The Micro-Governance of Collaborative Networks: Promoting Entrepreneurial Ecosystems

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Abstract

Collaborative networks composed of public and private organizations have been used to promote entrepreneurial ecosystems. However, the effectiveness of collaborative networks depends on how network leaders perform micro-governance to promote an internal environment that fosters collaboration among the participants. This study analyzes the combinations of micro governance roles that create collaborative environments in collaborative networks. Nineteen networks created to foster an entrepreneurial ecosystem in Brazil were analyzed. Through qualitative comparative analysis (QCA) we identified that *organizing resources (OR)*, *arbitrating tensions (AT)* and *monitoring efforts and results (MER)* are necessary, but not sufficient for the promotion of the collaborative environment. We contribute to the collaboration theory by showing that some micro-governance roles are essential to produce a collaborative environment while others may work as complements and substitutes. The results also offer guidance for practitioners and policymakers involved with collaborative networks that promote entrepreneurial ecosystems.

Keywords: micro-governance roles, collaborative environments, local innovation ecosystems, collaborative networks, Qualitative Comparative Analysis, entrepreneurial ecosystem governance.

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1. Introduction

Entrepreneurial and innovation ecosystems and interorganizational networks involving various local and regional actors, such as universities, government entities, companies, and civil society, have the potential to contribute significantly to regional and local development. These collaborations facilitate talent development for the digital economy, resource and infrastructure coordination, institutional and legal support, and improved quality of life, ultimately fostering local innovation (Zen et al., 2019).

However, in emerging economies, entrepreneurial and innovation ecosystems often encounter challenges such as limited social inclusion and trust, weak institutions, limited capabilities to design, implement and monitor complex policies, a marginal role for universities, and an overbearing influence of the public sector (Ferretti & Parmentola, 2015; Thomas et al., 2021). Promoting effective entrepreneurial and innovation ecosystems in such contexts becomes a complex problem due to the unstructured cause-and-effect relationships, the multi-dimensional nature of society, and persistent difficulties associated with the process (Weber & Khademian, 2008).

Entrepreneurship and innovation ecosystems' development can be supported by collaborative networks composed of a variety of local organizations from the public, private and third sector (Appio et al., 2019). These networks play a crucial role in ecosystem creation because they mobilize local actors whose resources, knowledge and legitimacy are necessary to produce change and local development. However, the mere establishment of a collaborative network is not sufficient to ensure a positive societal impact. Effective governance is crucial in facilitating the optimal functioning of networks (Cristofoli et al., 2014; Klijn et al., 2010; Ysa et al., 2014) designed to promote entrepreneurial ecosystems.

In this context, the effectiveness of governance is crucial and has been extensively examined (Provan & Kenis, 2008; Raab et al., 2015; Smith, 2021), along with network formation (Segato & Raab, 2019; Qvist, 2017; Berthod & Segato, 2019; Dyer et al., 2018). However, despite the recent progress in the literature, there is still a lack of studies that explore the different functions of governance and their contribution to the realization of a collaborative environment, particularly in terms of operational aspects (Thompson & Perry, 2006; Diaz-Kope et al., 2015; Wegner & Verschoore, 2021).

There is an empirical research gap in combining two crucial themes—network governance and the collaborative environment—within the context of fostering entrepreneurship ecosystems (Li, 2019). Thus, this study aims to address the following research question: **Which configurations of micro governance roles promote the development of a collaborative environment in collaborative networks for creating entrepreneurial and innovation ecosystems?**

A particular focus of this research is to evaluate the role of micro governance in network formation and the actualization of collaboration,

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with a specific interest in identifying patterns that contribute to success during the critical stage of network establishment. In contrast to traditional studies on interorganizational networks that primarily examine the influence of factors on specific outcomes, t**his study aims to identify the configurations of micro-governance roles that facilitate the realization of a collaborative environment during the formation of collaborative networks**

The present study employed a qualitative comparative analysis (QCA) of micro governance roles within collaborative networks dedicated to promoting the entrepreneurial ecosystem in the city of Porto Alegre, the capital of Rio Grande do Sul, which is considered the most innovative state in Brazil. In Porto Alegre, there is a social movement known as Pacto Alegre, aiming at creating collaborative networks that foster the city's entrepreneurship and innovation ecosystem. We used the theoretical framework of Wegner and Verschoore (2022), which proposed six functions of microgovernance: alignment, mobilization, organization, integration, arbitration, and monitoring. The findings of this research provide valuable insights for policymakers in formulating strategies for local development and innovation promotion.

Our study contributes to the literature by providing important insights into the micro-governance roles in collaborative networks. Moreover, the combinations of micro-governance roles were identified within an interorganizational network which promotes bottom-up creation of entrepreneurial and innovation ecosystems. Thus, contrary to the previous studies, which focused on analyzing isolated factors which influence on creation of entrepreneurial and innovation ecosystems, the current study, by using the crisp-set QCA approach, suggested combinations of these factors which, altogether, thus filling this research gap.

The findings are valuable for policymakers and practitioners who aim to foster the development of collaborative networks related to entrepreneurial and innovation ecosystems. Specifically, the insights from the present study can help identify and create mechanisms that foster interorganizational network collaboration and growth.

