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The role of individual orchestrators of innovation hubs: A multiple case study in the south of Brazil

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Abstract

Objective of the study: Innovation hubs have taken on a leading role in innovation-led regional development. This article seeks to understand the role of the individual orchestrators of innovation hubs from different stages.
Methodology: A multiple case study was conducted with three reference innovation hubs – Instituto Caldeira, Instituto Hélice, and Aliança Empresarial, located in different regions of the State of Rio Grande do Sul (RS), Brazil, with different market characteristics, sizes, and involvement with innovation.
Originality/Relevance: The work's originality lies in understanding the role of the individual who is orchestrating the innovation hubs. Previous literature has focused on orchestration activities but has not considered who would perform this task.
Main results: Unlike what is mentioned in the literature, we discovered that the orchestrator needs to act on a multi-level. This study, therefore, presents a model to guide the role of individual orchestrators of innovation hubs.
Theoretical/Methodological contributions: This study opens the black box of the orchestrator's role and explores the individual level of orchestration. From this, it contributes to a role that operates at the operational, tactical, and strategic levels.
Social/management contributions: The categorization provides a managerial framework to assist in the organization, development, and orchestration of innovation hubs. The research contributes to defining the roles of individual orchestrators in practice, helping hubs of different formats to promote more innovation from their relationships.

Keywords: innovation hubs, orchestration, orchestrator

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Resumo

O papel dos orquestradores individuais dos polos de inovação: Um estudo de casos múltiplos no sul do Brasil

Objetivo: Os polos de inovação têm assumido um papel de liderança no desenvolvimento regional liderado pela inovação. Este artigo busca entender o papel dos orquestradores individuais dos polos de inovação.

Metodologia: Foi realizado um estudo de caso múltiplo com três ecossistemas de inovação de hubs de inovação de referência - Instituto Caldeira, Instituto Hélice e Aliança Empresarial, localizados em diferentes regiões do Estado do Rio Grande do Sul (RS), Brasil, com características variadas de mercado, tamanhos e envolvimento com a inovação.

Originalidade/Relevância: A originalidade do trabalho está na compreensão do papel do indivíduo que está orquestrando os polos de inovação. A literatura anterior se concentrou nas atividades de orquestração, mas ainda não considerou quem executaria essa tarefa.

Principais resultados: Descobrimos que o orquestrador precisa agir em vários níveis, ao contrário da literatura. Portanto, este estudo apresenta um modelo para orientar o papel dos orquestradores individuais dos centros de inovação.

Contribuições teóricas/metodológicas: Este estudo abre a caixa preta do papel do orquestrador e explora o nível individual de orquestração. A partir disso, ele contribui para uma função que opera nos níveis operacional, tático e estratégico.

Contribuições sociais/gerenciais: A categorização fornece uma estrutura gerencial para auxiliar na organização, no desenvolvimento e na orquestração de centros de inovação. A pesquisa contribui para definir as funções dos orquestradores individuais na prática, ajudando os hubs de diferentes formatos a promover mais inovação a partir de seus relacionamentos.

Palavras-chave: polos de inovação, orquestração, orquestrador

Resumen

El papel de los orquestadores individuales de los polos de innovación: Un estudio de casos múltiples en el sur de Brasil

Objetivo del estudio: Los polos de innovación han asumido un papel protagonista en el desarrollo regional impulsado por la innovación. Este artículo pretende comprender el papel de los orquestadores individuales de los polos de innovación.

Metodología: Se realizó un estudio de caso múltiple con tres ecosistemas de innovación de hubs de innovación de referencia - Instituto Caldeira, Instituto Hélice y Aliança Empresarial, ubicados en diferentes regiones del Estado de Rio Grande do Sul (RS), Brasil, con características variables de mercado, tamaños e implicación con la innovación.

Originalidad/Relevancia: La originalidad del trabajo reside en la comprensión del papel del individuo que orquesta los polos de innovación. La literatura anterior se ha centrado en las actividades de orquestación, pero aún no ha considerado quién realizaría esta tarea.

Principales resultados: Descubrimos que el orquestador debe actuar en varios niveles, a diferencia de lo que se indica en la bibliografía. Por lo tanto, este estudio presenta un modelo para orientar el papel de los orquestadores individuales de los polos de innovación.

Aportaciones teóricas y metodológicas: Este estudio abre la caja negra del papel del orquestador y explora el nivel individual de la orquestación. A partir de ahí, contribuye a una función que opera a nivel operativo, táctico y estratégico.

Contribuciones sociales y de gestión: La categorización proporciona un marco de gestión para ayudar en la organización, el desarrollo y la orquestación de polos de innovación. La investigación contribuye a definir las funciones de los orquestadores individuales en la práctica, ayudando a los hubs de diferentes formatos a promover más innovación a partir de sus relaciones.

Palabras clave: polos de innovación, orquestación, orquestador

The role of individual orchestrators of innovation hubs: A multiple case study in the south of Brazil

In today's business world, organizations face a different market logic characterized by a people-centered culture across all areas (Penhalbel & Codecco, 2016), significant technological impacts accompanied by rapid social changes, and collaboration as an indispensable skill. In this scenario, innovation represents the central process of renewal within organizations (Bessant, 2003). Innovation ecosystems, which are structures of value co-production and organizational

collectivities that combine efforts to create a coherent space and deliver value to a specific audience, are gaining increasing importance (Granstrand & Holgersson, 2020). As a leader in this ecosystem, the orchestrator stands out by creating and extracting value from the environment through a set of intentional actions, learning to exploit its resources (Dhanaraj & Parkhe, 2006).

