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GOVERNANCE OF INNOVATION ECOSYSTEMS IN DEVELOPING COUNTRIES: A STUDY ON THE SANTA CATARINA – BRAZIL CONTEXT

Governança de ecossistemas de inovação em países em desenvolvimento: Um estudo sobre o contexto de Santa Catarina

Gobernanza de los ecosistemas de innovación en los países en desarrollo: Un estudio sobre el contexto de Santa Catarina - Brasil

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ABSTRACT

This study analyzes the governance characteristics of the Santa Catarina innovation ecosystem in southern Brazil, focusing on the Pact for Innovation program. This program was created to enhance collaboration within the ecosystem and requires appropriate governance features. Data collection involved semi-structured interviews, a documental analysis, and questionnaires applied to 41 organizations involved in the 240 actions of the program. Data analysis was conducted through thematic analysis and triangulation. As a result, we identified that the ecosystem's governance contemplates a diversity of actors whose relations are guided by coordination mechanisms. Despite the existence of a central leadership, the governance approach encourages the protagonism of the actors in a decentralized way and low formality. However, program sustainability requires increased capacity to mobilize new orchestrators. This research underscores the need for empirical evidence in developing countries and offers insights for managers and policymakers committed to enhancing collaborative capacity in innovation ecosystems.
Keywords: governance, innovation ecosystems, orchestration, collaboration, Pact for Innovation.

RESUMO

Este estudo objetivou analisar as características de governança do ecossistema de inovação (EI) catarinense, localizado no Sul do Brasil. Seu foco é o Pacto pela Inovação, programa criado para aprimorar a colaboração dentro do ecossistema e que requer uma governança adequada. A coleta de dados foi conduzida por meio de entrevistas semiestruturadas, levantamento documental e questionário, aplicados a 41 organizações envolvidas nas 240 ações do programa. Os dados foram examinados por meio de triangulação e análise temática. Os resultados mostraram que a governança do ecossistema contempla diversos atores cujas relações são orientadas por mecanismos de coordenação. Apesar de haver liderança central, a abordagem de governança incentiva o protagonismo dos atores de forma descentralizada e com baixa formalidade. Contudo, a sustentabilidade do programa exige uma maior capacidade para mobilizar novos orquestradores. O estudo enfatiza a necessidade de evidências empíricas nos países em desenvolvimento, oferecendo perspectivas para gestores e decisores políticos empenhados em melhorar a capacidade colaborativa em EIs.
Palavras-chave: *governança, ecossistemas de inovação, orquestração, colaboração, Pacto pela Inovação.*

RESUMEN

Este estudio examinó las características de gobernanza del ecosistema de innovación de Santa Catarina, Brasil, centrándose en el Pacto por la Innovación, un programa creado para mejorar la colaboración dentro del ecosistema y que requiere características de gobernanza apropiadas. La recopilación de datos involucró entrevistas semiestructuradas, análisis documental y cuestionarios aplicados a 41 organizaciones participantes en 240 acciones del programa. Se realizó análisis temático de los datos, además de triangulación. En los hallazgos, se encontró que la gobernanza contempla una diversidad de actores cuyas relaciones están guiadas por mecanismos de coordinación. Aunque con liderazgo central, el enfoque de gobernanza promueve el protagonismo descentralizado e informal de los actores. Sin embargo, la sostenibilidad del programa requiere una mayor capacidad para movilizar nuevos orquestadores. El estudio destaca la necesidad de evidencias empíricas en países en desarrollo y ofrece perspectivas para los administradores y formuladores de políticas comprometidos con mejorar la capacidad de colaboración en los ecosistemas de innovación.
Palabras clave: *gobernanza, ecosistemas de innovación, orquestación, colaboración, Pacto por la Innovación.*

INTRODUCTION

Since Schumpeter's pioneering work, the innovation studies field has transitioned from a primary focus on industries and firms to an increasing emphasis on ecosystems. However, despite the rising renown of ecosystems, significant amphibology remains about their definition and how an "ecosystem lens" can aid innovation progress (Baldwin *et al.*, 2024). The innovation ecosystems (IEs) relate to an evolving set of actors, activities, and artifacts, as well as complementary and substitute institutions and relationships relevant to the innovative performance of an actor or a population of actors (Granstrand & Holgersson, 2020). It is still a recent and growing topic of study (Cobben *et al.*, 2022; Foguesatto *et al.*, 2021; Granstrand & Holgersson, 2020; Stahl, 2022).

Given the diversity of actors, an IE demands the coordination of interactions through an alignment structure that enables the performance of specific and complementary roles (Thomas & Autio, 2020). IEs can develop organically or through deliberate intervention (Santos et al., 2021), which occurs through the action of an individual, organization, or group playing the role of orchestrator (Chen *et al.*, 2021). Different IE configurations require specific coordination strategies for mobilizing actors, aligning interests, and developing a common agenda (Santos *et al.*, 2021).

A governance effort is required (Wegner & Verschoore, 2021) to regulate inter-organizational relations through jointly established norms (Ostrom, 1990). Governance facilitates direction, control, and coordination among individuals and organizations, emphasizing collective goals and interests (Lynn *et al.*, 2000). Thus, governance promotes alignment among actors through direction and purpose (Könnölä et al., 2021), fostering the development of a shared vision among participants (Duarte *et al.*, 2021).

Understanding governance in industrial engineering is complex, especially across diverse regional contexts. As there are few studies, most of which are focused on developed areas, there is a lack of evidence generalization (Burda & Gavrikova, 2022). Developing countries face challenges such as inadequate innovation infrastructure, insufficient technology and human capital, ineffective institutions, limited research funding, structural uncertainties, and managing diverse stakeholder interests (Letaba & Pretorius, 2021; Weerasinghe *et al.*, 2024).

The dynamics in developing countries' IEs take on a different form from those commonly observed in more advanced markets, necessitating strategies that account for their specificities (Schaeffer *et al.*, 2024). Therefore, this study presents empirical evidence related to |IE governance, contributing to the development of research in this field and identifying inputs that enable policy formulation.

Santa Catarina, located in South Brazil, stands out for its economic robustness, ranking sixth in Brazil. Its cultural diversity and productivity make it the second most competitive state. Abundant natural resources and human potential drive education and training initiatives, sustaining a dynamic job market (Secretaria de Estado do Desenvolvimento Econômico Sustentável [SDS], 2017; Secretaria de Estado do Planejamento [Seplan], 2024). Amid Brazil's diverse landscape,

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the state faces challenges such as coordinating actors and institutions, mediating relationships, and bolstering innovation. Governance actions are imperative to address these complexities and leverage the state's growth potential.

Furthermore, the Santa Catarina IE is recognized nationally and internationally due to aspects such as the significant number and degree of entrepreneurs' qualifications, an institutional arrangement focused on the promotion of ST&I, and the existence of cooperation networks (SDS, 2017). The state is one of the pioneers regarding the business incubation movement in Brazil (Azevedo & Teixeira, 2018), and its cities were evaluated as the most entrepreneurial in the country, according to the general ranking of the Entrepreneurial Cities Index (ICE) 2023. The capital, Florianópolis, was ranked first concerning the human capital factor and the innovation driver, projecting itself as the Innovation Capital (Escola Nacional de Administração Pública [ENAP], 2023).

Despite the level of maturity attributed to Santa Catarina's IE, there is evidence of fragility regarding the capacity for collaboration among actors, coordination efforts, and convergence of resources. Concerned about this, 41 actors created, in 2017, an initiative called Pact for Innovation in Santa Catarina (SDS, 2017).

The initiative is grounded on the assumption that a robust ecosystem is hyper-connected. Thus, the focus was to enhance its capacity for articulation and collaboration. As such, it covered various actors from all over the state, including the government, the business sector, support foundations, universities, non-profits, business associations, research institutes, incubators, technological innovation centers, and technology parks. The 41 organizations involved in the initiative have agreed on 240 actions focused on common objectives. The complexity related to the presence of diverse actors, actions, and interests made appropriate governance characteristics necessary.