2. Entrepreneurship and Innovation Ecosystems Emergence

Studies have confirmed that entrepreneurship is rather learned (Carvalho et al., 2010) than inherited. However, over time, it has also been understood that more than teaching entrepreneurs how to create, manage, and innovate is needed. To be successful, entrepreneurs need a conducive environment in which they can innovate and prosper in their businesses (Maroufkhani et al., 2018). This idea of an environment conducive to innovation and entrepreneurship comes from economic geographers and authors who have studied social, cultural, and institutional factors, which are defined as a socio-territorial entity that engages both people and firms in a naturally bounded area (Becattini 1979). However, the concept of the entrepreneurial ecosystem offers a distinctive viewpoint that complements previous studies on the clustering of economic activity and socio-territorial entities (Maroufkhani et al., 2018) that focused on a more competitive approach, as Brown and Mason (2014) suggested. The difference between these approaches lies in their focus on facilitating conditions to support entrepreneurship and their emphasis on policy agendas that promote entrepreneurial and innovative processes.

Mazzarol (2014) emphasizes that an entrepreneurial ecosystem is a conceptual model or strategy designed to nurture economic development by promoting entrepreneurship, small business growth, and innovation. It is within this scope that many studies on the creation of ecosystems emerge. Isenberg (2010) outlined the key principles to be embraced when constructing a thriving entrepreneurial ecosystem. These principles encompass fostering bottom-up processes, encouraging ambitious entrepreneurship, driving cultural changes, and implementing regulatory, bureaucratic, and legal reforms tailored to local conditions. Research on entrepreneurial ecosystems has largely taken a macro-perspective to conceptualize better and map the determinants and evolution of entrepreneurial ecosystems. Yet, entrepreneurial forms, networks, relationships, and respective environments evolve over time and space (Lange and Schmidt, 2020), therefore calling for more attention to the micro-level interactions of various entrepreneurial ecosystem actors (Cunningham et al., 2019).

The studies on entrepreneurial ecosystems indicate that public efforts to promote entrepreneurship often fail due to challenges in replicating successful strategies across different locations (Spiegel, 2017). In this regard, various studies, such as those by Brown and Mason (2017) and Spiegel (2017), emphasize the need to understand the process of entrepreneurial ecosystem formation through different lenses. Recent studies, such as Colombelli et al. (2019), highlight the need for a more complex relational form of governance to grow an entrepreneurial ecosystem. This could be achieved through a systemic and participatory approach rooted in shared cooperative norms and everyday routines.

Scott et al. (2020) present a conceptual framework for understanding the evolution and development of effective entrepreneurial ecosystems. They argue that previous static approaches to studying entrepreneurial ecosystems have overlooked the importance of fostering inter-organizational connections, behaviors, and governance mechanisms to sustain the ecosystem's vibrancy, vitality, and wealth creation, an area that remains relatively unexplored pertains to the governance of entrepreneurial ecosystems. The establishment of institutions responsible for fostering and supporting entrepreneurship is intricately linked to the design of entrepreneurial ecosystems. The governance of an entrepreneurial ecosystem encompasses the network interactions and power dynamics among these institutions (Colombelli et al., 2019).

There are several types of networks, and among the networks that seek to promote both innovation and local development and social well-being, collaborative networks with a public purpose stand out and can be understood as complex networks of connection beyond the boundaries of the organization (Bergenholtz & Waldstrom, 2011; Berthod & Segato, 2019).

2.1 Governance Roles of CollaborativeNetworks

Collaborative networks are defined as groups of three or more legally autonomous entities that act together to achieve collective goals in parallel with their individual goals. They can be formally established around clear goals, with operational autonomy and without a hierarchical structure (Provan et al., 2007). Relationships between network actors can have transactional and relational characteristics, which can change over time (Bergenholtz & Waldstrom, 2011).

Collaborative networks are extremely complex, so the chances of failure are high (Park & Ungson, 2001). Therefore, governance is essential to ensure the network's effectiveness. It must be attentive to paradoxes (Carranza & Ospina, 2010) and tensions. As such, micro-governance roles to facilitate collaboration are essential to ensure its success.

In order to understand the functioning of collaboration in the context of networks, we are interested in, functions and practices performed for the development of a collaborative environment or even the operational aspects that keep the governance of the network in operation (Wegner & Verschoore, 2021). This research proposes to apply the theoretical model proposed by Wegner and Verschoore (2021), which establishes six rolesof network governance: align, mobilize, organize, integrate, arbitrate and monitor. In the next subsections, each of the micro-governance roles will be explored.

The first function of governance is to align the interests of the participants, identifying their objectives and proposing solutions (Damgaard & Torfing, 2010). It has a deliberative, representative and legitimizing character (Milward and Provan, 2006), being able to understand the institutional design of interaction spaces that establish the rules of engagement (Sorensen & Torfing, 2017). Alignment comprises the strategic direction of the network around a consensual objective with the mediation of individual interests, through a network vision that strengthens the interdependence between its actors (Li, 2019). In addition, alignment also seeks to build the actors' commitment, supporting the clarification of the connection between the organizational objectives and the network's objectives, not forgetting the balanced distribution of activities and internal communication (Bryson et al., 2015; Milward & Provan, 2006).

The second function of governance refers to mobilizing participants by institutionalizing the interaction of interdependent but operationally autonomous actors who collaborate intending to undertake efforts to define and create public value through a process of self-regulation. In this sense, mobilization seeks to encourage participants to converge efforts to achieve collective goals and comprises deliberate attempts at facilitation and management without completely affecting the self-regulation capacity of the network (Sorensen & Torfng, 2017; Van Veen-Dirks & Verdaasdonk, 2009). Establishing accountability processes contributes to this by giving a focus and providing incentives to participants, favoring the effectiveness and productivity of networks and, therefore, stimulating a collaborative environment (Acar et al., 2014).