One of the biggest challenges in the innovation ecosystems is their orchestration (Foos, Schmidt, & Teece, 2023). Orchestration can be characterized by the coordination of different actors and actions (Hurmelinna-Laukkanen, Nätti, & Pikkarainen, 2021). The orchestration of innovation ecosystems (Dhanaraj & Parkhe, 2006) is not a new issue, but discussion of the phenomenon has increased in recent years (Hurmelinna-Laukkanen, & Nätti, 2017; Mignoni et al., 2021; Autio, 2022). The literature on the orchestration of innovation networks and ecosystems comes up with three main dimensions from the perspective of a single orchestrator (Dhanaraj & Parkhe, 2006), in the context of a hub company.

Discussions are currently focusing on the roles and activities of these orchestrators (Nilsen & Gausdal, 2017; Johnsson, 2018; Hurmelinna-Laukkanen & Nätti, 2018; Reypens et al., 2021; Mignoni et al., 2021). However, they have not yet made progress in understanding the individual level of orchestration (Abootorabi et al., 2021; Theodoraki, 2020; Theodoraki, Dana, Caputo, 2022). In addition, there is another gap in the literature, which is the difference in the roles of the orchestrator depending on the stage of development of the innovation ecosystem. (Bittencourt et al., 2021).

Orchestration in these environments is necessary, but it is still important to understand the role of individual orchestrators in innovation ecosystems, that is, how and what to do to orchestrate effectively (Valkokari et al., 2017). Autio (2021) comments that there is a lack of research focused on how to successfully orchestrate an innovation ecosystem from inception to maturity. This theoretical gap is also identified by Piquée et al. (2019), Cantner (2020), Bittencourt et al (2021), and Lobo et al. (2024), authors who emphasize the necessity for further studies on the stages of the ecosystem life cycle and maturity.

In addition, multilevel studies present an intrinsic complexity, which makes studies that look at each level separately essential to unravel the dynamics that occur within ecosystems (Letaifa & Rabeau, 2013; Simatupang et al., 2015; Theodoraki & Messeghem, 2017). Thus, looking at orchestration in the different ecosystem life cycles and at their different levels can bring great contributions to ecosystem studies.

In this study, we will use innovation hubs as a context. Innovation hubs are environments in which different organizations exchange and interact for the promotion of innovation, therefore we will use them as a synonym for innovation ecosystems (Theodoraki, Dana & Caputo, 2022; Haukipuro, Väyrynen & Pikka, 2024). According to Moore's (1993) definition, innovation ecosystem refers to a loosely interconnected network of companies and entities that coevolve capabilities around a shared set of technologies, knowledge, or skills, and, in cooperation, develop new products and services.

This study aims to understand the innovation hubs orchestrators' role in its different stages. Autio (2021) notes that although the ecosystem orchestrator is typically the central firm, any ecosystem participant can engage in orchestration activities to shape the functioning of the ecosystem. According to Hurmelinna-Laukkanen & Natti (2018), orchestration has sparked the interest of academics and managers, but most studies are linked to the functions of orchestrators in complex environments (Pikkarainen et al., 2017; Bittencourt et al., 2020; Gomes et al, 2022). The research is justified by its contribution to defining the roles of individual orchestrators in practice, assisting developing or established innovation hubs in organizing their orchestration to achieve goals and evolve with an innovation culture.

As a methodological choice, a multiple case study was conducted with an analysis of institutional documents and semi-structured interviews with key actors from three reference innovation hubs: Instituto Caldeira, the most developed innovation hub in Rio Grande do Sul and a key player in the innovation ecosystem of Porto Alegre, the state capital; Instituto Hélice, a mid-sized innovation hub and key player in the innovation ecosystem of Caxias do Sul, the state's second-largest city; and Aliança Empresarial, an emerging innovation hub and key player in the innovation ecosystem of Passo Fundo, a regional agricultural center in the state. These regions exhibit different market characteristics, sizes, and levels of engagement with innovation.

The article is organized into 6 sections. Sections 2 and 3 present the theoretical bases and methodological choices that served as the basis for the analyses. Section 4 covers the presentation of the cases. The evidence is discussed in section 5, and finally, section 6 covers final considerations, weaknesses, and opportunities for future studies. (Where is section 1?)

Theoretical Background

Innovation Ecosystem

The term ecosystem was introduced to the field of management with the proposition of a business environment where companies work by cooperating and competing, aiming for the co-evolution of capabilities around an innovation (Moore, 1993). In a short time, in the innovation literature, the use of innovation ecosystems came to be conceptualized by collaborative agreements, which allow companies to combine their specific offerings into customer-oriented solutions (Adner, 2006).

Innovation ecosystems are structures of value co-production and organizational collectivities that combine efforts to create space, delivering value to a specific audience (Granstrand & Holgersson, 2020). The stakeholders embedded in the ecosystems are engaged as co-creators – public, private, academic, and non-governmental actors such as universities, corporate organizations, incubators, investors, startups, and local authorities, with different goals and values, but connected by the dimensions of the ecosystem (Bittencourt et al., 2020).

The ecosystem structure is fundamental as a competitive strategy for value co-creation and co-production (Autio, 2021). It is important for regional and socio-economic development (Oliveira & Carvalho, 2017). It can emerge and grow organically; however, the process can be managed through conscious intervention (Santos et al., 2021). Once structured, knowledge sharing, collaboration, and opportunity recognition are observed in this action, recognizing the complementarity between different actors and ecosystems, developing creativity, critical thinking, and networking (Faccin et al., 2021). They are also differentiated by their life cycle, the stage of the ecosystem. The older they are, the more mature and established these organisms will be within their network structure (Adler & Tanner, 2015).

