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Network orchestration: new role of business incubators?

Network
orchestration

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Abstract

Purpose – The purpose of this paper is to analyze the performance of incubators in the stages of formation and development of incubated business networks, especially in bottom-up and top-down network models.

Design/methodology/approach – The research is defined as qualitative and descriptive, with the application of multiple case studies, in which two networks of incubated businesses were investigated, one being top-down and the other bottom-up, which emerged within the incubation process of two business incubators (CIETEC and INCIT). To make the study operational, 11 semi-structured interviews were carried out and the thematic analysis of content was developed.

Findings – The results pointed out that in the top-down network the incubator performs a new assignment, the network orchestration, which corresponds to the actions of formation, coordination and governance of the group. In the bottom-up network, it was found that the role of the incubator was to expand the value offers usually practiced.

Research limitations/implications – As a limitation of the research, the very limitation of case studies is pointed out that is they do not allow for generalizations.

Practical implications – The research contributes to reflections on the effectiveness of the incubator and sheds light on the complementarity of networks in incubation processes, providing gains for incubators, incubated businesses and society.

Originality/value – The originality of this document is the new role of the incubator, which is orchestration, and its categorization. The results allow us to understand the effects of providing networks and relationships for incubated businesses. In addition, this study broadens the focus of traditional analyses of the incubator–incubated duo to consider the incubator–network–incubated trio.

Keywords Network orchestration, Incubated business networks, Incubator internal networks, Incubators actions

Paper type Research paper

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Introduction

The literature on business incubation has for years studied the role of incubators and how they allocate resources to their activities (Scillitoe & Chakrabartib, 2009). However, more recent research has removed the emphasis from the incubator and focuses on analyzing the role played by incubators in their network relationships, as well as the benefits that clusters provide to the incubation process (Anprotec, 2016; Petrucci, 2018).

Therefore, the importance of building relationship capital for the incubated businesses has also become recognized (Shih & Aaboen, 2017) and efforts are made to describe the interorganizational interactions within the incubator, leading to the study of networks formed by incubated businesses (Cantú, 2017).

Although the literature does not present an explicit definition about these types of networks, it is understood, in this article, that they are groupings of companies, in a system of interconnected nodes, in a dynamic governance structure and with specific attributes, in which these companies participate, or have participated, in the incubation process, and through the interactions within the incubator developed relationships of trust and cooperation, relational symbiosis and territorial synergy, due to the physical and mental proximity that they obtained within the incubator (Bollingtoft & Ulhoi, 2005; Totterman & Sten, 2005; Johnson-Cramer, Parise, & Cross, 2007). It is clear, therefore, that the incubator plays an important role in supporting the formation and development of these networks (Totterman & Sten, 2005), even if they present different models of formation, such as bottom-up and top-down (Bollingtoft & Ulhoi, 2005; Bollingtoft, 2012; Soetanto & Jack, 2013).

However, despite the different ways of forming networks, the theoretical starting point on incubation processes points out that relationships are important resources for the incubator, as these relationships allow to complement the value offer of the incubator (Shih & Aaboen, 2017). In addition, Petrucci (2018) suggests shifting the focus of analysis in incubators to an internal perspective, seeking to visualize incubation as a collective and dynamic process surrounded by actors who interact in networks (Petrucci, 2018). In this regard, the questioning of this research emerges, which consists in understanding how the business incubator has acted in the stages of formation and development of incubated companies' networks?

To answer this question, this article aims to analyze the actions of incubators in the stages of formation and development of incubated business networks, especially in the bottom-up and top-down network models. For the operation of the research, the study of multiple cases in two networks formed in incubation processes was used, within the Incubator of Technology-based Companies of Itajubá (INCIT), Itajubá (MG) and the Center for Innovation, Entrepreneurship and Technology (CIETEC), São Paulo (SP), both located in Brazil.

Finally, as motivation for this research, it is argued that there is evidence that efforts are needed to understand the interorganizational relationships at the incubators, especially those beyond mediation, facilitation and brokerage activities (Shih & Aaboen, 2017), as these activities refer to the practices of incubators to offer networks of external companies to the incubated ones, such as access to universities, service providers, unions and others and not in the development and formation of internal networks of incubated companies. Therefore, the deeper understanding of incubated company networks becomes salutary in the totality of the continuous transformations of paper, format and nature of incubators (Soetanto & Jack, 2016). Thus, this research contributes theoretically and practically to this research gap and presents as originality the insertion of the term network orchestration, a term originating from inter-organizational network theories and its categories to the context of incubators.

Actions of business incubators and networks of incubated businesses

The investigations on business incubators have approached that the origin of the phenomenon of incubation occurred in New York (USA), in the decade of 1940; however, it was only in the decade of 1985 that the incubators were created in Brazil, due to government stimuli (Antunes, Souza, Silva, Lopes, & Sugano, 2019). There are, in the country, more than 360 incubators that have incubated more than 2,300 companies and graduated more than 2.800 businesses, according to data from the National Association of Entities Promoting Innovative Enterprises (Anprotec, 2016).