The third governance function, called organizing resources, refers to the ordering and provision of human, financial, technological and legal resources for the network to develop, including the definition of the basic task to be performed by it and the provision of conditions or resources for its realization by those involved (Sorensen & Torfing, 2005, 2017). Also, this function can be understood as a political and discursive framework seeking to clarify the conditions for executing network tasks (Sorensen & Torfing, 2017). Previous studies have identified that the abundance of resources was an essential element in the success cases of the studied networks (Cristofoli et al., 2015; Raab et al., 2013), although not enough when it occurs in isolation (Turrini, Cristofoli, Frosini and Nasi 2009).

The fourth governance mechanism deals with integrating participants in terms of resources and capabilities (Lehtonen, 2014). Integration should seek to level access to the necessary information between the institutions that make up the network, and should be linked to an incentive system that encourages such integration (Van Veen-Dirks & Verdaasdonk, 2009). The search for complementary capabilities and resources among those involved motivates the creation of alliances (Dyer, Singh and Hesterly 2018), and we understand that public purpose-oriented interorganizational networks have similar dynamics.

Arbitrating tensions is the fifth function of governance and is related to resolving tensions, conflicts and disagreements to reconcile conflicting interests of the network components (Cristofoli et al., 2014); which allows you to explore new ideas collectively and guide interactions. Management focuses on developing relationships between actors, which significantly impacts achieving network results (Edelenbos et al., 2013). Arbitration involves the mediation and facilitation of interactions, reducing their transactional costs by building a stimulating and encouraging atmosphere that is open to dialogue, collaboration and co-creation (Nonaka et al., 2014; Sorensen & Torfing, 2017). Phenomena known as "free rides" (in which participants appropriate the benefits without incurring obligations) and "stealing" can lead to the establishment of conflicts, even if unnecessary (Potoski & Prakash, 2009). In this case, practices such as monitoring efforts and results can contribute to mitigating such volunteering phenomena.

Finally, the sixth governance function, monitoring efforts and results, demands accountability routines that allow the network to observe its own progress and performance, which helps it to understand what stage it is in to achieve the agreed objectives (Acar et al., 2008; Van Veen-Dirks & Verdaasdonk, 2009). An accountability relationship is quite difficult to establish due to the lack of performance information, personal differences in performance and collaboration, frequent changes in the people and partners present in the networks, and the commitment of resources (Acar & Robertson, 2004). However, this process can allow one to observe such phenomena and do something differently, thus allowing objectives and/or approaches to be revised (Acar et al., 2008). Table 1 summarizes the micro-governance roles proposed in this study.

Table 1 - Analysis framework: Micro-governance Roles

Micro-governance roles	Definition	References
Aligning interests	Align the interests of participants, identify their objectives and propose solutions.	Damgaard; Torfing (2010); Milward; Provan (2006); Sørensen; Torfing (2017); Li (2019); Bryson; Crosby; Stone (2015)
Mobilizing participants	Mobilize participants to converge efforts and achieve collective objectives.	Van Veen-dirks; Verdaasdonk (2009); Acar; Guo; Yang (2014); Sørensen; Torfing (2017); Hudson (2004); Mesquita (2007)
Organizing resources	Organize and make human, financial, technological and legal resources available for the network to develop.	Sørensen; Torfing (2005, 2017); Cristofoli; Markovic (2015); Raab; Mannak; Cambré (2013); Turrini, Cristofoli, Frosini e Nasi (2009); Segato e Raab (2019)
Integrating participants	Integrate the participants' resources and capabilities.	Lehtonen (2014); Van Veen-dirks; Verdaansdonk (2009); Dyer; Singh; Hesterly (2018); Dyer; Singh (1998)
Arbitrating conflicts	Arbitrate conflicts to reconcile conflicting interests of network members.	Cristofoli; Markovic (2015); Edelenbos; Van Buuren; Klijn (2013); Nonaka; Kodama; Hirose; Kohlbacher (2014); Sørensen; Torfing (2017); Segato e Raab (2019)
Monitoring efforts and results	Monitor the actions and the results achieved.	van Veen-Dirks; Verdaasdonk (2009); Acar; Guo; Yang (2008); Acar;

Previous studies have analyzed the micro-governance of collaborative networks in different contexts. For instance, da Rosa et al. (2023) investigated a cross-border network and concluded that resource asymmetry among network partners requires more effort to integrate, mobilize, and organize participants and their resources. Results also show that time of collaboration among network participants plays a positive role because it supports trust, facilitates communication, and reduces the need for alignment and arbitration. Wegner et al. (2023) analyzed two collaborative networks designed to promote social innovation in Germany. The study revealed that organizing and integrating each stakeholder's resources and monitoring the activities performed over time are critical roles in governing such collaborative networks. Recently, Wegner et al. (2024) performed a Qualitative Comparative Analysis to analyze the governance of 36 collaborative networks for water protection in Brazil. The authors identified four configurations that conduce the network towards a collaborative environment. Interestingly, mobilizing and organizing are the only two governance roles present in all configurations, while other functions work as substitutes in each configuration.

These studies (da Rosa et al., 2023; Wegner et al., 2023; Wegner et al., 2024) reveal that collaborative networks designed for different purposes may require distinct governance roles to produce a collaborative environment. No single role seems mandatory, but the roles may combine into different configurations to foster collaboration.