In the search for models that address the stages of ecosystems life cycle, it is considered that they have two stages: emergence and growth (Bittencourt et al., 2021; Presutti et al., 2013). In the first stage, emergence, relationships are transient, and the process of acquiring internal knowledge is almost nonexistent (Bittencourt et al., 2018). In the second stage, growth, a stock of knowledge develops, and tacit knowledge evolves organically through localized practices. In this stage, there is a dynamic process of diffusion and sharing of knowledge among the actors (Presutti et al., 2013).

In this scenario, an innovation ecosystem needs a key actor willing to be at the forefront of the group of actors , working to align expectations and motivations for its development, with strategies for coordinating the interdependent network actors (Autio, 2021). The orchestrator is

configured as a key actor, capable of influencing the evolution of the entire ecosystem (Thomas et al., 2020). In the next section, we will discuss more about the role of the orchestrator.

The Orchestrator's Role

Orchestration capability is a set of activities aimed at developing, managing, and coordinating actors to create and extract value from the network (Dhanaraj & Parkhe, 2006). According to Autio (2021), the value proposition of the ecosystem is collectively created and directed toward a defined audience of users, while the benefits of the ecosystem are operationalized at the level of individual actors within the ecosystem. Any individual actor can expect benefits from their participation. We highlight the importance of orchestration to obtain and optimize results, which involves managing a network of partners that the actor does not own; unlike internal processes, it must be more fluid, empowering partners and collaborators (Wind & Fung, 2009). Orchestrating an ecosystem covers the obstacles that the lack of formalized contracts among participants can cause in terms of governance and management, considering a network of hierarchically independent participants; however, it allows the generation of a systemic level for certain audiences (Autio, 2021).

Orchestration in innovation networks addresses the organizational model and the role of the individual orchestrator in the relationships among multiple actors. Therefore, this study aimed to understand the roles of individual orchestrators within the hubs, considered key actors in their respective hubs. Orchestration activities include ensuring knowledge mobility, network stability, and innovation appropriation, as well as coordination, agenda setting, and mobilization (Dhanaraj & Parkhe, 2006; Pikkarainen et al., 2017). There are various approaches to these activities, represented by different roles of the orchestrator and their respective key activities (Board 1) (Hurmelina-Laukkanen et al., 2014).

Board 1

Orchestrator's roles and key activities

Orchestrator's roles	Key-activities	Reference
Architect	Engages in strict coordination and agenda-setting activities	Hurmelina-Laukkanen *et al.* (2014) Nambisan & Sawhney (2011)
Doorman	The doorman supports knowledge extraction and information dissemination	Czakon & Klimas (2014) Howells (2006)
Conductor	Takes care of information acquisition, transmission, and task sharing	Nambisan & Sawhney (2011)
Developer	Creates concrete assets for the network based on knowledge mobility	Hinterhuber (2002)
Auctioneer	Sets the agenda and joint vision for the innovation network	Wallin (2006)
Leader	Motivates and embraces voluntary collaboration and identifies roles of network members	Dawson *et al.* (2014)
Promoter	Supports ecosystem members to work toward the same goal	Dawson *et al.* (2014)
Facilitator	Brings different and competitive parties to work together	Hurmelina-Laukkanen *et al.* (2014)

Source: The authors

The roles of Leader, Promoter and Facilitator are fundamental for the collaboration and integration of ecosystem members, identifying each one's role and helping them work together towards the same goal. The Architect is responsible for coordinating and setting the agenda together with the Auctioneer. The Gatekeeper, the Conductor, and the Developer focus on the acquisition, transmission, and mobility of knowledge and information (Board 1). Orchestrators are individuals who lead an ecosystem, centralizing the involved actors to connect them and share the same vision and goal (Silva, 2016). In this article, we want to understand the role of the individual orchestrator of innovation hubs. In the next section, we will outline the methodological procedures adopted by the study.

Methodological Procedures

Considering the research problem and its respective objective, qualitative research with an exploratory approach was chosen. A multiple case study was conducted (Yin, 2010) involving three innovation ecosystems in the state of Rio Grande do Sul (Brazil): Instituto Caldeira (Metropolitan Region), Instituto Hélice (North Region), and Aliança Empresarial (Northern Region). Rio Grande do Sul has emerged as one of the prominent states in innovation in Brazil, ranking first in the CLP (Center for Public Leadership) (CLP, 2024) and second in the Innovation

Atlas ranking of the National Confederation of Industries of 2024 (CNI, 2024). Furthermore, as we will explain in the description of the cases, the chosen hubs are prominent in the State, with different stages of development, presenting potential in terms of orchestration roles at different stages of the ecosystem. Simons (2014) states that case studies are valuable for exploring rare or extreme cases, offering insights that may not be attainable through other research methods; they are also well-suited for investigating complex and multifaceted issues, providing an opportunity for in-depth analysis of the interrelations between various factors.

The research followed in the footsteps of Eisenhardt (1989), who emphasizes a balance between flexibility and rigor, allowing researchers to develop well-grounded theories while being open to new insights that emerge from the data.

Case Study Steps

Board 2

Study steps

Step		Description
1	Getting Started	Clearly specify the research questions. Use existing theories as a foundation.
2	Selecting Cases	Select cases purposefully.
3	Crafting Instruments and Protocols	Use multiple data collection methods.
4	Entering the Field	Collect data systematically. Maintain flexibility to allow adjustments.
5	Analyzing Data	Compare and contrast findings.
6	Shaping Hypotheses	Constant comparison and contrast to ensure the theory is closely tied to the data.
7	Enfolding Literature	Compare the emergent theory with existing literature
8	Reaching Closure	Conclude when theoretical saturation is reached.

Source: adapted from Eisenhardt (1989)

In this paper, step 01, presented in the introduction, was defined based on the theoretical reviews presented in section 02. Steps 02, 03 and 04 are presented in this section. The research

instrument was constructed based on the final categories and previously tested. The remaining steps are presented in the following sections.

