

Identification of Social and Technological Aspects in the Startup Ecosystem of State of Rio de Janeiro

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Abstract. Startups ecosystems are important drivers of innovation, responsible for generating jobs and generating revenue in urban centers. They promote technological development through collaborative networks between entrepreneurs, startups builders and investor groups. The complex relationships formed in these communities are essential to ensure access to resources that enable the execution of projects, such as technologies, know-how, infrastructure and financing. However, understanding how these partnerships are formed and maintained is not a trivial task, because they depend on several regional factors. This paper presents a mapping of the startups ecosystem of the state of Rio de Janeiro. In our approach, we use data of different sources to define technical and social aspects of the entrepreneurial community. Then, social network analysis are used to characterize predominant sectors, competencies, interests and relevance of each group of entrepreneurs.

Keywords: Startups ecosystems · Urban Centers · Entrepreneurship · Big Social Data · Social Network Analysis · Rio de Janeiro State.

1 Introduction

Startup ecosystems are creative workspaces in which entrepreneurs seek to validate innovative ideas in a short period, converting them in disruptive business with low costs [9]. Besides acting as innovation drivers, these entrepreneurial communities have great potential in job creation and income. They also are vital for the development and strengthening of economic activities in urban centers [21].

These communities are composed by entrepreneurs, institutions and processes. They are situated in a given geographic location, where the actors interact through both formal and informal connections [2]. The distinct nature of these actors reveals different purposes in the network. Entrepreneurs pursue

new business creation and technological development. While ecosystem builders, such as incubators and accelerators play the role of facilitators in the enterprise development process by providing infrastructure and administrative support. In turn, investor groups provide financial support for scalability [11]. The interaction among these entities promotes the emergence of new companies and the development of the community as a whole [1].

The size of a startup ecosystem can be determined by its reach and geographic location [24]. A local ecosystem is restricted to the community formed around an entity of interest, university or research center. In a regional startup ecosystem there is a large number of participants, increasing the possibilities of partnerships and the availability of resources. The pluralism in the network aids to innovation process, once the collaboration among different participants brings new perspectives to the ventures [25]. However, the identification of suitable partners is a challenge. Ensure the convergence of interests among the various agents through such arrangements is not trivial. The different objectives, besides the circumstances, can make the conjugation less harmonious and complex [8, 26].

In this context, it is important to know the inherent characteristics of the community to facilitate integration and improve the efficiency of network interactions. According to Audretsh and Belitski [5], the complex nature of relationships in ecosystems is due to an unique combination of regional factors. They are cultural, social and material elements that influence the discovery and exploration of opportunities. The present work presents the mapping of the regional ecosystem of the state of Rio de Janeiro, tracing a technical and social profile of this entrepreneurial community.

This paper is structured as follows. Section 2 brings an overview of startup ecosystem. Section 3 describes the main concepts of social network analysis. Section 4 presents our approach to plan, collect and analyse data. Section 5 shows the research findings and limitations of the experiment. Finally, Section 6 presents the conclusions and suggests future works.

2 Startup Ecosystems

Startups are endeavors that search for a scalable and repeatable business, despite of uncertain conditions, little experience and limited resources [9]. These ventures have greater potential to launch innovations [10]. However, to overcome their constraints, startups make use of entrepreneurial communities. It is imperative to have partners that offer infrastructure, administrative services and networking to facilitate access to suppliers, technological assets and funding [27, 19].

This kind of communities behaves as a biological ecosystem - a system of different species living in the same habitat. The business activities are expressed by relations of interdependency and coevolution. This metaphor is useful to analyze the interrelationships existents in entrepreneurial environments. The interdependence denotes the complex nature of relationships among its participants, who compete for resources and collaborate for the common benefits, coevolute [20].

A startups ecosystem can be defined as a set of different agents that promote the entrepreneurial spirit. They follow and support the startups development process, stimulating entrepreneurship, generating innovation and economic growth [28, 26]. They are formed by actors with different roles and interests. Understanding the nature of the relationships among these different participants is imperative for their success as a whole. According to Águeda [2], these agents can be grouped into three categories:

- **Entrepreneurs:** people who are searching for some business opportunities to start a deal. Torres and Souza [28] emphasized that in developing countries many people undertake for lack of good jobs. They are called necessity entrepreneurs. On the other hand, there are those who are looking for new challenges, the so-called serial entrepreneurs.
- **Ecosystem Builders:** they are support institutions that act in the development, support and encouragement of entrepreneurial actions. They represent bridges among the participants of the ecosystem and ensure that the entrepreneurs have all the necessary resources to increase the chance of success of the ventures [2, 6]
- **Investor Groups:** they are responsible for funding high growth startups. In Brazil, the initial investments in the entrepreneurial communities have been carried out by government agencies [4]. The mission of development agencies is related to the public policies of technological development adopted in the ecosystem region. There are also other financial entities that have realized excellent business opportunities by offering credit to startups. These are venture capital funds or even experienced entrepreneurs who have decided to support new investments in order to get financial profits.