2.3 Collaborative Environment in Networks

Governance roles, when incorporated into routines, contribute to a collaborative environment, which is an important intermediary effect for the network to form and evolve, even corroborating to mitigate the negative effects of formalization on coordination, learning and trust (Albers et al., 2013). Ties and trust developed in interorganizational relationships drive the sense of belonging and lead firms to acquire new knowledge (Córcoles-Muñoz, 2020). Still, when there is a government presence, the analysis of collaborative partnerships of local governments revealed that the local authority tends to be the dominant partner in governance by stimulating its creation, boosting and allocating dedicated teams and raising political capital (Skelcher et al., 2005).

We can classify collaboration by the presence of dialogue, trust building, commitment to the process, shared understanding, intermediate deliverables and facilitative leadership (Ansel & Gash, 2007). A collaborative environment can be characterized by five factors: trust, legitimacy, learning, power and proportionality.

Collaboration, although essential in networks, presents intrinsic dilemmas in its dynamics, especially in voluntary contexts, namely: "free ride", guarantee and generosity. In all these cases, non-cooperation can be a dominant strategy if not properly addressed by governance with practices such as proper dissemination of information (Sorensen & Torfing, 2017). For the purposes of this work, the implementation of a collaborative environment was studied as an important intermediate result in the transition from the formation stage to the growth or maturation stage of networks (Berthod & Segato, 2019; Dyer et al., 2018) in which the micro-governance roles performed in everyday life play a fundamental role.

The first element of analysis is trust or belief and willingness to act based on the actions, statements and decisions of others (Getha-Taylor et al., 2019). It has a multilevel characteristic: individual, organization, group and system, and can be strongly influenced by relationships before the formation of the network (Ansel & Gash; 2007). To obtain more trust, cultivating personal relationships is a critical factor (Agranoff & McGuire, 2001). Many partnerships operate with limited trust, and a more pragmatic approach may be more appropriate, as linkages often need to be established quickly (Geddes, 2009).

Legitimacy, conversely, can be classified as the internal credibility of the network before its members, comprising process and result legitimacy. Factors that impact the perception of legitimacy are the degree of inclusion of the network and whether they are centered on public power or on civil society (Fawcett; Daugjberg, 2012). In a seminal essay by Provan and Kenis (2007), legitimacy is presented as one of the tension components to be managed in governance: how to manage legitimacy internally and externally. For the purposes of this study, it was understood that in the process of implementing a collaborative environment in the formation stage of a network, internal legitimacy is more critical. A strategy to ensure legitimacy is to ensure leaders or participants who provide the energy for execution and sponsors or people with the ability to legitimize interorganizational innovations through persuasion and influence (Mandell; Steelman, 2003).

Learning is the third element and refers to the apprehension on the part of organizations about how to act collectively (Knight, 2002; Gibb, Sune & Albers, 2016). Through the internal interaction between network participants, learning occurs when it results in changes in their attributes. Although interorganizational learning has a strong connection with network learning, it is important to emphasize that network learning comprises the group of component participants, not the individual learning that takes place within the network. To the extent that learning about how to collaborate can deepen participants' commitment, it is a potential tool for expanding or adapting collaborative efforts (Ansell & Gash, 2017).

The fourth element, power, means the ability to influence actions and behaviors among members (Huxham & Beech, 2008; Ansell & Gash, 2007). Although there is power asymmetry in all relationships, the feeling of a significant power imbalance that inhibits participation can discourage collaboration. According to Huxham and Beech (2009), the sources of interorganizational power can be classified as an imbalance of needs (such as skills and information), importance imbalances (such as strategic centrality, uniqueness, and sanctions), structural position (whether by formal authority, network centrality/discursive power), or by daily activities (which in turn would be points of power inherent in the relational process).

Finally, fairnessrefers to the perception that the benefits of being part of the network are proportional to individual contributions (Park; Ungson; 2001; Dyer, Singh; Hesterly; 2018). There is a strong relationship between the sense of fairnessand participation incentives. These stimuli have a direct relationship with the achievement of concrete, tangible and significant results from the actions of network participants (Ansel & Gash, 2007).

In this study these elements are understood as qualifiers of collaboration. Table 2 summarizes the dimensions that characterize a collaborative environment in this study.

Table 2 - Elements of Collaborative Environment

Elements	Definition	Authors
Trust	Belief and willingness to act based on the actions, statements, and decisions of others.	Getha-Taylor; Grayer; Kempf; O'Leary, (2019); Ansel; Gash (2007); Agranoff; Mcguire (2001); Geddes (2009)
Legitimacy	Network internal legitimacy among its participants.	Fawcett; Daugjberg (2012); Mandell; Steelman (2003); Persson, Lundberg; Andresen (2011)
Learning	Learning about how to act collectively.	Knight (2002); Gibb, Sune, Albers (2016); Ansell; Gash (2017)
Power	Ability to influence actions and behaviors among members.	Huxham; Beech (2008); Ansel; Gash (2007); Henttonen; Lahikainen; Jauhiainen (2014); Mandell; Stellman (2003)
Fairness	Perception that the benefits of being part of the network are proportional to individual contributions.	Park; Ungson (2001); Dyer, Singh; Hesterly (2018); Ansel; Gash (2007)

3 Method

We used crisp-set Qualitative Comparative Analysis (QCA) to identify the configurations of micro governance roles that produce a collaborative environment in collaborative networks during their formation process. Unlike traditional statistical methods, QCA allows for in-depth exploration of analyzed cases while producing some level of generalization (Ragin, 1987; Rihoux & Ragin, 2009). Additionally, QCA enables the identification of a set of factors that together lead to a certain result, rather than simply quantifying the isolated influence of one variable over another (Cristofoli & Markovic, 2016; Rihoux & Ragin, 2009). In this sense, QCA technique, unlike traditional data analysis technique such as regressions, can reflect more the nature of complex social phenomena, as it analyzes à given number of factors together, and not isolating the influence of one variable on another (Rinoux & Ragin, 2008).