Cases Selection

The criteria for choosing cases are essential for the quality of the results and must be defined in advance and with extreme care. The researcher must decide which and how many cases are necessary to achieve the desired depth and range of the study (Eisenhardt, 1989). According to Creswell and Poth (2016), the selected case must be one that is both accessible and capable of providing rich, in-depth data. The case should be intrinsically interesting, unique, or particularly revealing, thereby allowing the researcher to explore the complexities and nuances of the phenomenon in question.

The cases selected are the three main innovation hubs in Rio Grande do Sul, a southern Brazilian state. Rio Grande do Sul has been standing out and consolidating itself as a global innovation hub. It ranked first in the "innovation" dimension in the competitiveness ranking of Brazilian states for two consecutive years, evaluating indicators such as investment in research and development, scientific research, patents, master's and doctoral scholarships, and innovative ventures (CLP, 2024).

The selection of cases was based on Inova RS, a state program that guides and supports actions by the Secretary's Office of Innovation, Science, and Technology (SICT), aiming to make Rio Grande do Sul a global reference in innovation as a local development strategy, building partnerships among innovation ecosystem actors from all regions of the state (SICT, 2024). Approximately R$ 57 million were invested in the Scientific and Technological Parks Program between 2010 and 2017, resulting in a network composed of seventeen scientific and technological parks and four technology incubators. Concurrently, the RS Incubators Program received an investment of approximately R$ 9.7 million. Additionally, there has been a total investment of R$ 142,61 million between 2019 and 2023 in improving infrastructure and projects focused on innovation, science, and technology (SICT, 2024).

As criteria for defining the innovation hubs we determined 1) being part of Inova RS, because of the Program's relevance to the development of innovation ecosystems; 2) being an innovation hub made up of companies, academia, government, and civil society in favor of innovation, and 3) being at different stages of development. Based on this, we selected Instituto

Caldeira (the most developed ecosystem), Instituto Hélice (a developing ecosystem) and Aliança Empresarial (an emerging ecosystem).

Instituto Caldeira in Porto Alegre, Hélice Inovação Colaborativa in Caxias do Sul, and Aliança Empresarial in Passo Fundo are key initiatives driving innovation and entrepreneurship in the state of Rio Grande do Sul, Brazil. Instituto Caldeira acts as a dynamic innovation hub, connecting startups, corporations, and academia to foster digital transformation and business growth. In Caxias do Sul, Instituto Hélice promotes open innovation through a consortium of companies and educational institutions, enabling collaboration that helps traditional industries adopt new technologies and business models. Meanwhile, Aliança Empresarial in Passo Fundo is a regional business alliance that encourages entrepreneurship and innovation, focusing on sustainable development and economic growth in the Northern region of the state.

The following board presents the characteristics and differences of the researched hubs. The data were extracted from the websites of the innovation hubs.

Board 3

Characteristics and Differences of the Hubs

Company-hub	Instituto Caldeira	Instituto Hélice	Aliança Empresarial
Location	Porto Alegre, RS. Capital. Metropolitan Region.	Caxias do Sul, RS. North Region, 126 km from the Capital.	Passo Fundo, RS. Northern Region, 289 km from the Capital.
Foundation	2019	2017	2020
Size	Developed - Member of the International Association of Science Parks and Areas of Innovation, IASP, the largest innovation ecosystem institution in the world.	Medium - TOP 100 in the Open Startups Ranking, open innovation platform in Brazil and Latin America.	Emergent - The institute was born to follow the examples of Instituto Caldeira and Instituto Hélice.
Model	Private, non-profit.	Private, non-profit.	Private, non-profit.
Key players / Founding companies	Agibank, Banco Topázio, Banrisul, Évora, Gerdau, Goldstein, Renner, Panvel, SLC.	Florense, Marcopolo, Metadados, Randon, Soprano.	Atitus Educação, Be8, Coprel, Cotrijal, Farmácias São João, Grupo Grazziotin, Hospital Ortopédico, Metasa and Oniz Distribuidora.
Main programs and initiatives	Startup Awards - Technology Hub of the Year 2023 - Brazilian Association of Startups, Abstartups.	Propeller Body - Program that connects companies with technological solutions. Collaborative learning journeys.	Known as the “home of innovation in Norte Gaúcho (Northern RS”).

Company-hub	Instituto Caldeira	Instituto Hélice	Aliança Empresarial
	Startup acceleration program - Alana IA, Augen, Alura. Boiler application - Android and iOS systems. Intersectoral collaboration - academic institutions Atitus Educação, government institutions, Detran RS, Sebrae RS.	Investment opportunities and projects with partners. Propeller Startups - Connection of startups and solutions to large companies. Investment in early-stage startups.	The Hub follows standard programs and initiatives from other hubs in Brazil, with hackathons, lecture circles, thematic panels, coworking space, meetings, and case presentations.

Source: The authors

Data Collection

For this research, a combination of two data collection procedures was employed: primary data with semi-structured interviews with the orchestrators of the innovation ecosystems, and secondary data with the analysis of document archives from websites, reports, and previous meetings.

As the aim of the paper is to understand the role of the orchestrators of innovation ecosystems, we chose to interview the individuals responsible for orchestrating each of the selected innovation ecosystems. We realized that there are two levels of orchestration in these innovation ecosystems: i) the macro level - referring to institutional relations, played by the executive director and ii) the micro level - referring to the management of the actors that make up the ecosystem, played by the community manager. Therefore, we interviewed the directors and community managers of the three ecosystems selected. Board 4 shows the identification of the interviewees.