However, after three years, there was a significant demobilization around the initiative, which made its leadership seek to understand how to recover the initial momentum. Based on this issue and recognizing the importance of governance for the Pact and its capacity for collaboration and coordination of Santa Catarina's IE, this research aimed to answer the following question: How are the governance characteristics of the Pact for Innovation in Santa Catarina configured?

Given this scenario and the need for further theoretical deepening on governance characteristics in different IEs, mainly in developing countries, this study analyzes the governance characteristics of the Santa Catarina innovation ecosystem (IE) by focusing on the Pact for Innovation.

In the next section, we present a synthesis of the literature review, which led to the theoretical-analytical categories for studying IE governance, which, in turn, made up the research analysis model, which comprises the following categories: common objective and value co-creation; actors and roles; goals and evaluation; coordination mechanisms; the relationship between actors; and governance approach. Next, we present the methodological procedures, results, and final remarks.

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GOVERNANCE OF INNOVATION ECOSYSTEMS

Innovation ecosystems (IEs) comprise the relationship between interdependent and interconnected actors focused on value creation (Adner, 2017; Auria *et al.*, 2016; Gomes et al., 2018), which articulate joint value proposals (Gomes *et al.*, 2018; Könnölä *et al.*, 2021) for seeking collective benefits (Könnölä *et al.*, 2021).

This field of study has gained visibility (Granstrand & Holgersson, 2020), and the number of papers that address the relationship between actors oriented to value creation through IE has increased (Stahl, 2022). The concept originated in the business ecosystem approach, described by Moore (1993). Among various industries that business ecosystems involve, a company is not just a participant in a sector but part of an ecosystem.

The specificities of the IE concept, as discussed by Adner (2017), Auria *et al.* (2016), Dedehayir *et al.* (2022), Gomes *et al.* (2022), and Stahl (2022), offer insights into the complex relationships among interdependent actors and the dynamics of innovative environments. Unlike innovation systems and networks, IEs focus on value creation and the collective dimension of the process rather than geographical or industry perspectives (Auria et al., 2016; Spena et al., 2017). This distinction, highlighted by Auria *et al.* (2016) and Gomes *et al.* (2018), advances understanding in the literature.

Amid complex actor relationships and varied interests, governance is essential for coordinating interactions. IE governance aligns actions with actors' objectives and goals (Thomas & Autio, 2020).

When discussing governance challenges, the IE literature emphasizes the role of the orchestrator, which is related to the importance of rules, participation mechanisms, and actors' engagement (Gomes *et al.*, 2022). For an IE to promote the co-creation of value that is at the core of its purpose, it is necessary to seek non-hierarchical ways of orchestrating the elements of the ecosystem to coordinate the different contributions of the actors involved, seeking voluntary actions consistent with the proposal of existing value (Autio, 2022). However, the orchestrator can play different roles depending on each ecosystem's context (Cobben *et al.*, 2022).

From a systematic literature review conducted in SciELO, Scopus, and Web of Science databases, identified by Hoffmann *et al.* (2023), we identified attributes of IE governance that we assumed as theoretical-analytical categories for this study – common objectives and value co-creation; actors and roles; goals and evaluation; coordination mechanisms; the relationship between actors; and governance approach.

Common objectives and efforts for **value co-creation** define an ecosystem's direction and purpose (Könnölä *et al.*, 2021) and guide IE governance. Hence, interests are aligned for the implementation of the IE strategy (Roig *et al.*, 2020), emphasizing value co-creation (Autio, 2022; Cappellano & Makkonen, 2020; Chen *et al.*, 2021; Duarte *et al.*, 2021; Grobbelaar, 2018; Leceta & Könnölä, 2019).

There are different **actors and roles** in this process, highlighting the presence of companies, universities, public authorities, civil society organizations, entrepreneurs, investors, startups,

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coworking, incubators, and accelerators (Cobben et al., 2022; Duarte et al., 2021). Each can play multiple roles and participate in different projects (Duarte et al., 2021), and new functions may emerge (Leceta & Könnölä, 2019).

The government plays a vital role in fostering the ecosystem through policy development and funding (Camboim et al., 2019; Cappellano & Makkonen, 2020; Gifford et al., 2021; Leten et al., 2013; Liu et al., 2020). The private sector co-creates knowledge with other actors (Duarte et al., 2021; Leten et al., 2013; Roig et al., 2020). Universities contribute through research, and civil society proposes solutions and ideas for improving social and environmental problems (Chen et al., 2021; Grobbelaar, 2018).

By articulating a joint value proposition (Duarte et al., 2021; Könnölä et al., 2021), actors develop **goals** that must be monitored and assessed through an **evaluation** system that requires indicators and metrics, given the established strategic objectives (Chen et al., 2021; Leceta & Konnola, 2019).

Management practices (Leceta & Könnölä, 2019) and coordination mechanisms, both formal and informal (Arena et al., 2022), align actors around IE objectives, fostering participation, information exchange, and problem-solving (Duarte et al., 2021). Events, meetings, agreements, and contracts facilitate coordinated actions, ensuring ecosystem directionality (Chen et al., 2021; Könnölä et al., 2021; Wegner & Verschoore, 2021).

Hence, for collective action to occur, it is necessary to strengthen the **relationship between actors**, stimulating collaboration, partnerships, and integration activities (Gifford et al., 2021) based on the exchange and sharing of knowledge and information (Cappellano & Makkonen, 2020), and reinforcing trust between the parties.

Ranging from formal control to decentralized management, the **governance approach** adapts to the IE's context and maturity stage (Santos et al., 2021), sometimes combining hierarchical and participatory elements (Camboim et al., 2019; Gifford et al., 2021).

METHODOLOGICAL PROCEDURES

The Pact for Innovation in Santa Catarina was chosen due to its impactful actions and the challenges it addresses. The program aims to reduce overlapping individual efforts in the ecosystem amid limited resources, fostering collaboration. These dynamics are crucial for studying governance in IEs.

We conducted qualitative research on the governance of the Pact for Innovation, using semi-structured interviews, document analysis, and questionnaires from February to November 2022. Twelve key program stakeholders were interviewed (Table 1), representing ecosystem diversity.

For interview representativeness, actors were chosen reflecting the Pact's structure: a management committee and four working groups (WGs) handling actions under the program's four axes: Knowledge and Talents (Axis 1); Capital and Investment Attraction (Axis 2); Infrastructure (Axis 3); Networks and Collaboration (Axis 4). This included the committee's general coordinator, WG coordinators, and two members per group based on participation and accessibility.

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Table 1. Interviewees' Codes

Code	Institution
E1	State Secretariat of Sustainable Economic Development - SDE
E2	State Secretariat of Sustainable Economic Development - SDE
E3	Euvaldo Lodi Institute- IEL/FIESC
E4	Santa Catarina Technology Association - ACATE
E5	VIA Group/ Federal University of Santa Catarina - UFSC
E6	State University of Santa Catarina - UDESC
E7	Euvaldo Lodi Institute- IEL/FIESC
E8	State Secretariat of Sustainable Economic Development - SDE
E9	National Service for Commercial Learning - SENAC SC
E10	National Institute of Industrial Property - INPI
E11	Brazilian Bar Association - OAB SC
E12	State Secretariat of Sustainable Economic Development - SDE

The interview script, derived from Hoffmann *et al.* (2023), covered categories outlined in the theoretical foundation: common objectives, value co-creation, actors, roles, goals, evaluation, coordination mechanisms, actor relationships, and governance approach. Additionally, we gathered program meeting minutes, regulations, cooperation terms, action spreadsheets, photos, videos, and related documents.