Incubators, as a habitat for innovation, can be understood as institutions that catalyze new business, providing a link between the protected environment of incubation and the competitive external environment (Burnett & McMurray, 2008). As their main purpose, they stand out for offering infrastructure value, services and network access to incubated companies (Bergek & Norrman, 2008; Petrucci, 2018; Antunes et al., 2019), the latter purpose being to promote resources, knowledge and legitimacy for incubated companies (Bruneel, Ratinho, Clarysse, & Groen, 2012; Aaboen, Laage-Hellamn, Lind, Öberg, & Shih, 2016).

However, when it comes to the supply of networks, studies have shown that this aspect is still about access to networks outside the incubator (Antunes et al., 2019), and little focus has been given to the actions of the incubator in the supply or development of internal business networks for the incubated companies themselves (Eveleens, Rijnsoever, & Niesten, 2017).

In other words, external networks become useful by building social capital by associating incubated companies with institutions outside the incubator (external agents). Some authors argue that incubators, by developing external networks, perform actions related to facilitation, mediation and brokerage (Sherman & Champpell, 1998; Chandra, Chao, & Astolpho, 2014; Shih & Aaboen, 2017). Thus, the incubator adds value when it gathers skills by selecting external contacts, which can successfully complement its offered activities (Duff, 1994). Therefore, these types of networks have been widely studied in literature (Antunes et al., 2019), unlike the internal networks.

As for internal networks, focus of this study, also known as incubated company networks, they are also useful for building social capital and developing economies of agglomeration, as they allow several companies to share all kinds of resources available to them (Bergek & Norrman, 2008). Thus, incubated companies use the incubator as an instrument for relationship development (Sherman & Champpell, 1998), which is facilitated by shared space, a factor that makes collaboration more likely. These collaborative relationships may involve formal and informal partnerships, creation of joint ventures and sharing of information, knowledge and experiences (Bollingtoft & Ulhoi, 2005; Cantú, 2017). For Duff (1994), this environment provides the possibility of generating symbiosis, where incubates share resources and experiences, learn from each other, exchange business contacts and establish partnerships.

For Bollingtoft and Ulhoi (2005) internal networks are developed through two approaches (models), i.e. either the companies organize themselves (bottom-up model) or the incubator itself takes the initiative in structuring the networks (top-down model).

In the first case, bottom-up, the incubated companies develop links with other incubated companies and with other companies located within the incubator. Thus, by working in the same space, companies create synergies, relationships and social capital designed to improve innovative and commercial capabilities. In these interactions, resources, knowledge, information and experiences can be shared (Soetanto & Jack, 2013).

In the second case, top-down, incubated companies can obtain targeted support from the incubators. This support may occur when the incubator develops specific events to the public of the network, such as elaboration of business rounds, expansion of contact networks and incentive to training in related areas. By providing the connection, incubators

can act as a central point of the network, with the perspective of creating a flexible environment for the growth of incubators (Soetanto & Jack, 2013).

Finally, although the incubated company networks present these two dynamics, little is known about the actions of the incubator for the promotion and development of these types of networks, which is the contribution this research makes. In the next topic, the formation and development of business networks are presented.

Formation and development of networks

The interest in the study of how and why networks arise and develop is not something new. However, as much as this questioning pervades interorganizational research, according to Thorgren, Wincent, & Örtqvist (2009), Tonin, Ravanello, Bertóli, & Tonin (2016) and Schepis, Ellis, & Purchase (2018), this subject still lacks further studies.

In this regard, two perspectives of studies are present in the literature of networking. The first one is related to background, i.e. the reasons for forming the network. The second, structuring, presents proposals for network formation models, such as bottom-up or top-down models (Mariotti & Haider, 2017).

In the bottom-up model, networks emerge from common interests that develop from trivial goals and continued interactions. From this perspective, the formation becomes the focus of research, especially because of environmental pressures such as intensification of competition, government regulations, rapid market changes, among other factors (Mariotti & Haider, 2017).

On the other hand, in the top-down model, the network emerges from one or several central links, that is, one or several orchestrators (Mariotti & Haider, 2017). Thus, network orchestration can be understood as a set of deliberate and purposeful actions undertaken by the central links seeking to create and extract value, through a set of underlying processes of network formation and management (Dhanaraj & Parkhe, 2006). In addition, this central actor, who can be a public or private institution, shows power and gains from its individual characteristics and its position in the network structure, so that by using such power, it can present itself as a leader and group resources and capabilities for the group members (Dhanaraj & Parkhe, 2006).

Within the network formation process one can find important activities such as setting up the network, encouraging cooperation, recruiting and selecting members and identifying the network. Thus, network building can be understood as a process in which the orchestrator encourages potential network members to work together to achieve mutual benefits in a cooperative manner. Therefore, this assembly requires the encouragement of cooperation, reinforced by the actors' trust, at the moment of the network organization (Caglio, 1998). Thus, the process of recruiting and selecting members becomes critical in this context, as the size of the network is fundamental for the network to gain volume and membership (Bollingtoft & Ulhoi, 2005; Totterman & Sten, 2005). However, when this selection of actors is also based on common values among associates, it allows for the creation and sustaining of the network's identity in the long term, which allows network members to identify and legitimize themselves as a group, within delimited borders and full of meanings (Huemer, Becerra, & Lunann, 2004).