Board 4

Identification of the interviewees

Ecosystems	Interviewee/Role	Time
Instituto Caldeira	I1- Community Manager	42 minutes
	I2- Head of Community	29 minutes
Instituto Hélice	I3- Community Manager	30 minutes
	I4- CEO	23 minutes
Aliança Empresarial	I5- President	21 minutes
	I6- Executive Director	41 minutes

Source: The authors

As for secondary data, we used websites, documents, and available materials relating to the Inova RS Program and the three innovation ecosystems. Board 5 shows the documents consulted.

Board 5

Documents

Documents
D1 - Planning Inova RS Program
D2 - Secretary's Office of Science, Innovation and Technology of Rio Grande do Sul (SCIT) website
D3 - Ranking of Innovation Ecosystems in Rio Grande do Sul
D4 - Instituto Caldeira website
D5 - Instituto Hélice website
D6 - Aliança Empresarial website
D7 - Instituto Caldeira presentation video
D8 - Instituto Hélice report
D9 - Aliança Empresarial Strategic Planning

Source: The authors

Data Analysis

Content Analysis was chosen as the analysis procedure for this research. Content analysis aims to use a set of methodological instruments that can be applied to diverse discourses, to systematically and objectively analyze the content of textual data (Bardin, 2011). The primary objective of content analysis is to interpret the qualitative aspects of communication by categorizing and quantifying the presence of specific words, themes, or concepts within the text. Bardin (2015) delineates this process into several key phases: (i) the pre-analysis phase, where the material is selected and the analytical framework is established; (ii) the coding phase, involving the systematic breakdown of the text into manageable categories based on predefined criteria; and (iii) interpretation phase, where the categorized data are analyzed to identify patterns, draw conclusions, and infer meanings that address the research questions. This structured approach ensures a comprehensive and replicable analysis, facilitating the extraction of meaningful insights from complex textual data. In this research, we analyzed the transcribed interviews, and the

documents consulted based on the categorization established in Table 1, in the theoretical framework.

Results

In this section, we will begin by presenting the three innovation hubs and how each of them is orchestrated.

Instituto Caldeira

Instituto Caldeira, founded in 2019 and physically open in 2021, is a hub dedicated to enhancing competitiveness, connecting people and initiatives, and fostering the innovation ecosystem in Porto Alegre (RS). According to I2,"it arose from the aspirations of several leaders (mainly business) in Porto Alegre to understand that RS has always been widely recognized as a place of great talent, public safety, and business culture, and today, there is a feeling of loss of competitiveness, especially of talents". Currently, the institute comprises 42 founding companies, 280 companies and institutions, 661 startups, and connections with 15 national and international hubs.

In May 2024, a flood hit the capital and parts of the state. Unlike Aliança and Hélice hubs, Instituto Caldeira was affected by the flood that inundated parts of Porto Alegre. Located in the 4th District, near the Guaíba waterfront, the first floor of the hub was flooded with water levels reaching over 2 meters high. Amidst the reconstruction of the 4th District, with much resilience and commitment from the actors and the local community, a portion of the hub began operating within Tecnopuc, a technology park located next to the Pontifical Catholic University of RS. After a month from the onset of the flood, Instituto Caldeira reopened its headquarters, resuming activities on the second and third floors. Additionally, innovation programs, acceleration initiatives and events were also resumed, continuing to grow, all made possible by the collaboration of both the community and the key actors who maintain connections between large companies, startups, universities, and public authorities (Instituto Caldeira, 2024; Exame, 2024).

The mission of Caldeira Institute is to promote innovation and entrepreneurship through physical and digital experiences, creating transformative connections with an engaged community. The main stakeholders include public authorities, companies, startups, and organizations. The primary activities are structured around connection and events, with a focus on content (Associação Instituto Caldeira, 2022). According to I2, innovation in the ecosystem is driven by

an active agenda: *"The calendar is the form of connection between all members; innovation happens through collaboration and exchange."*. According to I1, *"the main asset is the "creation of value through connections* [...], *which generates business, profitable partnerships"*." The institute's management is aimed at actors who serve as orchestrators to connect the ecosystem, with Community Management mediating and creating partnerships. However, it is essential to stimulate the maturity of the teams within the ecosystem strategically.

Analyzing those primarily responsible for orchestration activities (Board 5), it becomes clear that while most tasks are handled by Community Management team members, activities are managed at different levels. Community Management acts as a host, engaging and connecting members daily. At a more strategic level, such as the Institute's Board and its members, the CEO takes over the role of orchestrator. This analysis highlights governance and management challenges in orchestrating an ecosystem. Even if there is a hierarchically independent network of participants, a coherent systemic level can be generated for specific audiences (Autio, 2021). I1 corroborates this perception: *"I don't feel like an orchestrator of an ecosystem, I'm an agent within an ecosystem hub in which I'm doing my part"*.

The articulation of these actors is understood through the division of macro levels, with the CEO and Board members handling stakeholder participation at the ecosystem level. However, daily activities are led by the Community Team, actively constructing dialogues to understand their moments, pains, and challenges, identifying needs through their analytical capacity, creativity, and relationship-building skills. Strategic and systemic vision, coupled with relationship-building and a broad repertoire, is crucial for managing Caldeira through collaboration and various activities.

I2 describes the orchestrator as "who, on a more horizontal level, dictates the agenda and pulls the others along; [...] in Caldeira there is no such verticalization, but he is the one that will connect people and know how to manage the actors to, together, generate innovation." Success hinges on the team's ability to effectively manage and coordinate the ecosystem, embracing a multilevel structure. Additionally, I1 defines the orchestrator as "the figure [...] in the centrality of the movement [...] knowing how to identify opportunities, directing people and demands; identifying patterns and differences, knowing how to hierarchize and prioritize information to make an organized distribution." This underscores the importance of recognizing complementarities, communicating needs, and fostering creativity, critical thinking, and networking for effective orchestration (Faccin et al., 2021).