The QCA method is based on the principle that a result is not easily explained by a single cause, and the factors that potentially explain the result rarely operate in isolation. It is recommended for determining and justifying interactions between conditions and observing their results in a reduced number of cases. Therefore, QCA was the chosen method to analyze the factors that, together, contribute to the creation of a collaborative environment in networks, including the functions of governance.

3.1 Description of the Object of Study

The study analyzed the collaborative networks established by the initiative known as Pacto Alegre. The main objective of this initiative was to promote socioeconomic development and foster the innovation ecosystem in Porto Alegre, Brazil, which is one of the ten largest capitals

in the country. The initiative was initiated in April 2018 following the establishment of the Alliance for Innovation by three local universities: UNISINOS, UFRGS, and PUCRS (PACTO ALEGRE, 2019b).

Pacto Alegre began with informal discussions among local leaders. This was followed by raising awareness and identifying influencers in the political, financial, cultural dimensions, as well as support for entrepreneurship, human capital, and the market. Additionally, there was integration of these key actors, the establishment of the project's macro governance ("Pact table"), mapping of the innovation ecosystem, definition of the city's macro challenges, submission and selection of project ideas, attracting supporters, constitution of teams comprising the drivers (who were the initial proponents of the project ideas) and supporters (participants), and the establishment of action plans focused on short-term deliverables. The entire process is being monitored by a foreign consultant who was hired due to their experience in the ecosystems of Barcelona, Medellín, and Florianópolis (Thomas, Faccin & Asheim, 2021).

Participation in Pacto Alegre was voluntary, and the distribution of entities and participants across the collaborative networks was based on their affinity for the problems that the projects aimed to address, as well as their institutional capabilities and the objectives and suggested deliverables of the projects. When Pacto Alegre was initiated, the signatory entities identified six macro challenges - talents, urban transformation, business environment, city image, quality of life, and modernization of public administration - that resulted in 24 collaborative networks.

3.2 Data collection

Data was collected by sending a structured questionnaire to the managers of the collaborative networks via email. The questionnaire was developed based on the literature review, using questions from the preliminary version. After that, three research specialists in network governance and entrepreneurial and innovation ecosystem also validated it. To refine the data collection instrument, three senior researchers specializing in innovation ecosystems, networks, and governance evaluated the preliminary version of the questionnaire. Additionally, a pre-test was conducted by administering the questionnaire to one of the network managers (Flick, 2008; Yin, 2015). For 19 networks established to promote entrepreneurship and innovation ecosystems, a total of 37 questionnaires/answers were obtained. Previously to the interviewing through data collection instruments, all respondents were explained that their personal identities will be kept confidential and obtained data will be used only for academic purposes.

3.3 Data analysis

Table 3 shows codification of causal conditions and outcome:

Table 3 - Causal conditions and outcome

Causal conditions - Micro-governance roles	Code
Aligning interests	IA
Mobilizing Participants	MP
Organizing Resources	OR
Integrating Participants	IP
Arbitrating Conflicts	CM
Monitoring Efforts and Results	MER
Outcome	**Code**
Collaborative environment	CE

In the exploratory stage prior to designing the research project, excerpts highlighting the findings obtained through the Qualitative Comparative Analysis (QCA) were identified in the interviews. These excerpts will be presented to illustrate the qualitative comparative analysis.

The Crisp-Set Method (csQCA) utilizes Boolean algebra, which involves assigning a value of 1 (present) or 0 (absent) to factors in order to identify the combination, or solution formula, of these factors that lead to a specific outcome (Grofman & Schneider, 2009). To achieve this, the data was dichotomized by establishing a cutoff point (Betarelli Junior & Ferreira, 2018; Rihoux & Ragin, 2009; Wagemann & Schneider, 2012). The five-point Likert scale used in the study was calibrated to the csQCA binary format according to Mello (2019).

In this study, scores of 5 and 4 were considered to indicate the presence of a condition (1), while scores of 1 and 2 were considered to indicate the absence of a condition (0). For cases where the score was 3, other responses were evaluated. If the respondent scored 4 or 5, the condition was considered present, whereas if they scored 3 or less, it was considered absent.

Nine cases included more than 1 respondent. In eight out of nine cases, all respondents gave answers that matched the same output value (0 or 1) for all questions related to causal conditions[1]. Hence, the responses of all respondents in each case showed alignment.

1For instance, if respondent 1 answered 5 to question X of case Y, another respondent would answer 3 or 5 for the same question. Or, for instance, the situation where respondent 1 for question Z of case H responded 3, respondent 2 for the same question would score either 4 or 2. No case received combinations of answers for à given question of 2 and 4, or 4 and 1, or 5 and 1.