The questionnaire contained 17 categorized closed questions, including mutually exclusive (yes/no) and multiple-choice questions, split into three blocks. The first block characterized organizations by type, sector, location, and range of operation (from municipal to international). The second block identified implementation stages (ongoing, concluded, paralyzed, or canceled) and related details about agreed actions, such as results achieved, investment, partnerships, and reasons for paralysis or cancellation.

The last block had two multiple-choice questions, asking respondents to indicate their perception of the Pact's strengths and achievements and additional issues considered challenges for its consolidation.

We focused the application of questionnaires on the managers of the agreed actions. We sent 41 forms to the managers of the 240 agreed actions (N=240). Of these, 25 were answered, corresponding to 167 actions (n=167). The reason for such differences is that the same organization can coordinate more than one action.

To systematize data, respondents were categorized into four groups: Associations, incubator networks, technological innovation centers, and technology parks (NET); companies, associations, and professional representatives (BUS); government (GOV); and science and technology institutions (STI). Of the 25 responding organizations, nine were STI entities reporting on 73 agreed actions; eight were GOV, responsible for 45 actions; five were BUS, detailing 26 actions; and three were NET, providing information on 23 actions.

Most organizations researched (15 out of 25) operate at the state level. Seven operate nationally, five of which are in the STI group. Participants operating at the local and international levels are less represented, with one and two, respectively. As for the area of operation, seven of them work with education and five with public administration/government/defense. The others operate in other different areas.

Data triangulation, involving various collection methods and sources (Zappellini & Feuerschutte, 2015), facilitated a comprehensive analysis of the governance of the Pact for Innovation in Santa Catarina. This approach combined participant selection and data collection strategies outlined in Table 2.

Table 2. Data triangulation

Sources	Categories					
	Common Objectives and Value Cocreation	Actors and Roles	Goals and Evaluation	Coordination Mechanisms	Relationship Between Actors	Governance Approach
Interviews	x	x	x	x	x	x
Questionnaires	x	x	x	x	x	x
Document search	x	x		x	x	x

We used the thematic analysis technique to analyze data from the categories defined in advance. As proposed by Braun and Clark (2006), we operationalized the analysis by following six phases: (1) familiarizing with the data; (2) generating initial codes; (3) Searching for the themes; (4) reviewing the themes; (5) defining and naming themes; (6) producing the report.

Using the ATLAS.ti software, codes were applied, and analysis schemes were generated as figures that show the number of citations per category. The number of times each code was applied is represented by the letter G (grounded). The images also contain the value of D (density), which refers to the number of connections between one code and others. As in this work these relations were not generated, the D value is zero. We used simple descriptive statistics to process quantitative data from the questionnaire, extracting absolute and relative frequencies.

This process allowed the definition of themes related to each category of the study, which made it possible to characterize the elements that make up the ecosystem's governance in detail.

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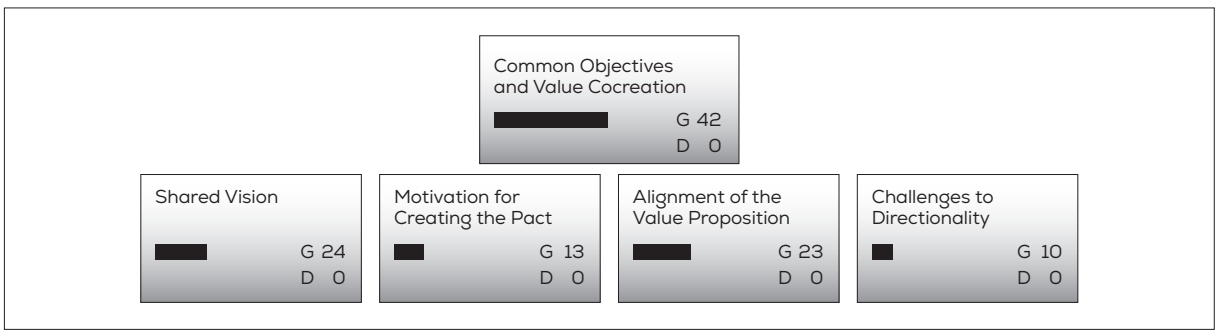
RESULTS

This section shows the results achieved for each of the categories that made up the theoretical-analytical model of the research: a) common objectives and value co-creation; b) actors and roles; c) goals and evaluation; d) coordination mechanisms; e) the relationship between actors; and f) governance approach. The discussion of the findings, considering their relationship with the problem that motivated the study, is built from data triangulation, as proposed in the methodological procedures section.

Common objectives and value co-creation

In this category, the four elements most mentioned by respondents were the existence of a shared vision, the motivation for creating the Pact, the alignment of the value proposition, and the challenges to directionality faced in the movement. Figure 1 shows the number of citations that refer to these elements.

Figure 1. Common Objectives and Value Cocreation



The first element, the shared vision among the actors who worked directly in the Pact for Innovation, showed that the main objective of these actors was to strengthen the IE in the state. There was a unanimous response among interviewees: "to leverage innovation in the state", to really change Santa Catarina into the most innovative state in Latin America by 2030.

The wish to enhance Santa Catarina's innovation leadership is widely shared among respondents (I1; I4; I5; I6; I8; I12), aiming for national and international recognition (I7). Shared values and vision rank second in the Pact's strengths, with 13 citations, closely following actor diversity, mentioned by 22 of the 25 respondents.

In interviews and document analysis, we found the program's central objective is integrating innovation agendas and enhancing actors' collaborative capacity for concrete actions, illustrated by the analogy: "It is putting a conductor so that the instruments play under that baton, and not being a dissonant polyphony. So, that is the vision" (I4).

Hence, we highlight the existence of a common objective (Könnölä et al., 2021) and a shared vision among the participants (Duarte et al., 2021). However, the quantitative empirical evidence showed that deepening collaborative processes in the ecosystem is still a challenge to address

in the future. Mentioned by 10 of the 25 managers who answered the questionnaire, it is the most cited challenge.

As for the second element related to common objectives and value co-creation, motivation for creating the Pact, several actors referred to the duplicity and overlapping of efforts and initiatives, which led to the dispersion of resources and weakening of the existing potential in the state (I1; I2; I4; I6; I8; I10). The Pact for Innovation emerged to promote directionality, a concept that concerns promoting the direction of the ecosystem with a focus on the established purpose (Könnölä *et al.*, 2021).

In addition, the results confirmed that the context of the Pact's creation had a robust interface with building Innovation Centers in different regions of Santa Catarina. Therefore, this program's objectives and vision are intrinsically related to the state's innovation center network.

When asked to explain the third element that came up with the category common objectives and value co-creation - the Pact's value proposition and the collective concept of innovation - some actors mentioned objectives associated with research, development, and technological innovation (I1; I2; I8; I9). Other actors mentioned attracting and qualifying talents and creating new technology-intensive businesses (I2; I5; I9; I11). There is also the vision that the Pact went beyond fostering innovation capacity in the business sector, as it wanted to promote all kinds of innovation in all spheres, including public management and civil society organizations, through social innovations (I1; I2; I4; I5; I7; I8; I11). From a broader perspective, the Pact's focus was creating policies and programs for innovation (I1; I10).

Hence, it revealed the common goal of promoting collaborations and joining efforts for the state's development and leading role based on innovation capacity and more diverse and emerging objectives, which arose gradually and varied according to the nature and origin of each actor. Thus, social responsibility and social impact (Cobben *et al.*, 2022) are the objectives most recently incorporated into IEs. In this context, the relationship between actors and the sharing of resources is highlighted with a focus on implementing sustainable development objectives - United Nations SDGs, facilitated through digital platforms (Duarte *et al.*, 2021).