The importance of physical space in facilitating actors' articulation, creating connections, and learning environments is emphasized, as the culture of innovation is built by the environment itself. Although face-to-face interaction is not essential, as Covid-19 has demonstrated, where face-to-face coordination in complex scenarios lost relevance, the virtual presence provided by the online environment still impacts connections and the mobility of innovation (Visentini, 2023).

Instituto Hélice

Instituto Hélice, founded in 2017, represents a group of organizations committed to transforming the innovation ecosystem of Serra Gaúcha collaboratively, aiming to accelerate the region's maturity (Instituto Hélice Institutional Material, 2022). According to I3, *"the movement began with the union of four CPFs (Brazil's registration document), representatives of four of the largest companies in Serra Gaúcha, from the moment they noticed that the State of RS was not on the map of innovation ecosystems in Brazil, in the mapping of the main innovation centers in the country by ABS (Brazilian Association of Startups)".*

The main objectives are fostering a culture of innovation and talent. Without a physical structure, it manages relationships and mobilizes knowledge and innovation among its 20 member companies through events and community connection actions. It develops Innovation Frameworks for associates, creates innovation maps, and assigns metrics to monitor innovation maturity (Institutional Material, 2022). Stakeholders include public authorities, organized civil society, companies, and educational and research institutions, all engaging in co-creation with different objectives and values, connected by the ecosystem dimensions (Santos et al., 2020).

Key orchestrators include I3 and I4, senior executives of the Governance Board, and representatives from large companies. Orchestration, according to I4, is *"the ability to put the importance of innovation to all actors in a practical way, to execute projects that contribute to the whole" with the orchestrator as the mobilizer, "he schedules the meeting and raises the theme [...], puts innovation on the agenda and if it is already there, it provides support, speed, and maintenance, leaving everything in harmony"*. This mobilization reflects on the stability of the network and the appropriability of innovation, coordination, definition, and agenda setting (Dhanaraj & Parkhe, 2006; Pikkarainen *et al*., 2017).

Analyzing the key activities (Board 6) aimed at agenda setting, information dissemination, knowledge mobility, and task sharing are, strictly, the responsibility of members of the Executive

Team (mainly the community manager and the executive director). The process of motivation for collaboration and work moving towards the same objective points to the Governance Board as the main responsible. The executive director understands the council as a strategic decision-maker, while the community manager still has the executive director as this reference. The orchestration in Helice, although applied on a multilevel basis, has as its main objective *"knowing how to extract something of collaboration from the moment of competition and identify where, within so many competitive parts, there can be a collaboration"* (I4).

Board 6

Orchestration and identification of roles – Instituto Caldeira and Instituto Hélice

Orchestrator's role	Key-activity	Responsible for the Activity in the Ecosystem – Instituto Caldeira	Responsible for the Activity in the Ecosystem – Instituto Hélice
Architect	Engages in strict coordination and agenda-setting activities	Head of Events (part of the Community Management team)	Community Manager and Engagement Leader
Doorman	Supports knowledge extraction and information dissemination	Community Management Team (one person responsible for the communication channels and another for the conversation with the companies)	Executive Team (Community Manager, Engagement Leader, and Executive Director)
Conductor	Takes care of information acquisition, transmission, and task sharing	Head of New Business and Community	Executive Team (Community Manager, Engagement Leader, and Executive Director)
Developer	Creates concrete assets for the network based on knowledge mobility	Head of New Business and Community	Community Manager and Executive Director
Auctioneer	Sets the agenda and joint vision for the innovation network	CEO	Governance Board: role in guiding priorities (thinking about the ecosystem as a whole)
Leader	Motivates and embraces voluntary collaboration and identifies roles of network members	Community Management Team	Executive Team + Governance Board: voluntary engagement by companies and entities
Promoter	Supports ecosystem members to work toward the same goal	Community Management Team, responsible for the relationship and day-to-day conversation with the actors	Executive Team, Governance Board, and Associated Companies
Facilitator	Brings different and even competing parties to work together	CEO (at a more strategic level) and Community Management Team (day-to-day)	Executive Director, Governance Board, and Associated Companies

Source: The authors

Aliança Empresarial

Aliança Empresarial, founded in 2019, brings together a group of entrepreneurs to generate change in the northern region of the State of RS through innovation and cooperation. Its purpose is to transform the reality of this region by fostering the innovation and development ecosystem. The stakeholders involved are public authorities, companies, academia, and startups. According to Institutional Material Aliança 2022, it is structured around culture, corporations, startups, and capital, which allows for a value co-production structure (Autio, 2021).

According to I6, they invest in business diversification, solidifying the existing ones, creating new models, and connecting startups to meet the challenge of cultural transformation conceived in a systematic way, with innovation being an important process aimed at effective management. Although it does not yet have its own physical space, all activities are already in operation virtually or at the facilities of associated companies. These activities include benchmarking, hackathons, connection events, events to promote regional development, and participation in projects and research in a regional innovation ecosystem. Interviewees I5 and I6 believe that a physical location is essential to materialize what already exists and keep the ecosystem alive and active, as in Instituto Caldeira: *"we are very inspired by Instituto Caldeira, the idea is that it is like a Caldeira from the northern region"* (I5).

The lean structure, led until recently by I5, together with the members of the executive board who lead the main companies in the region, highlighted that there is still not a great diversification among those who assume the roles of orchestrators and their respective activities. Until the recent entry of I6, I5 took over the orchestration with help and support from members of the executive board. Analyzing the centralization of activities in I5, the picture of orchestration and identification of roles was not present. According to I5, *"the goal now is to make everyone involved in the Alliance agents of the entrepreneurial culture... In the beginning, it was necessary to focus on me, now it is necessary to articulate the ecosystem to the outside [...]. It is necessary to delegate [...], which will be the main role of the new executive director"*, a reference willing to assume the front of the group and coordinate it in an organized and voluntary manner (Santos et al., 2021).