However, regardless of the structure model (bottom-up or top-down), networks have dynamic structures, which, over time, may change causing their development. In the meantime, this article positions itself on the idea that the development of networks is associated with the realization of dynamic, non-exclusive events that can bring the network to maturity (Wegner, Alievi, & Begnis, 2015). Thus, these events are related to the definition and institution of mechanisms of coordination/governance of the cluster.

These mechanisms can, therefore, be observed in some network development activities, such as the management of network activities and strategy, member management and

leadership process. In other words, the mechanisms of communication, control and social coordination, integration unity, common teams, planning and control systems, social and collective sanctions develop the management of activities among members; while the mechanisms of communication and decision and negotiation drive the strategic management of the network. On the other hand, after the orchestrator creates the network, in the process of formation, the leaders, who can be the orchestrators themselves, or others, who stimulate the members to remain in the network as an integral part of a common identity, are highlighted. Hence, mechanisms such as hierarchical relationship and authority, incentive systems, creation of own culture and reputation of members are essential for relational leadership to emerge within the development of the network.

Finally, for this study, it was considered for the formation and development of incubated company networks that these groupings, independent of their models, present aspects of governance and coordination that emerge since the emergence of the networks and are consolidated as the groups become more consolidated. Therefore, these aspects were considered for the construction of the research instrument, which are in the next topic, of methods and procedures.

Methods and procedures

This study is characterized by its qualitative and descriptive approach, with the use of the multiple case study research strategy. According to [Yin \(2005\)](#), the study of multiple cases allows the research to expand beyond individual case analysis. Thus, while individual analyses determine their own data, the analysis between cases allows for the identification of models, providing foundations for the creation of assumptions and the elaboration of theories ([Eisenhardt, 1989](#)).

In this study, two networks of incubated companies that emerged within the incubation process were investigated, one from CIETEC and the other from INCIT. Thus, there are seven networks of companies at CIETEC, being the networks of: biotechnology; medicine and health; chemistry; electronics; environment; information technology; and more recently, education network. These networks emerged due to the high and constant number of companies installed within its campus (from incubated and graduated), which made the management propose the creation and management of networks of incubated companies, segmenting them by markets of operation (top-down model). It is worth mentioning that CIETEC is a nonprofit civil society, constituted in 1997 by a government agreement and is installed at the University of São Paulo (USP). In 2019, the incubator had 105 incubated companies and graduated about 160 technology-based companies since its foundation.

At INCIT, there are 3 networks:

- (1) energy company group;
- (2) health products and services company groups; and
- (3) technology, innovation and knowledge company network.

These networks emerged in 2010, within the incubator premises, initiated by synergetic movements of companies in certain sectors, which culminated years later in the formalization of the networks, which have a bottom-up process. INCIT was founded in 2000, it is installed in Itajubá, Minas Gerais State, had 26 companies incubated in 2019, being the vast majority of the information technology and communication, electromedical and energy sectors. Since its foundation, the incubator has graduated 42 companies.

To choose the incubated company networks, it was determined that the groups should have started their activities within the incubation process and should have at least one year

of activities. Thus, the only networks that met the criteria established in 2018 were, at CIETEC, the education network (EDU), with 12 companies, and, at INCIT, the Network of Technology, Innovation and Knowledge Companies (RETIC), with 35 companies. Therefore, the definition of such criteria allowed the networks to establish relations with the incubators in sufficient time to find out how they (incubators) have been acting toward the incubated company networks. It should also be noted that each of these networks presented different models. Thus, the network from CIETEC, EDU, was found in the top-down model, while the network that emerged at INCIT, RETIC, was found in the bottom-up model. The investigation of different models of incubator networks has provided a wealth of details on incubator actions, as the literature itself does not identify incubator actions for each of these models, as reported by [Bollingtoft and Ulhøi \(2005\)](#), [Totterman and Sten \(2005\)](#) and [Soetanto and Jack \(2013\)](#). It should be noted that this comparative analysis between the models was not previously investigated, as observed by [Eveleens et al. \(2017\)](#).

Semi-structured interviews were used for data collection. The interviews were carried out with three agents: network managers, incubated and/or graduated companies and people in charge of the incubators. It is important to emphasize that the analysis was done in the relationships between the incubators, networks and companies, and for this purpose, these three agents were investigated. According to [Denzin and Lincoln \(2005\)](#), the use of different actors to analyze the same phenomenon, the triangulation of data is configured, bringing a richer and more detailed view of the phenomena investigated. Thus, all these actors were directly linked to the emergence and development of company networks. However, in the case of CIETEC, there was a coordinator of the incubator who also managed the networks. Soon, besides the interviews with the startups of this incubator, there was only the interview with this coordinator, who approached both the managed networks and the incubator.

For the operationalization of the interviews, a script was developed with 22 open questions, [Table A1](#) of the appendix, about the relationship of the incubator and the network within the process of formation and development of the incubated company networks. Thus, these questions were subdivided into three research blocks, [Table 1](#), according to the theoretical basis developed in this work.

Therefore, the interviews were previously scheduled with the subjects, and at the beginning of each one of them the objectives of the research were exposed, as well as the request for recording the testimonies. Each interview lasted approximately 25 min and all were transcribed in full. The interviews were conducted throughout the second half of 2018.