Quantitative data analysis revealed diverse initiatives aligned with the Pact's objective. Key results, and the percentage of actions associated with them, include qualification on innovation and entrepreneurship training (46.70% of actions); expanding innovation partnerships in the state (45.50%); acquiring new knowledge and technologies (41.31%); attracting and training talent (33.53%); and enabling companies to anticipate technologies and create new markets (32.33%).

Given this diversity and dynamism to achieve concrete measures, the Pact's strategy was to unfold this set of more abstract objectives into actions and goals, focusing on ensuring directionality, which refers to "the purpose of the system and its normative direction" (Könnölä et al., 2021, p. 4).

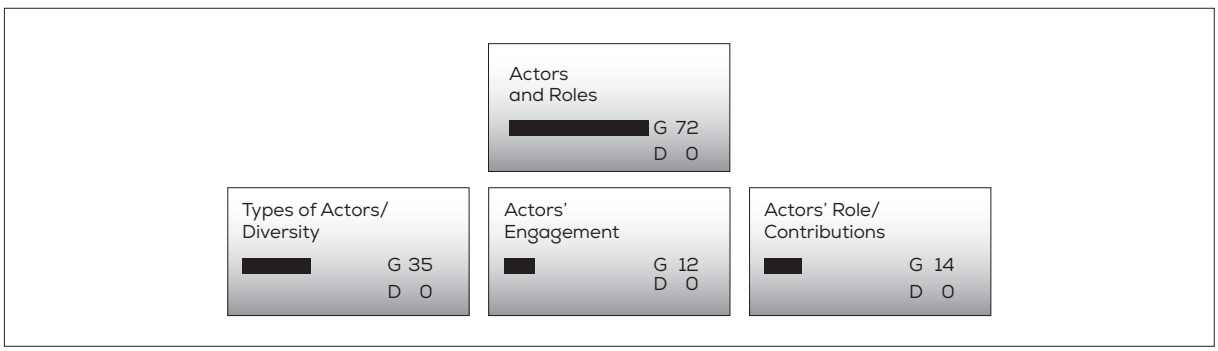
At this point, we identified the fourth element that connected to the category of common objectives and value co-creation: challenges to directionality faced in the process. Diffuse objectives, difficulties breaking down objectives into actions, and managers' turnover were the most mentioned. The purpose was to make the state a reference in innovation, but according to

interviewee 3 (I3), the objective was not broken down into actions aligned between the institutions. The changes in organizational managers also contributed to weakening the knowledge of the objectives and guidelines of the Pact (I4), resulting in challenges keeping its directionality.

Actors and roles

The analysis of the category 'actors and roles' involved in the Pact allows us to highlight the following three elements from the interviewees' standpoint: types of actors, with emphasis on diversity; actors' engagement in the movement; and actors' roles and their contributions. Figure 2 shows these findings, where the most prominent element is the diversity of actors participating in the movement.

Figure 2. Actors and roles



The first element related to this category - types of actors - showed that Pact involves actors that promote or support science, technology, innovation, entrepreneurship, and education in Santa Catarina. The agreed actions involve companies, business and professional associations, government, universities, research institutes, technical and professional education institutions, higher education institutions, foundations that support science and technology institutes, incubator associations and networks, technological innovation centers, and technology parks.

This composition shows diversity, which, according to the literature on the different types of actors that make up an IE, allows for performing different and complementary roles (Cobben *et al.*, 2022; Duarte *et al.*, 2021). The results from the quantitative data also highlight the actors' diversity mobilized by the Pact. It was mentioned by 22 out of the 25 respondents as one of the achievements/strengths of the program, ranking first in the number of citations.

Interviewees recognized the Secretariate of Economic Development of the State of Santa Catarina (SDE) as a key orchestrating element of the Pact in its initial phase. The secretariat was responsible for developing the architecture and coordination mechanisms focused on value creation (Autio, 2022) to make initial contact with leading institutions in the ecosystem and mobilize them to articulate a collective value proposition. Therefore, SDE played the role of orchestrating existing resources and knowledge in the IE (Grobbelaar, 2018): "In the beginning, it was a movement that SDE organized and talked with each actor, then, everybody wanted to be part of it" (I6).

To join the movement, the criterion established for engagement (the second element related to this category) was that the organization should have state, national, or international coverage, excluding municipal operations. Because of the growing interest in joining the Pact, an instrument was created to attract new members through adhesion terms. During this process, initiatives emerged throughout the state, aiming to become Local/Regional Pacts for Innovation (I1; I2; I8; I9; I12). They could join the movement if they met the acceptance conditions for unlisted entities. A management group made this analysis, which we will discuss later.

Joining the Pact implied that each organization assumed contributions, the so-called "agreed actions." As a result, this is the third element associated with this category. Document research showed that these actions were defined based on the identification of priority areas and structuring projects and were organized in four axes: Knowledge and Talents (Axis 1), Capital and Investment Attraction (Axis 2), Infrastructure (Axis 3), and Networks and Collaboration (Axis 4). Thus, as summarized by I10, the movement's agenda was established from the contribution of each institution to IE development, considering the specifics and possibilities of each stakeholder (Cobben et al., 2022; Duarte et al., 2021), and the interdependence between the actors (Gifford et al., 2021). Thus, several alliances were created, strengthening the collaboration between the institutions (Cobben & Roijakkers, 2019).

The analysis from the triangulation of quantitative data, interviews, and documents on the agreed actions shows the prevalence of those already ongoing within organizations, even before and regardless of the Pact. According to quantitative data, of the 167 actions, 64.67% already existed before the creation of Pact, and 34.13% were created out of it (two forms received no answers). Therefore, we identified a few new actions that could contribute to structuring the projects. This issue was criticized by some interviewees (I1; I3; I8), who felt the need for efforts to develop new initiatives.

Interviewees also revealed some aspects related to actors' participation. Within the working groups (WGs), some institutions were more active than others (I1; I2), and there was a diversity of actors within some axes, while others were more concentrated in specific types of actors (I4). Amidst this diversity, the university had a leading role, as did the government (I2; I4; I5; I6), which was also identified through quantitative data. This enabled noticing the predominance of finished actions by science and technology institutions' actors (41 actions, corresponding to 56.16% of those completed, according to the sample) and the government (20 actions, corresponding to 27.39%).

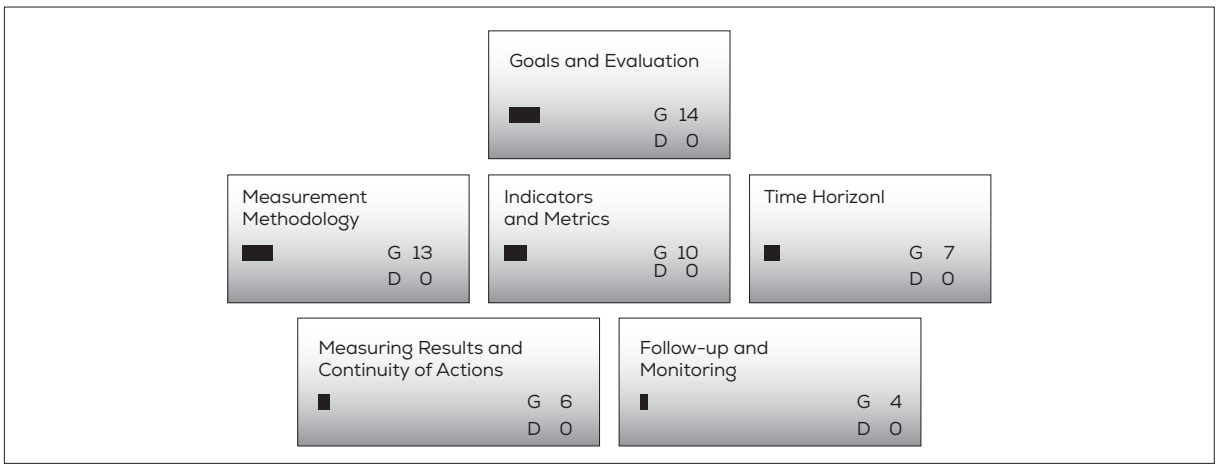
In addition, we observed that the largest ranges of invested values were concentrated in actions under the responsibility of these two groups, totaling 26 actions with investments above BRL 1 million. Such findings align with Grobbelaar (2018), who states that the university plays an essential role in regional development, and Liu *et al.* (2020), who see the government as a facilitator of alliances in IEs. From another perspective, quantitative data also suggest that insufficient commitment from actors could be one of the reasons for interrupting the uncompleted actions when 17 out of 25 actors responsible for canceled or interrupted actions mention insufficient partnerships and external articulations.