Considering this centralization, it is observed that the network of participants is still hierarchically dependent, unlike what Autio (2021) describes as a characteristic of orchestration. For I5, orchestration consists of *"putting different people in the same environment to make the best*

decisions." Today, the execution of activities reflects I5's strengthened articulation with the executive board and the strong involvement of the associated parties, who make collective decisions based on the strategic planning established by the board. Knowledge is mobilized organically and spontaneously (I6). They identify the importance of actors dedicated full-time to orchestration activities. Hence, the hiring and role of I6 aims to delegate tasks, structure an internal team to divide orchestration roles, and create a culture of development for active members, enabling the training of new and future orchestrators.

Discussion

In the analysis of the cases, a difference was noticed in the organization of the orchestrator's roles according to the size and structure of each hub. The physical space infrastructure at Instituto Caldeira and the number of actors involved actively contribute to a more distributed orchestration, with a larger team structure capable of assuming the roles of orchestrators. Instituto Hélice and Aliança Empresarial still concentrate the execution of key orchestration activities on a few individuals, who, out of necessity, end up assuming multiple roles.

As a similarity, a standardization of orchestration levels was observed, in which the multilevel organization, mainly assumed by community managers, executive directors, and executive boards, divides these same actors as responsible for each of the orchestration roles. According to I1, "*we have some macro levels, some actors come directly through the CEO, others through the board [...], but on a day-to-day basis it is a very hands-on process, the community team is very much in charge of talking to all the actors and teams, understanding their moment, challenges, and pains."* It is understood that the key orchestration activities are carried out by individual orchestrators divided into three different levels, handling everything from routine activities of connection, coordination, and agenda setting to more strategic activities of systemic and strategic vision for the network, bringing together the parts with a common goal, as at Instituto Caldeira: *"Community management has a role in this too, of giving life and hosting the hub [...] but who will talk and assist the board members, for example, is the CEO [...] he has an orchestration role in this sphere; we are treated at different levels."* (I1).

It is observed that the size of the structure and the team responsible for activities in the innovation ecosystem affects the organization of the individual orchestrator's role. At Aliança Empresarial, the executive director (I5) acted alone for a period, carrying out activities and articulating actors. In this scenario, she ended up taking on all (or almost all) the orchestrators'

roles. According to I5, *"in the beginning, it was necessary to centralize my figure, now [...] we need more people with authority to organize at home, something that today is only exercised by me and by the leaders of the great founding companies."* This means that the role of orchestrating routine connection, coordination, and agenda-setting activities is assumed by an institutional and strategic orchestrator.

Based on field and literature evidence, it is proposed that orchestration in innovation hubs occurs on a multilevel basis. Therefore, orchestration roles are advocated for the operational, tactical, and strategic levels. According to Hurmelinna-Laukkanen & Nätti (2012), there is an inherent need for coordination and governance due to the high complexity of working in a network composed of heterogeneous actors. However, we disagree with Hagel et al. (2002) who state that these ecosystems lack hierarchical structures and authorities, since field evidence supports the understanding of the operational, tactical, and strategic levels of orchestration. In practice, these represent the involvement of individual orchestrators in different roles and types of activities, with relationship and execution activities being strategic (Board 7).

Board 7

Orchestration Levels

Level of Orchestration	Orchestration Roles	Key-Activities
Operational	Architect, Doorman, Conductor, and Leader	Coordination and agenda setting; Knowledge extraction, acquisition, and dissemination of information and task sharing; Motivation and mobilization of voluntary collaboration, identifying the roles of network members
Tactical	Leader, Auctioneer, Promoter, and Facilitator	Motivation and mobilization of voluntary collaboration, identifying the roles of network members; Joint vision for the innovation network; Brings different and even competitive parties to work together towards the same goal.
Strategic	Auctioneer, Promoter, and Facilitator	Joint vision for the innovation network; Brings different and even competitive parties to work together towards the same goal.

Source: The authors

It is observed that the levels cross some orchestration roles, as the orchestrators involved at the tactical level also have active participation in the operational and strategic levels.

Management skills are important at all levels of orchestration, but these will differ according to the activities carried out and the strategic manifestation in each one. Understanding the levels of orchestration and the grouping of the different roles that the orchestrator assumes in them made it possible to list the main roles assumed in each studied ecosystem and its organization. Board 8 presents four main key orchestration roles in the analyzed cases, which may or may not follow the structure (Hurmelina-Laukkanen & Natti, 2018), as the same actor can assume more than one role, centralizing the activities of all of them. Furthermore, a new structure of orchestration roles is presented, with new nomenclatures for those that group more than one role. Thus, there are the suggested four orchestration roles in innovation hubs: Architect, Informant, Leader, and Moderator.

Board 8

Main key orchestration roles and new naming of orchestration roles and key activities