To select the interviewed companies, it was opted to approach four companies belonging to each network, which proved to be enough by the saturation criteria. The choice of such companies occurred because of the intensity of performance (leaders) in the network, since the process of formation of clusters. This way, it was obtained the total of 11 investigated actors, as pointed out in [Table 2](#).

It should be emphasized that, as the INCIT network is older, the interviewed companies found themselves as graduates of the incubation process. Thus, these interviews were conducted with members who participated in the entire process of formation and development of the networks. Finally, nine interviews were conducted in person and two by videoconference. After data collection, transcriptions of the testimonies were made; therefore, the analysis of content was carried out, which seeks to discover the nuclei of meaning that make up a communication of the theme present in the speeches of the respondents ([Bardin, 2016](#)). Therefore, three stages were developed for its operation: pre-analysis, exploration of the material and treatment of the results obtained and interpretation.

In the first stage the preparation and organization of the material, reading and coding, was carried out. Later, in the exploration and treatment stage, the most pertinent parts of the

Table 1.

Theoretical basis of the interview script

Blocks	Goal blocks	Theoretical foundation	Researchers
Network Characterization	Caracterizar o processo sócio-histórico da rede de empresas incubadas	Formation and development of firm networks and Incubated Firm Networks	Bollingtoft & Ulhoi (2005) , Soetanto & Jack (2013) and Mariotti & Haider (2017)
Evolutionary dynamics of the network	Investigate the process of formation and development of networks, focusing on the actions of agents who may have influenced it	Formation and development of firm networks	Grandori & Soda (1995) ; Jones, Hesterly & Borgatti (1997) ; Dhanaraj & Parkhe (2006) , Wegner et al. (2015) and Mariotti & Haider (2017)
Incubator-network relationship	Identify the actions of incubators in the network formation and development process of incubated companies	Acting of the incubator and network of incubated companies	Sherman & Champbell (1998) , Bollingtoft & Ulhoi (2005) ; Totterman & Sten (2005) , Soetanto & Jack (2013) ; Chandra et al. (2014) ; Cantú (2017) ; Huemer (2017) ; and Shih & Aaboen (2017)

Source: Developed by the authors

Firms/ codification	Status before the incubator	Attachment to the network	Survey respondent
I1	Incubator CIETEC	Incubator and Networks Manager	Business, International Relations and Special Projects Coordinator
I2	Incubator INCIT	Incubator Manager	Manager
R1	Graduated	RETIC Manager	Owner (current manager of the network)
E1	Incubated	EDU	Commercial Director (Partner)
E2	Incubated	EDU	Executive Director (Partner)
E3	Incubated	EDU	Owner
E4	Incubated	EDU	Technology Director (Partner)
E5	Graduated	RETIC	Owner (first network manager)
E6	Graduated	RETIC	Owner (second network manager)
E7	Graduated	RETIC	Owner
E8	Graduated	RETIC	Owner

Table 2.

Characterization of the interviewed subjects

Source: Developed by the authors

narratives were located considering the open grid. In other words, initially, the dimensions were delimited according to the incubated, bottom-up and top-down company network models presented by [Bollingtoft and Ulhoi \(2005\)](#), allowing the emergence of empirical categories within each dimension, that is, the categories were not previously delimited. The emergence of categories from empirical evidence is an incremental approach to case selection and data collection ([Eisenhardt, 1989](#)). Later on, the categories and sections selected were analyzed against the literature. The results are presented below.

Results presentation

For the development of this section, the top-down and bottom-up models of incubated company networks were established as dimensions.

Actions of the incubator in the top-down network model: education network

In this dimension the results were organized in 11 categories of CIETEC incubator actions in relation to its networks. All these categories are described below.

Thus, as the first category was found the *assembly of the network of incubated companies*. This aspect refers to all construction, structuring and organization of the associates to develop the activities as a network, including the breaking of resistance of the members to join it. Examples of this category are the excerpts extracted from E1 and I1 (as codified in [Table 1](#)):

[...] we made a first connection in this network via the [incubator representative]. [...] what happened, according to the representative, was that the number of companies in the educational sector had increased within the incubator [...] because of this volume the representative decided to set up the network [...]. [E1]

[...] it was more of a slow process, it took about a year [...] the guy has to see to believe; then there was a deal with the ten businessmen, now it broke a lot of resistance and it took a year to get the event done. [I1]

Similarly, it is noted that this first category is directly associated with the next category of **cooperation incentive**, which refers to the stimulus developed by the incubator to develop business among the incubated companies, so that they can create social capital and agglomeration economy ([Bergek & Norrman, 2008](#)). The synergies between the startups are, therefore, observed, leading to the emergence of values based on the principle of cooperation and trust. Examples are the reports of E3 and I1:

[...] the incubator representative started to organize the network, he started talking to the other entrepreneurs and everything [...] and as we had a regularity in the meetings and we started to have synergies, right [...] synergies, the companies started to exchange ideas, I did some work with a couple of companies and we became partners, and these companies offer services and products that are complementary to my service and product [...]. [E3].