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Goals and evaluation

Along with shared vision and objectives, good governance in an IE involves unfolding the objectives into concrete goals and establishing mechanisms for monitoring and evaluating their progress (Chen et al., 2021; Leceta & Könnölä, 2019). Data analysis in the "goals and evaluation" category resulted in the following elements: indicators and metrics, measurement methodology adopted in the Pact, time horizon, follow-up and monitoring, and measurement of outcomes and continuity of actions.

Figure 3. Goals and evaluation



While interviewees understand the need for evaluation and monitoring indicators, they said this aspect was not discussed and matured, despite some attempts. Interviewees I2, I7, and I8 mentioned monitoring actions by a tool that updated the implementation status. In this sense, Cobben et al. (2022) strengthen the importance of adopting metrics for monitoring performance and comparative analysis of different ecosystems.

As shown in Figure 3, the first element associated with this category, indicators and metrics, stood out in data analysis, appointed as a challenge related to the difficulty of making measurements. In this regard, interviewees highlight the OKR [Objectives and Key Results] (I2; I5; I6; I8; I9), composing the second element that resulted from this category, the measure methodology adopted in the program. Adherence to OKR as a methodological option to deal with the difficulties associated with measurement can be illustrated by the following statement: "It was difficult to measure these goals or translate them into something effective within Pact. But we mapped the OKRs and the indicators could help us in monitoring these actions" (I6).

With the support of a facilitator, meetings were held in each working group, focused on the actions that were assigned to it, and, through a participatory approach (Grobbelaar, 2018), they created indicators and deadlines for achieving actions, showing concern with the definition of a time horizon. Highlighting this concern led us to characterize it as the third element resulting from the analysis of this category. This allowed them to move toward more specific guidelines for follow-up and monitoring the movement's progress, making up the fourth finding related to this category (Chen et al., 2021; Leceta & Könnölä, 2019).

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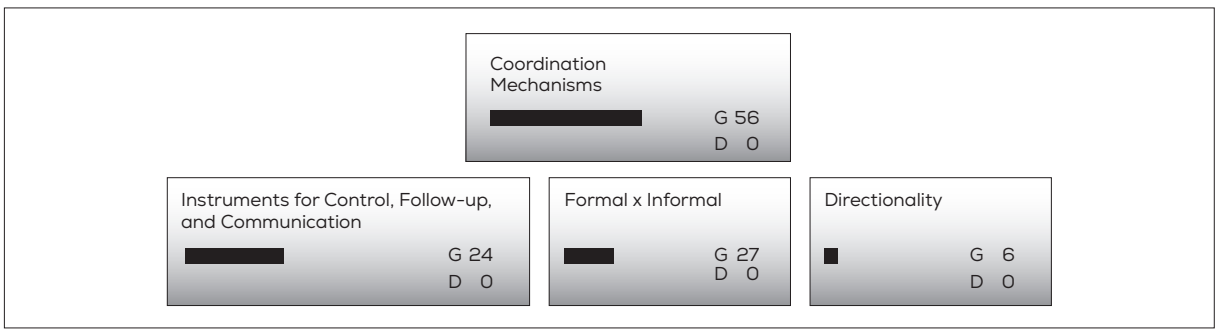
Thus, the data demonstrated that the actors intended to measure results and maintain monitoring of actions, but this was not enough to maintain the continuity of the initiatives (I1). This issue represents the fifth element of analysis.

Thus, prioritizing actions, defining the incorporation or not of actions already in progress by the agreed entities, ensuring the connection of indicators and goals with macro-objectives, linking goals to deadlines, and establishing monitoring remain governance challenges for Pact.

Coordination mechanisms

To maintain the directionality and alignment of the actors in an IE, coordination mechanisms must be used (Könnölä et al., 2021). Data analysis highlighted the following three elements in this category: control, monitoring, and communication instruments used; formality; and directionality.

Figure 4. Coordination mechanisms



Meetings were identified as the main coordination mechanisms in Pact, such as assemblies, general meetings, WG meetings, and events. Thus, several appointments were facilitated (Chen et al., 2021; Leceta & Könnölä, 2019), so meetings encouraged the involvement and mobilization of the actors, keeping the group active, which contributed to maintaining the alignment of actions with the purpose of the ecosystem: "Therefore, the [four] axes, the general coordination, and the General Assembly, were significant to keep the link with the agreed institutions, the vision, the values" (I4).

The assemblies counted on the participation of at least one representative per institution and were an important mechanism to inform the actors. On the other hand, WG meetings brought the actors closer due to the small number of people involved, according to interviewees I1, I2, and I6. Since they were small groups, people had more autonomy and freedom of action (I1; I2; I6). In general, the appointments enabled by the joint effort of the agreed organizations strengthened communication and dialogue between the actors (Liu et al., 2020; Roig et al., 2020).

As instruments of control, follow-up, and communication used by the groups, which composed the first element that resulted from this category, we highlight those that helped follow up the agreed actions, such as a platform provided by the Federation of Industries of the State of Santa Catarina - FIESC, and a control spreadsheet designed and operated by the SDE team

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(E6; E8; E9; E10). The quantitative data point out the need to improve the communication efforts within the initiative. This issue was cited as one of the future challenges of the Pact by eight interviewees, being considered the fourth most cited challenge.

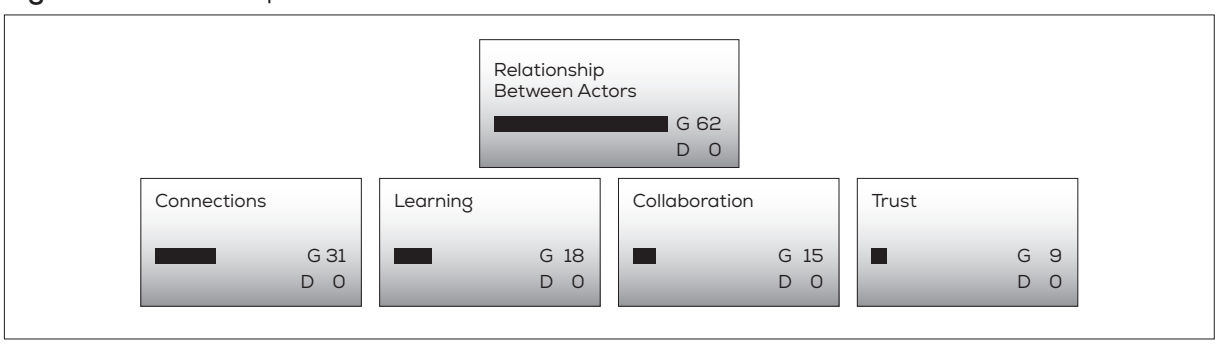
Regarding the formality of the coordination mechanisms used, which we considered as the second element associated with this category, we identified the choice for more formal mechanisms, such as signed agreements regarding the actions and rules created (I1; I5; I6; I7). This was found through the triangulation of data sources and is related to the stage of program creation. However, the movement took on a voluntary characteristic since there were no explicit controls regarding organizations' participation. At the same time, informal mechanisms such as meetings facilitate interactions, establish links, provide freedom, and encourage participation (Duarte *et al.*, 2021). According to I8, I9, and I11, the absence of formal control mechanisms and the prevalence of voluntary work are associated with difficulty feeding data and losing engagement over time. Grobbelaar (2018) mentions that both formal and informal engagement processes depend on the development of appropriate actor capacities, and, ultimately, these allow constructive and productive collaborations.

