greater details in the analysis of innovation ecosystems' movements and evolution, as well as present strategies for the development of these ecosystems based on a broader range of elements that must be considered.

The case of the Alliance for Innovation is a recent initiative that is still structuring many activities. Thus, in the reconfiguring dimension, we are still unable to visualize results from the actions that provide the recombination and reconfiguration of resources. Reconfiguration competence would help avoid unfavourable trajectories as routines are developed, which guarantee the effectiveness in the orchestration of the ecosystem. Over the years of this innovation ecosystem's development, we will be able to analyse its evolution and transformation according to internal and external changes.

It is important to highlight that when deciding to use some practices to boost the ecosystem of the city of Porto Alegre, the university alliance suffered tensions and many challenges were presented. These challenges and tensions certainly also influenced decisions about the adoption of each practice. For example, the mobilization meetings held personally by the prorectors demonstrate that "power" and "hierarchical levels" matter in this society. However, given that the objective was to understand how they were mobilized and what are the dynamic capacities that "matter" in this activity, questions were not inserted to allow exploring why certain actions were adopted or even what challenges were faced. In this sense, a new opportunity for research emerges.

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