[...] it took about a year, several meetings, let's say this feeling [of trust], it only appeared when we managed to make the first event [...] we broke much of the resistance [...]. [I1]

Another function of the incubator was the *management of network activities*. According to [Totterman and Sten \(2005\)](#), several occasions organized by the incubators are important to determine the level of activity of the network within the incubator. This factor includes the generation of actions for companies, creation of events in the network and distribution and delegation of activities to members. The following extracts from the E2 and I1 interviews are an illustration of this:

The incubator representative determines the tasks, we fulfill [...] all the startups present place their demands, place their interests, and then a list of goals appears and, from there, the representative generates a task list for everyone [...]. [E2]

[...] I as facilitator, am the guy who schedules the meeting. In the beginning, when I was trying to break the inertia on a higher frequency, for example: 'look, let's do the meeting every fifteen days or every month' or 'let's try to make a calendar', then, you called them on the dates to discuss the subjects. [I1]

In turn, the *network management* category represents the coordination of the network. For [Hibbert, Huxham, and Ring \(2008\)](#) network management comprises all actions aimed at management processes that define the direction of the network, as well as the allocation of resources to achieve certain objectives, which can be exemplified by the E2 and I1 excerpts:

[. . .] Then, the meetings took place when everyone could go. The incubator representative determined the Tuesdays, once a month or once every fifteen days, and with presence of sixty percent of the startups [. . .] the incubator representative himself made the notes, asked for the completion of tasks by e-mail, when it did not work by e-mail, the representative also went from door to door to ask for it, then basically the representative [. . .][E2].

[. . .] we [Cietec] simply called everyone who was in the educational network [. . .] in order to form the network [. . .] what we did was bring a mentor to the network [. . .] who was almost a secretary [. . .][I1].

Associated with the previous category is the function of the *strategic management* incubator. Therefore, activities such as help in defining the vision, objectives and goals are carried out under the supervision of the incubator, as shown in the example of I1 and E2. In this regard, [Ford and Mouzas \(2008\)](#) disagree that business network strategies are influenced by the multiplicity of interactions between the actors and their effects:

[. . .] the network itself is who makes the objective of the network, [. . .], they are discussing possible activities, but if it has a great objective that is valid for any network, it can be of education or information technology, which is to foment business [. . .][I1].

We all propose objectives, I proposed, the [incubator representative] proposed, other companies proposed and they are always evaluated in the meeting [E2].

In the category *recruitment and selection of members*, the activities of the incubator related to the selection and search of incubated companies were verified, as well as the presentation of the new member to the other members of the network. In this category there are also activities to persuade companies to participate in the network, as illustrated by I1 and E4, below:

[. . .] you have to 'sell' the idea that, by participating in the network, the company will benefit from these network activities [. . .] to break the inertia of startups [. . .][I1].

[. . .] the [incubator representative] started to organize, started to talk to the other entrepreneurs and everything else, then we tried to schedule the first meeting at the end of 2015 [. . .][E4].

In a similar way, the *associate management* category consists of tasks related to controlling associate participation and managing their satisfaction, interest, benefits and expectations, as pointed out by E1. Also found in this factor were actions to minimize opportunistic activities, deal with the diversity of companies/entrepreneurs and concerns with the ideal size of networks. About this E1 and I1 point out:

(.) My entrance in the network was only because of the representative, he saw a product that could be applied in the educational sector and that could incorporate the network with a new, let's say, a new perspective of products for markets still to come [. . .][E1].

[. . .] the size of the network is dynamic, you have companies coming in and out of the network, [. . .] so the network has to have a minimum number that you can't tell exactly what it is, but a minimum number that is attractive [. . .][I1].

Another important category was *leadership*. Thus, it refers to activities that aim to link the relationships of social influence and interaction between leaders and followers, being characterized as relational leadership (Akram, Lei, & Haider, 2016). Accordingly, E4 and I1 reinforce:

[...] the IT network, [...] the incubator itself, which led there, coordinated in the same direction as the education network, i.e. the initiative and coordination of the network were basically carried out by the incubator itself [...][E4].

[...] the incubator as the conductor of the network, let's say as a promoter [...], because you have to have a person to do it, who has to grab the thing, and if you don't have that person, then, no person will do it, and it won't go anywhere [...][I1].

The *network identification* category comprises common identity development efforts for members. According to Huemer et al. (2004) the identification of the network presents itself as a continuous and dynamic process in which the actors simultaneously create and perceive the identities of the network, through the understanding of the boundaries of the group itself that are delineated and full of meanings. The testimonies of I1 and E3 are shown to illustrate this:

[...] there's this guy who is from the network, but he doesn't even know that he is in the network [...] in the case of the education network I made it on purpose, to create the logo of the network, to try to create a little bit, to generate a little bit of this thing [network identity] [...], I call the meeting of the educational network, event of the educational network [...][I1].

[...] we [Cietec together with the network members] forced ourselves to create this common identity in an attempt to make a visual identity for the network, that is, that everyone will then go back to that visual identity that gives us visual identity, we take other aspects of identity from the network, we tried to move in this direction [...][E3].

The *mediation* category, on the other hand, deals with the assignment of the incubator's contacts to the needs of the incubated companies network itself. In this case, the incubator's actions aimed at intermediation between associates and other institutions and the management of the network's contacts are observed. As examples, E1 and I1 reports:

[...] the network representative went [...] to approach the network there at the union [...][E1].