Despite the prevailing informality, the figure of the coordinator appears in the results, responsible for seeking adjustment between the different axes. WG coordinators were in charge of thematic meetings, tried to stimulate members' participation, and managed action plans. There was also a concern about the alignment between the Pact's coordinator and WG coordinators, in addition to standardizing communication with the media.

Relationship between the actors

Relationships between the actors, especially in collaborative arrangements, are part of the very nature of IEs (Cobben & Roijakkers, 2019; Leten et al., 2013). In this category, the following elements stood out: connections, collaboration, trust, and learning, as shown in Figure 5.

Figure 5. Relationship between actors



The interviewees consider the first element, connections between actors within the Pact, to be an important element and part of the program's assumptions. They resulted from the actors' union of efforts, generating ideas and opportunities of interaction and connectivity that would not be possible otherwise (I6) (Könnölä *et al.*, 2021). In addition, Santa Catarina is a state with a

solid infrastructure for qualifying people, with a group of highly skilled professionals (I2), and Pact is the opportunity to leverage these resources, especially through connections, integrating the actors involved in the ecosystem (Gifford *et al.*, 2021): "Then, among us, it created an even stronger link, we got together and saw this will, 'this business is spectacular, it will be part of the history of Santa Catarina. I want to be part of this history.' So, the feeling of belonging was strengthened" (I7).

The program opened doors for many institutions (I2), building partnerships and expanding perspectives for achieving innovative actions. It created a space for free circulation and discussion of ideas that culminated in defining objectives. Likewise, the environment allowed networking among those representing the institutions (I3; I6; I8; I10; I11; I12).

To ensure homogeneous participation, joint production and collaboration (the second element from this category) were valued and expressed in discussions that led to creating the statute and building Objectives and Key Results (OKR), for example (I4; I7; I9). The profiles of the participating actors and their different personalities and experiences provided heterogeneity to the process and contributed to building a collective culture toward a common purpose (I4; I9). We also observed a strengthening of the sense of belonging since participants identified themselves with the Pact vision (I1; I7).

Document research, interviews, and the questionnaire showed that Pact contributed to identifying and beginning new partnerships in the ecosystem. On the other hand, the questionnaires revealed that, of the 73 completed actions, 34 were done with partnerships and 39 without them, and of the 57 ongoing actions, 49 have partnerships, and only eight do not. Therefore, increasing the capacity for collaboration is still a challenge, considering that the main reason for the program's creation was precisely the establishment of connections. This is made explicit in the quantitative data since deepening collaborative processes is among the three challenges with the highest number of citations. Hence, data triangulation suggests that while the ability to collaborate in the ecosystem is one of the achievements of the Pact for Innovation in Santa Catarina, it is still an ongoing process.

We highlight establishing trust relationships as the third element in this category. Trust is considered essential in initiatives of this kind, where collaboration between the actors is appreciated. The history of people's relationships and knowledge before Pact also made a difference, facilitating the approach and the working format (I3; I7; I8), which is in line with the literature (Cobben & Roijakkers, 2019; Cobben *et al.*, 2022). Interviewees I1 and I8 revealed personal connections from interactions within the program, which, in turn, leverage new actions beyond Pact in an overflow effect.

The possibility of learning together (I1; I7) and sharing knowledge (I4) was also crucial in this process, strengthening learning, the fourth element associated with this category. The synergies and interdisciplinary knowledge stand out as gains (Gifford *et al.*, 2021). However, regarding opening and resource exchange, some participants mentioned the difficulty of sharing financial resources and information because some actors do not make organizational data available (I2; I8; I9).

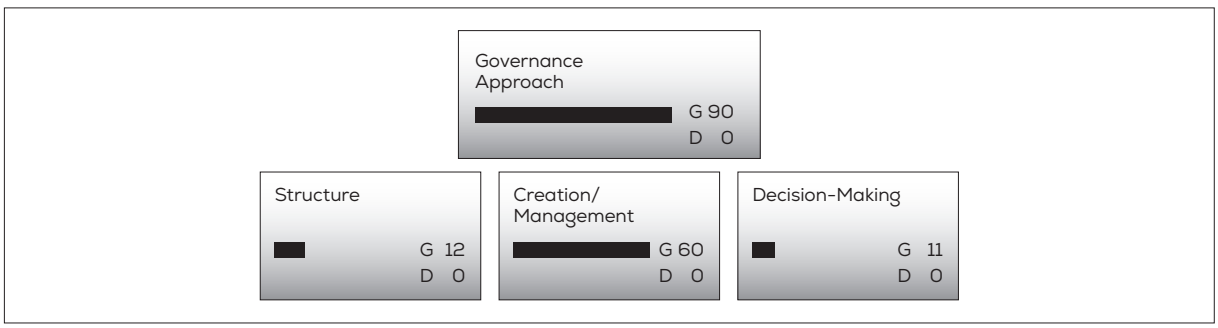
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The balance of coopetition - the interplay of cooperation and competition - in IEs is a complex puzzle. Researchers can deepen our understanding by quantitatively studying how firms navigate this tension over time, shedding light on the dynamics of IEs (Corbo et al., 2023). Another analysis perspective concerns the openness paradox, which focuses on the tension between knowledge sharing and protection (Paasi et al., 2020). Jin et al. (2023) explain that the openness paradox in IE is because 'either everyone innovates, or everyone imitates,' thus creating the possibility of opportunistic behaviors in these ecosystems, where many heterogeneous actors do not know each other, i.e., they are more diverse than in a network.

Governance approach

Regarding the approach developed by Pact and understanding its characteristics, the following three elements stood out in the analysis: structure, creation/management, and decision-making.

Figure 6. Governance approach



The Economic Development Secretariat - SDE was a key actor in the process. It was responsible for uniting the institutions, at the forefront of the movement, directing it, organizing meetings, encouraging the connection between actors, and monitoring WG coordinators (I6). New entities were integrated into Pact, which grew and expanded organically (I11), with decentralized management, open to the participation of different actors (Camboim *et al.*, 2019).

In other words, although SDE was initially in charge of Pact, it did not hold power and centrality. On the contrary, it favored the leading role of different institutions, providing them with leadership in emerging situations (I11). The assumption was that Pact was not the property of any specific actor: "We strongly insisted: this movement does not have ownership. It doesn't belong to the state government, it belongs to the state of Santa Catarina" (I7).

In this sense, we identified a deliberate effort to promote the involvement of all actors in the meetings to debate ideas (I7; I11). The active organizations were intensely engaged in the movement (I4, I10, I11), although it was voluntary (I9). On the other hand, quantitative data reveal the need for more resources as the most cited reason for interrupting agreed actions, along with insufficient partnerships and external articulations. Both were mentioned by 17 of the 25 respondents, ranking ahead of the 10 citations that refer to the impact of the COVID-19 pandemic on the continuity of actions. In addition, the questionnaire also highlights actors' greater commitment as the challenge with the highest number of citations, 10 out of 25.

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According to the documents examined, Pact's structure is based on a managing committee and four working groups oriented to the following topics: Knowledge and Talent (Axis 1); Capital and Investment Attraction (Axis 2); Infrastructure (Axis 3); and Networks and Collaboration (Axis 4). This structure composes the first element that resulted from this category. The axes were broken down into strategic projects to meet the main demands for strengthening the ecosystem. From the need assessment, entities sought to commit to actions agreed publicly and became monitored by an open-access tool.