Table 4 - Dichotomization of outcomes

CASE	IA	MP	OR	IP	MT	MER	AC
1	0	1	1	0	1	1	1
2	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0
4	1	0	1	1	1	1	1
5	1	1	1	1	1	1	1
6	1	1	1	1	1	1	1
7	1	1	1	0	1	1	1
8	1	1	1	1	1	1	1
9	1	1	1	1	1	1	1
10	1	1	1	1	1	1	1
11	1	1	1	1	1	1	1
12	1	1	1	1	1	1	1
13	1	1	1	1	1	1	1
14	1	1	1	1	1	1	1
15	1	1	1	1	1	1	1
16	1	1	1	1	1	1	1
17	0	0	0	0	0	0	0
18	1	1	1	1	1	1	1
19	1	1	1	1	1	1	1

4 Findings

4.1 Necessity analysis

A necessity analysis was carried out for the collaborative environment (Table 5) to identify necessary conditions. Two parameters were used to identify whether the condition was necessary. The first parameter is called "consistency", which is similar to the analogue regression significance. Consistency is calculated by dividing the number of cases with a value on the configuration and an outcome value by the total number of cases with an outcome value. The second parameter is coverage, which is similar to the regression R square indicator. Coverage scores indicate the percentage of cases that exhibit the outcome that also exhibit a specific solution (Rinoux & Ragin, 2008). For a condition to be necessary, consistency cutoffs above 90% and coverage above 70% were used (Ragin & Davey, 2016). Therefore, it can be stated that the conditions, except integrating participants, are necessary for the collaborative environment's effectiveness. These are: Align Interests, Mobilize Participants, Organize Resources, Conflict Management, and Monitor Efforts and Results.

Table 5 – necessity analysis for the causal conditions of the Collaborative Environment

CONDITION	CONSISTENCY	COVERAGE
AI	0,9375	1,0000
~AI	0,0625	0,2500
MP	0,9375	1,0000
~MP	0,0625	0,2500
OR	1,0000	1,0000
~OR	0,0000	0,0000
IP	0,8750	1,0000
~IP	0,1250	0,4000
MT	1,0000	1,0000
~MT	0,0000	0,0000
MER	1,0000	1,00000
~MER	0,0000	0,0000

4.2 Sufficiency test

The application of csQCA begins with the sufficiency test, where a truth table is created to generate condition settings (AI, MP, OR, IP, MT, MER) that are sufficient to achieve a specific outcome (AC). The truth table includes all logically possible combinations, resulting in a number of rows equal to 2 raised to the power of the number of conditions used, which in this case is 64 rows. To reduce the number of rows, a consistency level selection is necessary. In this study, combinations with a consistency level above 80% were considered, indicating that these causal conditions were present (Marconatto et al., 2020).

4.3 csQCA results

The csQCA analysis generates three solutions: complex, intermediate, and parsimonious. Ragin (2014) suggests using an intermediate solution as it represents a balance between complexity and parsimony, using procedures similar to conventional case-oriented comparative research practice. In this study, all combinations obtained from running the csQCA, as well as the consistency and coverage indices, were identical for all generated solutions (Table 6).

The "quality" of the csQCA analysis is measured using two indicators: consistency and coverage. The academic literature suggests a minimum consistency of 0.8 and coverage of 0.4 for a solution to be considered valid (Marconatto et al., 2020; Ragin, 2008). According to Table 6, both consistency and coverage of the solution presented a value of 1, which is the maximum possible value for these indices. Therefore, the presented solution is highly satisfactory.

The solution generated two combinations of micro-governance roles used by the collaborative networks to foster a collaborative environment. The first combination (MP*OR*~IP*MT*MER) indicates the presence of the functions Mobilize Participants, Organize Resources, Conflict Management, and Monitor Efforts and Results, and the absence of Integrate Participants. The second combination (AI*OR*IP*MT*MER) suggests that Align Interests, Organize Resources, Integrate Participants, Manage Conflict, and Monitor Efforts and Results are necessary to create a collaborative environment. Thus, it appears that three out of the six causal conditions studied (Organize Resources, Arbitrating Tensions, and Monitor Efforts and Results) are necessary but not sufficient for achieving the Collaborative Environment outcome. At the same time, none of the governance mechanisms individually lead to the desired outcome.

Table 6 - QCA Solution

Out-come	AI	MP	OR	IP	AT	MER	Coverage		Combination consistency	Solution coverage	Solution consistency	Cases
							Raw	Unique				
CE		●	●	⊙	●	●	0.125	0.125	1	1	1	1, 7
	●		●	●	●	●	0.875	0.875	1			4, 5, 6, 8, 9, 10, 11, 12, 13, 14,15, 16, 18, 19

● Causal condition present

⊙ Causal condition absent

As shown in Table 6 the solution formed by two configurations presents the highest possible solution consistency (1.0). It means that 16 out of 16 collaborative networks configured in one of the two suggested configurations produced a collaborative environment. The solution coverage is 1.0 which is also the highest possible value. It means that together two identified configurations cover all collaborative networks where a collaborative environment was successfully achieved.

Furthermore, the results also demonstrate good unique coverage for both configurations. The raw coverage indicates that 12.5% of all cases that produced a collaborative environment contain the first configuration, while 87.5% contain the second configuration. The unique coverage is extracted from the cases that have the same configuration. It indicates that 12,5% of all cases that produced a collaborative environment contain the first configuration exclusively, and 87,5% contain the second configuration exclusively (Rihoux and De Meuer, 2009). Also, unique coverage numbers show that the second configuration is more prevalent in the cases that result in a collaborative environment.