[...] This Friday I'm going to the union to have a meeting there, trying to generate an event within the union with our educational network [...][I1].

In the same way as the previous category, the *support to networks* refers to the assignment of the incubator's resources to network issues, such as the use of infrastructure, services, brand and professional staff associated with the Institution. As illustrations are the statements of I1 and E4, below:

[...] the convenience of the network is that they can meet right here, in the incubator, with infrastructure, with physical area, it is easy for them [...][I1].

[...] due to the proximity of the companies within the incubator [...] there was physical proximity between us, the network has socially linked the companies [E4].

In summary, therefore, it is observed actions of the incubators focused on the creation and management of incubated company networks, composing itself as an entity that creates,

organizes and plans the value for the startups. In the next topic, the categories obtained by the actions of incubators to bottom-up networks are presented.

Incubator actions in the bottom-up network model: RETIC

Four categories were found in this dimension: mediation, provision of infrastructure and services and encouragement of cooperation. They are presented next.

In the first category, *mediation*, it was observed that, as in the top-down network dimension, the incubator developed intermediation activities of network actors with other institutions. This aspect was manifested in the statements of E6, E8 and R1:

[. . .] any contact that we wanted to go after, the former representative of the incubator got, a contact bringing the other so that we could sit down and present the network [E6].

[. . .]. And another fight we wanted was to have access to the UNIFEI laboratories [. . .] so it was another fight, to get through the INCIT agreement for access to laboratories [R1].

[. . .] the Incubator provided networking and started everything. If we weren't in the incubator, there wouldn't be networking. I don't think so, I'm sure of it [E8].

The second category of operation of the incubator is the *assignment of infrastructure*. The second category is the transfer of infrastructure. Thus, there is the use of the common access sites of the incubator by the members, as well as the appropriation of the own address and use of equipment and resources of the incubator. As testimonies were extracted the statements of E6, R1 and I2:

[. . .] the incubator ended up helping us with what it could there, for example [. . .] the structure itself, availability of the room, nothing much more than that, right? [. . .][E6].

[. . .] In terms of incubator, what an incubator has of major significance, at least today and in the experience that we had with INCIT, the major asset is the environment, that we call ecosystem. You are there with other companies that are growing, having difficulties. And because they are all there on the same level, some with more time, others with another, what they have most is the sharing of information. [. . .][R1].

[. . .] The groups themselves, RETIC, use the incubator spaces, but informally' [I2].

The third category is the *incubator services*. This one is associated with the assignment of professional services to the network issues, training of the incubated, availability of information and appropriation of the selective process of the incubator as criteria for entry of new companies to the grouping. As examples, E7 and R1 reports are identified:

[. . .] I called the lawyer at INCIT, asked him/her to also make a review of the network statute. The lawyer and I would discuss, I would make the changes and have the network staff discuss [. . .] until the statute was ready. [. . .][E7].

(.)In the case of the IT group, companies that worked in this area entered, basically when a new Incubated entered, we would already invite them to participate in the network, regardless of the area of operation of the company, because the incubator already made a selection process before the company entered the network, usually companies that developed the same product would not enter the incubator, for example not to be competitors, so this first selection was already made by the incubator itself [R1].

In the last category, of *incentive to cooperation*, it can be observed that the actions of the incubator were focused on stimulating the exchange of information, experiences and interactions, as well as the presentation of the network to the new incubated. As a demonstration of this category, the narratives of I2, E5, E8 and R1 are presented:

[...] here the exchange of experience, coffee breaks, open doors, collaborative environment is encouraged. It has to be open, democratic [I2].

[...] after the manager was replaced [...] I see that he does try to encourage companies to participate in the network [...] [E8].

[...] on the public notices they [Retic and INCIT] always fought hard to help companies survive and develop [R1].

[...] yes, because we had quarterly follow-up, so if you had a problem, or you needed to solve something, they would indicate the guy to you [...] [E5].

In summary, these results show that the incubator, in this model of incubated company networks, presents itself as an entity that expands its offer of value to the networks, occasionally supporting the actions of the network. In the next topic, the most profound discussions on the different modes of action of the incubators investigated are presented.

Network orchestration: evidence of another incubator role

According to previous investigations, in general, the incubator's activities have been based on the provision of infrastructure, services and, more recently, access to business networks. However, this research presents a deepening of these actions, especially in what corroborates [Shih and Aaboen \(2017\)](#) as efforts to describe their interorganizational interactions, in addition to the relationship of mediation, facilitation and brokerage of networks outside the incubator. In this regard, the results presented here demonstrate a new function of the incubator, in which it assumes the role of orchestrator of the incubated company network, a term derived from the theory of inter-organizational networks.

Thus, network orchestration manifests itself prominently in the top-down network, that is, CIETEC, as the incubator configures itself as a central actor in the network, creating a flexible environment for the growth of the incubated companies. This is made possible by its individual characteristic and position within the network legitimized by the startups ([Dhanaraj & Parkhe, 2006](#); [Soetanto & Jack, 2013](#)). This aspect is observed as the incubator organizes and manages a set of actions to create and expand the value of the network so that the incubator itself and the other members of the network can appropriate such value.