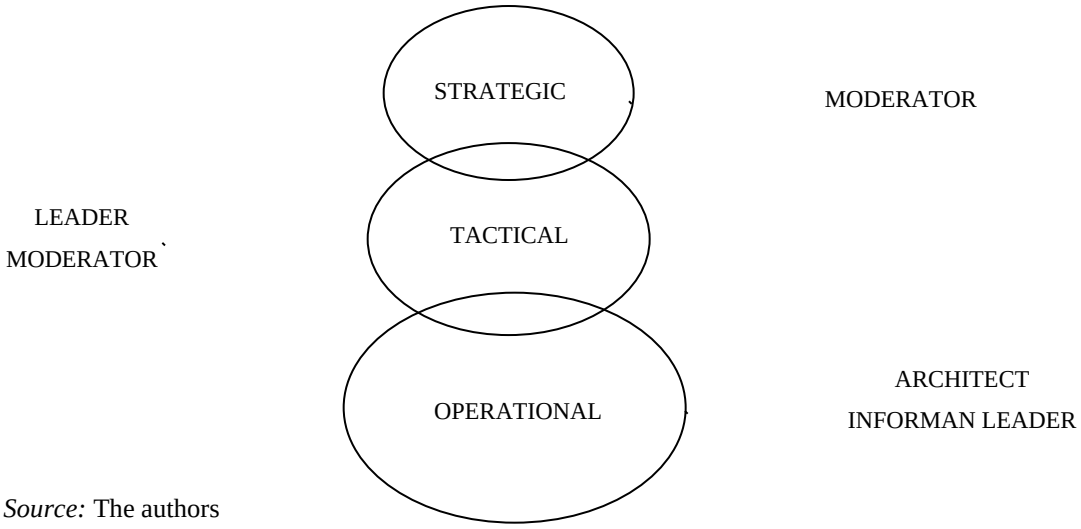
Orchestration Key Roles	New Nomenclatures for Orchestration Roles	Key-Activities	Empirical Evidence
Architect	Architect	Engages in strict coordination and agenda-setting activities	*"The community management team is responsible for defining the agenda, based on the most important agendas at the time of the new economy."* (I2)
Doorman + Driver	Informant	Support knowledge extraction, information acquisition and dissemination, and task sharing	*"The executive team, made up of community management and the executive director, is responsible for acquiring information externally and disseminating it in the ecosystem* (I3)*; "Community management has to have the ability to prioritize."* (I2)
Leader	Leader	Motivates and embraces voluntary collaboration and identifies roles of network members	*"The CEO and community manager are primarily responsible for this activity."* (I1)*; "The executive director is the central figure, managing to make companies trust each other to collaborate and understand their place within the network."* (I6)
Auctioneer + Promoter + Facilitator	Moderator	A joint vision for the innovation network brings together different and even competitive parties to work together towards the same goal	*"The governance board and the executive team – with a focus on the executive director – are responsible for bringing together major players in the market, large companies, and their executives, to be working together for the same purpose and objective."* (I4)

Source: The authors

This structure aims to facilitate the articulation of orchestration in innovation hubs. That is, the role of the individual orchestrator will be related to networked activities and processes, used to recognize the roles needed to perform them (Nilsen & Gausdal, 2017). Based on the proposed model, the levels are organized according to Figure 1.

Figure 1

The levels and new nomenclature of the main orchestration roles



Source: The authors

The new nomenclatures result from the grouping of roles, as they are performed by the same actors in the innovation hubs and involve very similar activities. It is understood that the orchestrator roles at the operational level assume activities that involve routine processes and organization, such as agenda structuring (connection and content), collaboration, and identifying the roles of each member. At the tactical level, collaboration and systemic vision become more institutional, raising the conversation to more strategic actors of the hub itself and the institutions involved. The strategic manager, on the other hand, takes the lead in bringing together the parties present in the network, being the most influential agent for them to become actively involved in the available activities, using the leaders as an example for the use of the ecosystem throughout the organization. These will be primarily responsible for demonstrating the value and importance of being part of an innovation ecosystem.

Conclusions and Limitations

In order to understand the roles of individual orchestrators in conducting innovation hubs at their different stages, a multiple case study was carried out involving Instituto Caldeira, Instituto Hélice, and Aliança Empresarial. This study examined how these roles manifest in hubs, highlighting similarities and differences, particularly concerning size and structure, that reflect the stages of development. The findings indicate a standardization in orchestration roles across different innovation environments, organized into a multilevel structure. Individual orchestrators identify the responsibilities of various actors in a strategic or operational manner, situating themselves within distinct spheres of action.

The main results pertain to the multilevel structure of innovation hubs, according to their different stages. As a theoretical contribution, it is proposed that the orchestration be organized into three levels: operational, tactical, and strategic. This study identifies multilevel performances and suggests a categorization of orchestrators' roles for innovation hubs, diverging from those presented in existing literature. This categorization provides a managerial framework to assist in organizing, developing, and orchestrating innovation hubs .

A limitation of this study is the inability to interview all stakeholder segments and orchestrators across the three levels of orchestration in each hub, due to the varying sizes, stages of development, and structures of these ecosystems. Thus, interviews were not conducted with actors outside the innovation hubs, key actors in their respective ecosystems. This restricted the understanding of the broader dynamics of the environments. This constraint limited the ability to capture diverse opinions regarding the orchestrators' roles from all spheres.

In future studies, it is suggested to deepen the understanding of the main skills required at each level of orchestration. As for orchestrators at a strategic level, an analysis is suggested to verify whether they take advantage of their neighboring networks, where ties and social capital present more advantages when they form a network, with insights into why actors and social organizations perform more than others (Burt, 2010). Furthermore, it is necessary to elucidate how much relationships influence the role of the individual orchestrator for the coordinated performance of innovation hubs, since actors can appropriate their neighboring networks to build new configurations (Visentini, 2023), such as innovation networks. This study does not intend to exhaust the discussions surrounding the proposed problem. Instead, it aims to inspire new research on driving hubs innovation.

CRediT - Authorship Contribution Statement

Contribution	Bittencourt, Bruno A.	Helale, Julia	Visentini, Ana Laura F.	Martins, Bibiana W.
Contextualization	X	X	X	--
Methodology	X	X	--	--
Software	--	X	--	--
Validation	--	X	--	--
Formal Analysis	X	X	X	--
Investigation	X	X	--	--
Resources	X	X	--	--
Data curation	X	X	--	--
Original	X	X	--	X
Revision and editing	X	--	X	X
Viewing	X	--	X	X
Supervision	X	--	--	X
Project Management	X	X	--	--
Obtaining funding	--	--	--	--

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