The equations for the two configurations of micro-micro governance roles present in collaborative networks with a high level of collaborative environment can be expressed as follows:

1. Configuration 1: MP*OR*~IP*MT*MER

This configuration indicates that the presence of Mobilize Participants (MP), Organize Resources (OR), Conflict Management (CM), and Monitor Efforts and Results (MER), with the absence of Integrate Participants (IP), is associated with a high level of collaborative environment.

2. Configuration 2: AI*OR*IP*MT*MER

This configuration suggests that the presence of Align Interests (AI), Organize Resources (OR), Integrate Participants (IP), Arbitrate Tensions (AT), and Monitor Efforts and Results (MER) is necessary for achieving a high level of collaborative environment.

The two configurations can also be expressed by the equation below[2]:

$$OR*CM*MER*(MP*\sim IP+AI*IP) \rightarrow AC$$

5 Discussion

The QCA method is valuable in identifying configurations of causal conditions that explain the outcome variable and determining whether these conditions substitute or complement each other. In our study, utilizing the QCA method allowed us to identify two configurations of micro-governance that demonstrated a high level of consistency (100%) within our sample.

Specifically, these two configurations represent the options of governing collaborative networks created to develop an entrepreneurial and innovation ecosystem. Although these governance configurations do not guarantee the attainment of final goals - i.e. the success of an entrepreneurial and innovation ecosystem - , they do contribute to creating a positive and interorganizational network environment. This supportive environment facilitates effective collaboration among network members and fosters smoother interactions. As a result, it may contribute to the overall development of the entire ecosystem (Wegner and Verschoore, 2022).

[2] The symbol "+" denotes the logical operator "or"; "*" denotes the logical operator "and"; "~" denotes the logical operator"absence " or"opposite," and → "denotes the logical implication operator (Rihoux and De Meuer, 2009.

The two configurations show that Organizing (OR), conflict management (CM) and Monitoring (MER) are roles that have been performed by network leaders of collaborative networks that achieved high levels of a collaborative environment (Acar, Guo and Yang, 2008; Sørensen; Torfing, 2005, 2017). This result highlights that a collaborative environment demands efforts to organize the activities and resources of network members, aligning with Kooiman and Jentoft (2009) when they state that the meta governance is the process in which the discussion, formulation and application of values, norms and principles for governance takes place. For instance, leaders must schedule and organize meetings, define responsibilities and determine which activities must be performed over time. Organization is required to define the processes and routines to make collaboration effective (Cristofoli, Macciò, and Pedrazzi, 2015). Furthermore, these efforts in organizing the group help network members understand their tasks and the resources they need to deploy (Sørensen and Torfing, 2005).

Arbitrating is also vital in both configurations, as network members may have divergent backgrounds, experiences, and interests that can lead to disagreements about network activities or their execution. Leaders must therefore arbitrate conflicts that could transform into relationship problems and harm collective work. Lastly, monitoring helps leaders and members in evaluating the success of their efforts, minimizing opportunistic behavior, and finding alternative strategies in case of poor performance.

The first configuration (OR*CM*MER*__MP__*__~IP__→CE) incorporates two additional micro governance roles to the three previously mentioned, namely mobilizing the participants (MP) and the absence of integrating (~IP), alongside organizing (OR), conflict management (CM), and monitoring (MER). We label the collaborativenetworks that follow the configuration as "Meta-governed collaborativenetworks". In such networks, leaders invest their time in mobilizing the participants rather than heavily engaging in integrating their resources and knowledge. Our findings align with Müller-Seitz (2012) who suggests that leadership in collaborative networks influences all members in order to 'make things happen'.

Furthermore, this configuration does not require micro governance roles to align interests and promote a shared vision among network participants. Networks that adhere to this configuration may benefit from the meta-governance structure commonly employed within entrepreneurial ecosystems (Colombelli et al., 2019). Meta-governance defines the strategic direction of the ecosystem and provides guidelines for collaborative work, reducing the need for aligning network members. As Gjaltema, Biesbroek and Termeer (2020) point out, meta governance often comprises a form of process design - activities that bring together actors and institutionalize cooperation between them - in which networks are institutionalized. Mobilizing participants remains necessary because collaborative network members may not exert strong influence over network directions and therefore need stimulation to perform their roles effectively.

Through qualitative analysis of the collaborativenetworks, we found that the first combination corresponds to cases 1 and 7 (cases were anonymized as agreed upon with respondents). These two collaborative networks exhibit noteworthy shared characteristics that account for the observed variations when compared to the majority of cases, which fell under the second configuration. Notably, the entrepreneurial ecosystem meta-governance played a vital role in mobilizing actors for both collaborative networks *before* the official formation of other networks within the project. Furthermore, the primary focus of activities within these two interorganizational networks revolved around mapping actors and initiatives - this alone suggests that those who undertook the mapping, although having a common objective, may have performed individual tasks that did not require extensive integration with other actors, hence the absence of integrating participants (~IP).

The second configuration (OR*CM*MER*__AI*IP__→CEc) includes the micro-governance roles of aligning (AI) and integrating (IP) in addition to the previously mentioned functions of organizing, arbitrating, and monitoring. We refer to the collaborative networks that follow this configuration as "Self-governed collaborative networks". Most of the networks in our sample exhibited this configuration to explain the resulting collaborative environment. In this case, leaders focus their micro-governance efforts on aligning goals among network members, organizing activities, integrating resources and knowledge, managing conflicts, and monitoring outcomes (Cristofoli and Markovic, 2015; Acar et al., 2008).