According to the entrepreneurs' reports, it is observed the acceptance of the incubator's performance within the network, in a natural and beneficial way by the members of the network. In this regard, the main activities of the incubator, observed in this study, are related to the development of common goals (strategic management), stimulation of the interests of those involved (management of associates and incentive to cooperation); definition of standards of conduct (assembly, management and identity of the network); distribution of value to all audiences; and attraction, management and learning among network participants as they grow. However, other aspects can be observed as functions of orchestrators such as activity management, leadership, mediation and support to the networks themselves. In addition, it is worth mentioning that the incubator itself, by being the orchestrator, appropriates revenues ([Dhanaraj & Parkhe, 2006](#)), mainly because these

groups allow better management of the entity's coordinating activities, as manifested in the II report:

[...] when you have a hundred startups, it's so much stuff, so much that it's humanly impossible inside the structure, that you assist everyone [...] so that's when it was thought to create networks [...].

In a deeper way, the actions of formation of the incubated companies network such as network assembly, recruitment and selection of members and incentive to cooperation present tasks that involved a deliberate intentional action of the incubator to create value to the incubated (Dhanaraj & Parkhe, 2006). It is argued, therefore, that by forming networks of incubated companies, the incubators develop orchestration when they intentionally insert the formation of networks in incubation programs, as well as mobilize resources, information and partnerships to build such a network. In addition, orchestration also occurs when they provide situations of interactivity between the incubated companies, such as the development of specific events to the public of the network, such as elaboration of business rounds, expansion of contact networks and incentive to training in related areas.

On the other hand, the development activities, translated into network management, such as activity management, network management, strategic management, associate management, leadership and network identification, which exposed the incubator's attempt to extract value from the associates, so that they can appropriate the revenues from the joint action.

It is also argued that the orchestration of the network takes place when efforts and resources of the incubator are directed toward conducting the network. Therefore, the incubators present themselves as responsible for coordinating the network, inserting and creating mechanisms of governance.

In addition, the results also pointed out that the orchestration is also related to other actions such as facilitation, mediation and brokerage. In this regard, facilitation was verified at the moment that the incubator, as the central entity, made possible the contacts between the incubated companies. In this case, the incubator is the only one that has the capacity to act as an intermediary for the incubators, and it is also the one that has the capacity to act as a broker. It is, therefore, argued that the orchestration function is not disassociated from other functions, but more research in this area will help to confirm this assumption.

On the other hand, the actions of the incubator in the bottom-up model, that is, the INCIT, does not configure itself as an orchestrator, as this role was developed by the incubated companies themselves, who also become leaders in the formation and development processes of their own networks. As supported in literature (Bollingtoft & Ulhoi, 2005; Bollingtoft, 2012; Soetanto & Jack, 2013), in this case, the incubator acts as a support agent, passive, propitiating the creation and growth of the network, but in an incipient and supporting manner. As the results pointed out, for the incubator to become an orchestrator, it must perform its functions beyond the support verified in the bottom-up model, especially establishing itself as a central node of the network of incubated companies.

Thus, by interweaving the categories of both network models, bottom-up and top-down, it was realized that all categories of the first model were, directly or indirectly, linked to the second model, totally or partially. In other words, the categories of mediation, provision of infrastructure and services, and cooperation incentives from the bottom-up model correspond to the categories of mediation, recruitment and selection, network support and cooperation incentives from the top-down model. This aspect leads us to believe that the actions of the incubator as an orchestrator are reflected in the bottom-up model. These

results, therefore, broaden the understanding of these two models proposed by [Bollingtoft and Ulhoi \(2005\)](#) and used by [Soetanto and Jack \(2013\)](#).

In addition, the categories of mediation, support, assignment of infrastructure and services and encouragement of cooperation were associated with the value offer of the incubator. It is observed that these activities are present in literature ([Chandra et al., 2014](#); [Cantú, 2017](#); [Shih & Aaboen, 2017](#)) as actions focused on the needs of incubated companies and not on activities focused on their networks. Therefore, it is questionable whether such categories are, in fact, from the incubator's actions in the formation and development of networks, or if they are reconfigurations of services already offered to incubated companies, but with greater scope. However, it is possible to infer that the incubator's actions in incubated company networks should extend the offer of its basic services (infrastructure and services) to the networks themselves. In view of the above, [Table 2](#) has been developed.

Therefore, [Figure 1](#) shows that among the conventional offers of infrastructure, services and external networks, through facilitation, mediation and brokerage (black arrows), the incubator acts as an orchestrator of the incubated company networks, for the top-down model and/or extends its own offer to the internal network, for the bottom-up model. Thus, the red arrow points the value stream from the incubator to the network reaching the incubated (top-down), as well as the orchestration itself adds value to the incubator itself, while the blue arrow points the value stream, both from the incubator and the incubated, to the network (bottom-up) and from the network back to the incubated companies. The figure also reveals the relationship between the orchestration and the expansion of the value offer, as for the former to occur it is a necessary condition that the incubator increases its value offers beyond the incubated companies, thus reaching the networks of incubated companies. Finally, it should be added that both incubators and incubated companies can be promoters in the formation of networks of incubated companies.