As for the program management, the second element that composed this category, there was a general coordinator, a secretary, a coordinator, and a vice-coordinator for each WG. The coordinator is responsible for provoking and making the movement happen without effectively being the process controller (I11). At the General Assembly, each participating entity was represented by its chief officer, who designated people to participate in the axes (I4).

Therefore, the creation of Pact involved a participatory, democratic process (I5; I7; I10; I11), and horizontal management (I8), a decentralized movement (I5) that stimulates freedom, autonomy (I7), and discussion of ideas (I5). According to I11, there was little rigidity and formality, making it dynamic. In this context, decision-making (the third element from this category) was done jointly at the axes and strategically at the Annual Meetings (I4, I5, I8), with the participation of institutions' leaders (I1). In the beginning, decisions were in the hands of the government/SDE, but after establishing governance (I6) they became collective, with dialogue and ideology building (I10). Hence, we notice the perspective of Pact's co-creation (Camboim et al., 2019; Duarte et al., 2021).

Although document research and the interviews show an alleged bottom-up governance approach, quantitative data and the interviews revealed the importance of solid and present central leadership for the program's continuity (I2; I5; I6; I7; I11; I12), suggesting the importance of a top-down approach (Arena et al., 2022). Interviewees' references to the impact of managers' rotation in participating organizations indicate the difficulty of the ecosystem in mobilizing new orchestrators. Going further, we highlight 'strengthening a central leadership' as the challenge with the highest number of citations, 13 out of 25, and only two citations for the existence of strong leadership as a strength.

These issues present themselves as orchestration challenges because they deal with the difficulty of imposing roles, defining relationships, and involving voluntary efforts. An orchestration that balances control and autonomy is essential (Autio, 2022).

FINAL REMARKS

This study analyzed the characteristics of the governance in an Innovation Ecosystem (IE) in Santa Catarina, Brazil. Based on theoretical-analytical categories for understanding the characteristics of ecosystem governance defined by Hoffmann *et al.* (2023), the article showed empirical evidence collected through document research, interviews, and a questionnaire with the Pact for Innovation actors.

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The results showed the existence of common objectives, emphasizing the recognition of Santa Catarina as an innovative state. On the other hand, emerging objectives arose gradually as the actors joined the Pact. Such objectives are also related to the nature of participating entities and regional priorities. The Secretariat of Sustainable Economic Development's role in the initial mobilization of the players was evident.

The number and diversity of actors that joined the Pact while enriching the initiative create challenges for coordination. Although SDE assumed the role of orchestrator in the process, defining strategies to foster interaction and collaboration between the entities and using formal and informal coordination mechanisms, we noticed that the program's success depended on keeping a decentralized approach. Despite this, the capacity to mobilize new orchestrators was identified as a challenge to the adaptability and sustainability of the Pact. Other challenges were prioritizing and aligning agreed actions toward common objectives, connecting indicators and goals with macro objectives, and operating a monitoring and evaluation process. Finally, the complexity associated with strengthening links of trust, connection, and collaboration capacity between the actors is seen.

This paper can fill some gaps in the literature, which lacks studies focused on governance characteristics in IEs, mainly in developing countries, by bringing empirical evidence related to the Santa Catarina IE through the analysis of the Pact for Innovation. The proposed theoretical-analytical model can also contribute to the literature, being a benchmark for future research.

Identifying theoretical-analytical categories for understanding ecosystem governance characteristics can also have managerial implications. The production of empirical evidence from the study on Santa Catarina's IE and other IEs can contribute to managers and policymakers working in the field implementing actions and practices favorable to value cocreation in the ecosystem by promoting alignment and collaboration between actors.

As for the study limitations, defining categories in advance can limit identifying new ones. Furthermore, the case study method combining qualitative and quantitative approaches poses challenges to generalizing the results. Future studies could deepen the understanding of the governance challenges identified here and focus on comparative research with other IEs in Brazil and other developing countries, contributing to filling the gap addressed in this study.

REFERENCES

Adner, R. (2017). Ecosystem as structure: An actionable construct for strategy. *Journal of Management*, *43*(1), 39-58. https://doi.org/10.1177/0149206316678451

Arena, M., Azzone, G., & Piantoni, G. (2022). Uncovering value creation in innovation ecosystems: Paths towards shared value. *European Journal of Innovation Management*, *25*(6), 432-451. https://doi.org/10.1108/EJIM-06-2021-0289

Auria, A., Tregua, M., Spena, T. R., & Bifulco, F. (2016). Exploring innovation contexts: System, network and ecosystem innovation. *International Journal of Management and Enterprise Development*, *15*(2-3), 127-146. https://doi.org/10.1504/IJMED.2016.078206

Autio, E. (2022). Orchestrating ecosystems: a multi-layered framework. *Innovation*, *24*(1), 96-109. https://doi.org/10.1080/14479338.2021.1919120

Azevedo, I. S. C., & Teixeira, C. S. (2018). *As incubadoras de Santa Catarina*. VIA.

Baldwin, C. Y., Bogers, M. L., Kapoor, R., & West, J. (2024). Focusing the ecosystem lens on innovation studies. *Research Policy*, *53*(3), 104949. https://doi.org/10.1016/j.respol.2023.104949

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative research in psychology*, 3(2), 77-101. https://doi.org/10.1191/1478088706qp063oa

Burda, E., & Gavrikova, E. (2022). Innovation ecosystems in developing markets: Empirical evidence from Russian electric power industry. *Technology Analysis & Strategic Management*, 36(7) 1443-1460. https://doi.org/10.1080/09537325.2022.2099263

Camboim, G. F., Zawislak, P. A., & Pufal, N. A. (2019). Driving elements to make cities smarter: Evidences from European projects. *Technological Forecasting and Social Change*, *142*, 154-167. https://doi.org/10.1016/j.techfore.2018.09.014

Cappellano, F., & Makkonen, T. (2020). Cross-border regional innovation ecosystems: The role of nonprofit organizations in cross-border cooperation at the US-Mexico border. *Geojournal*, *85*(6), 1515-1528. https://doi.org/10.1007/s10708-019-10038-w

Chen, H. Q., Jin, Z. Z., Su, Q. K., & Yue, G. Y. (2021). The roles of captains in megaproject innovation ecosystems: The case of the Hong Kong-Zhuhai-Macau Bridge. *Engineering Construction And Architectural Management*, *28*(3), 662-680. https://doi.org/10.1108/ECAM-01-2020-0076

Cobben, D., Ooms, W., Roijakkers, N., & Radziwon, A (2022). Ecosystem types: A systematic review on boundaries and goals. *Journal of Business Research*, *142*, 138-164. https://doi.org/10.1016/j.jbusres.2021.12.046

Cobben, D., & Roijakkers, N. (2019). The dynamics of trust and control in innovation ecosystems. *International Journal of Innovation*, *7*(1), 1-25. http://dx.doi.org/10.5585/iji.v7i1.341

Corbo, L., Kraus, S., Vlačić, B., Dabić, M., Caputo, A., & Pellegrini, M. M. (2023). Coopetition and innovation: A review and research agenda. *Technovation*, *122*, 102624. https://doi.org/10.1016/j.technovation.2022.102624

Dedehayir, O., Mäkinen, S. J., & Ortt, J. R. (2022). Innovation ecosystems as structures: Actor roles, timing of their entrance, and interactions. *Technological Forecasting and Social Change*, *183*, 121875. https://doi.org/10.1016/j.techfore.2022.121875

Duarte, L., Reis, D. A., Fleury, A. L., Vasques, R. A., Fonseca, H., Filho, Koria, M., & Baruque-Ramos, J. (2021). Innovation ecosystem framework directed to sustainable development goal #17 partnerships implementation. *Sustainable Development*, *29*(5), 1018-1036. https://doi.org/10.1002/sd.2191