Surprisingly, mobilizing network members is a micro-governance role whose presence is not required in the configuration. A possible explanation is that, as members get actively involved in aligning goals and defining the purpose of collaboration, they are inherently motivated to perform their activities collaboratively. As a result, leaders do not need to invest time and energy in instilling a sense of collaboration among network members.

By exploring the set of collaborative networks that follows this micro governance configuration, we observed that they have more freedom to define their goals and develop their activities than those networks in the first configuration. The entrepreneurial ecosystem meta-governance does not offer that much guidance to these collaborative networks and therefore their leaders need to invest more time aligning goals and a shared vision, integrating the participants and their resources, as well as organizing, arbitrating conflicts and monitoring the results. This finding adds to the seminar work from Scott *et al*. (2020) about behavioural interactions in ecosystems.

Ultimately, "Self-governed colaborative networks" require more attention and efforts to produce a collaborative environment. This shows the constant in flux characteristic of networks, as reported by Berthod and Segato (2019).

6 Conclusions

This study explored the synergistic effects of the six micro governance roles (Wegner & Verschoore 2022) in facilitating collaboration within early-stage collaborative networks created to foster entrepreneurship ecosystems. The research employed a qualitative comparative analysis (QCA) method to identify the combinations of micro-governance roles that drive successful collaboration within these collaborative networks. As our empirical field, we investigated 19 collaborative networks created in Southern Brazil to support the nascent entrepreneurial ecosystem in the city of Porto Alegre. These networks involve local public, private and third-sector organizations engaged in collaborative activities that support the local ecosystem.

Based on the qualitative comparative analysis, we identified two distinct combinations of micro governance conditions present in collaborative networks whose internal environment fosters collaboration among network members. The results offer several contributions to theory and practice of collaborative networks' governance and the development of entrepreneurial ecosystems.

Firstly, the findings reveal that no single micro governance role in isolation is sufficient for fostering a collaborative environment; rather, it is the interplay of multiple roles that facilitates collaboration. This result confirms the theoretical proposal of Wegner and Verschoore (2022) regarding the interplay of several micro governance roles to produce collaboration. The two combinations we found account for the entirety of the cases studied and share three common roles: organizing (activities and members), arbitrating (conflicts and disagreements), and monitoring (results and members' commitment).

Besides the three micro-governance mentioned above, each configuration requires the performance of two extra roles, which leads us to our second contribution. The results allow us to conclude that collaborative networks designed to foster entrepreneurial ecosystem development may follow two different governance configurations. We call these configurations "Meta Governed collaborative networks" and "Self-governed collaborative networks". While the first rely on guidance and goals described by the entrepreneurial ecosystem meta governance, the latter have more freedom to set and align their goals, which creates a more complex network environment and requires extra governance efforts. These findings shed new light on the contextual factors that trigger micro governance in collaborative networks and answers the call for studies proposed by Wegner and Verschoore (2022). It also contributes to the general field of network governance and its early findings regarding how to govern interorganizational networks (Albers, 2016; Torfing, 2005).

From a managerial perspective, the choice between "Meta-governed" networks, which aim to mobilize participants and organize resources without deep integration, and "Self-governed" networks, which require alignment of interests and resource integration, should align with the specific objectives of the network. Furthermore, autonomy in defining objectives among participants implies greater effort in resource integration and alignment of interests, making the network more complex. Investing in governance practices that promote trust, legitimacy, and learning is fundamental to reducing opportunistic behaviors and increasing participant commitment. These considerations offer valuable directions for policymakers and leaders of collaborative networks in building environments that favor the growth of entrepreneurial ecosystems.

The study also has some limitations. Firstly, the inclusion of additional qualitative techniques could have provided insights into whether the perception of power refers to potential decisions or realized ones. However, the suspension of project activities during the data collection period due to the Covid-19 pandemic, as well as the inherent challenges of transitioning from in-person to virtual networks during periods of social isolation, not only impacted data collection but also disrupted the very dynamics of these networks, which rely on voluntary collaboration. Also, it is important to add the QCA as a method and data analysis technique has limitations byits own. QCA is à case-oriented method so occasionally small changes in case configuration can lead to changes on results obtained through sufficiency test. Another limitation of this research is that the respondents primarily consisted of individuals who were actively involved in the activities, potentially leading to a limited understanding of those who exhibited lower levels of engagement and the extent to which the performance of micro governance roles played a significant role. Moreover, it is worth noting that the data collected relied on interviewees' self-assessment. Future studies could overcome this limitation by integrating self-assessment data with tangible measures of collaboration outcomes. Moreover, we suggest future studies with members of collaborative networks in different cultural and economic contexts to verify whether the configurations we identified also work in these contexts. To deepen the understanding of the relationship between meta-governance and micro-governance practices in collaborative networks, future studies should investigate how higher-level governance structures influence daily governance practices in everyday interactions. Research could explore how macro-level guidelines and policies affect the effectiveness of organizational, arbitration, and monitoring functions performed by leaders in self-organized networks. Additionally, it would be relevant to analyze how the autonomy granted to participants to define objectives and align interests impacts the complexity and success of networks, especially in contexts requiring greater resource integration. Studies examining the interaction between contextual factors, such as organizational culture and competitive environment, and micro-governance practices could also provide valuable insights into adapting governance strategies to promote effective collaborative environments.

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