Final considerations

The main theoretical contribution of the study is the identification of a new role for the incubator, which is the orchestration, regarding exclusively the internal networks of the incubator. This result broadens the vision and scope of the definition of incubator networks, as well as enables a deeper understanding of the effects of providing networks and relationships for incubated companies. In addition, it is important to emphasize that another emphasis of this research is the importance of network theory for the understanding of the incubation phenomenon, which seeks to explain the relationships beyond the incubator–incubated duo, broadening the focus to the incubator–network–incubated trio. This work also broadens the understanding of orchestration, as it complements the actions already mentioned in literature.

Therefore, it is important to emphasize that this theme is still incipient and needs further studies. Finally, the originality of this study is found in the introduction of a new term to the incubator context, presenting itself as a new concept that allows for a better understanding of the relationship between the networks themselves, incubators and incubated companies.

In the empirical field, the research also contributes to reflections on the effectiveness of the incubator, especially for the managers of these institutions, maintaining entities and political agents. It sheds light on the complementarity of networks in incubation processes, providing gains for incubators, incubated and society. In addition, this research has the potential to add value to the model of the Reference Center for Support to New Enterprises (CERNE). Therefore, CERNE is a business incubation model that seeks to promote the improvement of incubator results in several sectors ([Centro de Referência para Apoio à Novos Empreendimentos \[CERNE\], 2019](#)).

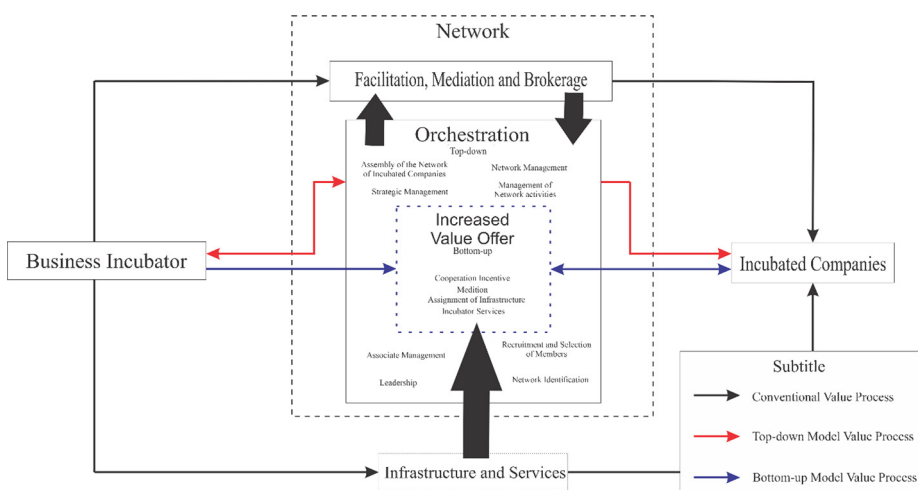


Figure 1.
Incubator actions in
the top-down and
bottom-up models

Source: Developed by the authors.

Managerial contributions to the networks themselves are emphasized, highlighting important aspects of their management that deserve to be carefully observed. It is understood that incubation processes that use or complement networks allow incubators to achieve their mission, as well as favor the stakeholders involved in the incubation business.

Finally, as a limitation of the research, the very limitation of case studies is pointed out, as they do not allow for generalizations. Regarding proposals for future research, in addition to those present in the body of the text, such as to investigate the relationship between facilitation, mediation, brokerage and orchestration, it is indicated to investigate other contexts in which networks of incubated companies are presented, as well as to deepen the models in isolation. Additionally, it is suggested that studies perform statistical validation of the aspects mentioned here about orchestration.

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Blocks	Questions
Network characterization	<ol style="list-style-type: none"> 1. What is the history of the network? 2. When and why the network was formed? 3. How many members the network had at the time of its formation? 4. What were the main motivations that led companies to participate in the network?
Network evolutionary dynamics	<ol style="list-style-type: none"> 5. Who led the network formation process? 6. Were there external agents who participated in the network's formation? Who and how did they participate? 7. What are the main difficulties (problems, conflicts and challenges) and facilities regarding the network formation? 8. Which factors enabled overcoming difficulties during the formation period? 9. How and by whom the network was structured? 10. Was there a deepening of the relationships of trust, friendship and partnership among the members of the network? How did you notice this? 11. What and who applied penalties when a company did not behave cooperatively? 12. What were the main factors that contributed to the development and consolidation of the network? 13. How and by whom was the distribution and control of the network activities done? 14. In your perception, was there a common identity of the companies? How was it created? 15. What were the main difficulties (problems, conflicts and challenges) and facilities regarding the development of the network?
Incubator-network relationship	<ol style="list-style-type: none"> 16. Which factors enabled overcoming difficulties in the development period? 17. In your perception, did the incubator help in the formation of the network? How? 18. Did the incubator encourage companies to seek partnerships with other companies before the formation of networks? How? 19. During the formation period, what facilities did the companies receive for being associated to the incubator? 20. During the training period, what were the difficulties, facilities and benefits that the companies in the network had for being associated to the incubator? 21. In your perception, did the incubator help in the development of the network? How? 22. During the period of development of the networks, what were the difficulties, facilities and benefits that the networks and their companies had for being associated to the incubator?

Table A1.
Interview script and
theoretical basis

Source: Developed by the authors

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