Escola Nacional de Administração Pública. (2023). *Índice de Cidades Empreendedoras (ICE)*. Brasil 2023. enap.gov.br

Foguesatto, C. R., Santini, M. A. F., Martins, B. V., Faccin, K., Mello, S. F. & Balestrin, A. (2021). What is going on recently in the innovation ecosystem field? A bibliometric and content-based analysis. *International Journal of Innovation Management*, *25*(7), 2130001. https://doi.org/10.1142/S1363919621300014

Gifford, E., McKelvey, M., & Saemundsson, R. (2021). The evolution of knowledge-intensive innovation ecosystems: Co-evolving entrepreneurial activity and innovation policy in the West Swedish maritime system. *Industry and Innovation*, *28*(5), 651-676. https://doi.org/10.1080/13662716.2020.1856047

Gomes, L. A. V., Facin, A. L. F., Salerno, M. S., & Ikenami, R. K. (2018). Unpacking the innovation ecosystem construct: Evolution, gaps and trends. *Technological Forecasting and Social Change*, *136*, 30-48. https://doi.org/10.1016/j.techfore.2016.11.009

Gomes, L. A. V., Santos, M. G., & Facin, A. L. F. (2022). Uncertainty management in global innovation ecosystems. *Technological Forecasting and Social Change*, *182*, 121787. https://doi.org/10.1016/j.techfore.2022.121787

Granstrand, O., & Holgersson, M. (2020). Innovation ecosystems: A conceptual review and a new definition. *Technovation*, 90, 102098. https://doi.org/10.1016/j.technovation.2019.102098

Grobbelaar, S. S. S. (2018). Developing a local innovation ecosystem through a university coordinated innovation platform: The University of Fort Hare. *Development Southern Africa*, *35*(5), 657-672. https://doi.org/10.1080/0376835X.2017.1421902

Hoffmann, M. G., Murad, E. P., Lemos, D. C., Farias, J. S., & Sanches, B. L. (2023). Characteristics of innovation ecosystems' governance: An integrative literature review. *International Journal of Innovation Management*, *26*(08), 2250062. https://doi.org/10.1142/S1363919622500621

Jin, Z., Saixing, Z., & Gao, X. (2023). Unpacking the paradox of openness in megaproject innovation ecosystems. *Technology Analysis & Strategic Management*, 1-17. https://doi.org/10.1080/09537325.2023.2283552

Könnölä, T., Eloranta, V., Turunen, T., & Salo, A. (2021). Transformative governance of innovation ecosystems. *Technological Forecasting and Social Change*, *173*, 121106. https://doi.org/10.1016/j.techfore.2021.121106

Leceta, J. M., & Könnölä, T. (2019). Fostering entrepreneurial innovation ecosystems: Lessons learned from the European Institute of Innovation and Technology. *Innovation: The European Journal of Social Science Research*, *34*(4), 475-494. https://doi.org/10.1080/13511610.2019.1612737

Letaba, P. T., & Pretorius, M. W. (2021). Toward sociotechnical transition technology roadmaps: A proposed framework for large-scale projects in developing countries. *IEEE Transactions on Engineering Management*, *69*(1), 195-208. https://doi.org/10.1109/TEM.2021.3050812

Leten, B., Vanhaverbeke, W., Roijakkers, N., Clerix, A., & Helleputte, J. Van. (2013). IP models to orchestrate innovation ecosystems: IMEC, a public research institute in nano-electronics. *California Management Review*, *55*(4), 51-64. https://doi.org/10.1525/cmr.2013.55.4.51

Liu, Z., Ma, L., Huang, T., & Tang, H. (2020). Collaborative governance for responsible innovation in the context of sharing economy: Studies on the shared bicycle sector in China. *Journal of Open Innovation: Technology, Market, and Complexity*, *6*(2), 35. https://doi.org/10.3390/joitmc6020035

Lynn, L. E., Heinrich, C. J., & Hill, C. J. (2000). Studying governance and public management: Challenges and prospects. *Journal of Public Administration Research and Theory*, *10*(2), 233-261. https://doi.org/10.1093/oxfordjournals.jpart.a024269

Moore, J. F. (1993). Predators and prey: A new ecology of competition. *Harvard Business Review*, *71*(3), 75-86. https://parsmodir.com/wp-content/uploads/2019/08/InnEcho-Moore1993.pdf

Ostrom, E. (1990). *Governing the commons: The evolution of institutions for collective action*. Cambridge university press, Cambridge.

Paasi, J., Valkokari, K., Rusanen, H., Makkonen, H., & Laiho, T. (2020). *Paradox of openness: Knowledge sharing-protection tension in ecosystems.* ISPIM Innovation Conference: Innovating in Times of Crisis, Lappeenranta University of Technology. https://urn.fi/URN:NBN:fi-fe202101283104

Roig, A., Sun-Wang, J. L., & Manfredi-Sánchez, J. L. (2020). Barcelona's science diplomacy: Towards an ecosystem-driven internationalization strategy. *Humanities and Social Sciences Communications*, *7*(1), 1-9. https://doi.org/10.1057/s41599-020-00602-y

Santos, D. A., Zen, A., & Bittencourt, B. A. (2021). From governance to choreography: Coordination of innovation ecosystems. *Innovation & Management Review*, *19*(1), 26-38. https://doi.org/10.1108/INMR-08-2020-0117

Schaeffer, P. R., Fischer, B. B., Queiroz, S., & Moraes, G. H. S. M. D. (2024). What makes an entrepreneurial university? Institutional moderators of ecosystem impacts in a developing country. *Science and Public Policy*, *51*(1), 108-126. https://doi.org/10.1093/scipol/scad062

Secretaria de Estado do Desenvolvimento Econômico Sustentável. (2017). *Guia de implantação dos Centros de Inovação*: *Livro I – Conceito e fundamentos*. SDS.

Secretaria de Estado do Planejamento. (2024). *Boletim de indicadores econômico-fiscais de Santa Catarina*. Seplan.

Spena, T., Tregua, M., & Bifulco, F. (2017). Searching through the jungle of innovation conceptualisations: System, network and ecosystem perspectives. *Journal of Service Theory and Practice*, 27(5), 977-1005. https://doi.org/10.1108/JSTP-10-2015-0224

Stahl, B. C. (2022). Responsible innovation ecosystems: Ethical implications of the application of the ecosystem concept to artificial intelligence. *International Journal of Information Management*, 62, 102441. https://doi.org/10.1016/j.ijinfomgt.2021.102441

Thomas, L. D. W., & Autio, E. (2020). Innovation ecosystems in management: An organizing typology. In *Oxford encyclopedia of business and management*. *Oxford University Press*. https://doi.org/10.1093/acrefore/9780190224851.013.203

Weerasinghe, R. N., Jayawardane, A. K. W., & Huang, Q. (2024). Critical inquiry on national innovation system: Does NIS fit with developing countries? *Sustainable Technology and Entrepreneurship*, 3(1), 100052. https://doi.org/10.1016/j.stae.2023.100052

Wegner, D., & Verschoore, J. (2021). Network governance in action: Functions and practices to foster collaborative environments. *Administration & Society*, 54(3), 479-499. https://doi.org/10.1177/00953997211024580

Zappellini, B., & Feuerschutte, S. G. (2015). O uso da triangulação na pesquisa científica brasileira em administração. *Administração: Ensino e Pesquisa*, 16(2), 241-273. https://www.redalyc.org/pdf/5335/533556754005.pdf

NOTE

For more information about the actors and other elements of the Pact for Innovation, visit: https://sistemabu.udesc.br/pergamumweb/vinculos/0000ad/0000adae.pdf

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CONFLICTS OF INTEREST

The authors have no conflicts of interest to declare.

AUTHORS' CONTRIBUTION

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