The size of a startups ecosystem can be determined by its reach and geographic location. This dimension is a key factor for the development of innovations, bringing direct influences to collaborative activities of creation and diffusion of knowledge, capacity development, resource sharing and networking [24]. A greater diversity in the community impacts on the creative process, because the collaboration with different participants brings new perspectives to the ventures [25]. Pombo-Juárez et al. [24] establish four levels of entrepreneurial community coverage: local, regional, national and international. A local ecosystem is limited to participants in a university or research center. A regional ecosystem is a bit more comprehensive than the local, with more participants and resources. A national ecosystem involves institutions and entrepreneurs from a whole country. An international ecosystem involves several countries, such as initiatives by companies or groups of countries interested in developing entrepreneurial policies.

3 Social Network Analysis

The behavior of certain elements can not be studied separately due to the influences produced by the environment. In such cases, it must to study how connections are formed and what their relevance is to the problem in question.

In the case of startup ecosystems, partnerships provide members with a range of resources that they would otherwise not have access to [18]. Considering that an entrepreneurial community is a set of interdependent organizations, the study of its dynamics can be facilitated by the use of social network analysis [12, 22].

A social network is an abstraction that allows to codify relationships between pairs of individuals, such as ties of friendship, affinity, common interests or commercial relations [14]. There are a number of phenomena occurring in networks that depend fundamentally on their structure. Therefore, the study of the properties of networks can reveal patterns of interaction. The analysis of social networks can help in the analysis of the level of coordination of partnerships, the intensity of interactions, the emergence of communities, the level of connectivity, the relevance of participants, the influence of groups and patterns of group behavior [3].

3.1 Network Topological Characteristics

The structural aspects of the network can reveal important information about relationships in communities. The social network analysis aids to identify critical points in the community's performance [15]. The networks are normally represented using graphs: the actors are the nodes (or vertices) and the bonds are the edges (or links) of the graphs. Nodes and edges can receive differentiated weights to represent the number of node connections or frequency of interactions. Thus, it is possible to represent different characteristics of a social network. Edges can use different weights to indicate intensity, number of occurrences, or probability of relationships [12, 14].

The number of nodes and edges of a network define its density. The network density represents the ratio between the links in the graph and the total number of edges that the graph could have. In turn, the density of a node is the ratio between the number of neighbors of the node and the number of possible neighbors. This measure indicates how well connected a node is in the network [14].

In the study of organizational networks, an important issue refers to the concept of centrality. It determines the extent to which a specific node is connected to the others in the network. In general, the degree centrality of a node is determined by its number of edges. A high degree centrality implies a greater number of relationships and better opportunities because they have choices [15]. In a network of partnerships, the degree centrality points the relevance of the participant in the community. Thus, incubators that have a great importance for the enterprises have a high centrality [25, 19].

There is a set of specific centrality metrics that can be applied in specific cases. The simpler measures consider only the presence or not of an edge, however, more sophisticated metrics can take into account the weight of the edges [14]. The closeness centrality metric is based on the total distance between a particular node and all others and the total number of other nodes accessible from the observed vertex. Nodes with high values for closeness centrality have

great importance in the dissemination of information in the network [12]. Betweenness centrality measures the frequency at which a node is used as a bridge between two others. The intermediary has the power to interrupt relations and isolate actors, preventing contact between them [12]. In order to analyze the importance of nodes with low degree centrality, the eigenvector centrality can be applied. This metric checks the impact of a node's relationships through a score assigned to all nodes in the network. If an actor has few relationships, but with other nodes of great relevance, their importance will also be considered [15].

In a network of entrepreneurs, individuals with more relationships will have more access to resources. The role played by the actor will determine which centrality metric should be applied. As reported by Grassi et al. [15], there are four strategic positions:

1. **central individuals:** they have many connections with others, that represents great opportunities for interactions. They can mobilize more resources and influence partners to achieve results. In the entrepreneurial communities, it is the role played by incubators, accelerators and technology parks. They are hubs for entrepreneurs, the diversity of contacts is fundamental to expand business opportunities [6, 13]. In this case, degree centrality is the most appropriate tool.
2. **brokers:** individuals who act in the community controlling the flow of information. They do not have a large number of connections, but they have a betweenness centrality. The startups behave in this way [21].
3. **boundary spanners:** they maintains relationships with individuals from outside their community, seeking new opportunities. Companies usually establish these relationships in entrepreneurial communities [6]. The best tool here is eigenvector centrality [15].
4. **boundary specialists:** they have high level of technical skills or specific information, and they establish in the border of the network. They have a low centrality measure [15].

3.2 Network Behaviors in Startup Ecosystems

The complex nature of ecosystem relationships is the result of a unique combination of environmental aspects. They are sociocultural and material factors that influence the discovery and exploitation of opportunities [17, 5]. Cultural aspects are based on implicit beliefs and norms that shape the perception of ecosystem members in relation to entrepreneurship. A friendly culture is concerned with establishing the environmental conditions necessary to stimulate entrepreneurial activity, through a climate of greater acceptance of risks. According to Audretsch and Belitski [5], tolerance and openness to diversity establishes the conditions for testing new possibilities, assuming the chances of failure and making the environment richer by tolerating different ideas and ways of thinking, ethnicities and cultures. The culture also appears related to the sense of confidence and security necessary to establish activities of collaboration in the community [26].

The influence of family and friends is also mentioned as a factor that can affect the actions of entrepreneurs [28].

The social factor, the so-called social capital, refers to the benefits obtained or acquired through the social network of the community. The importance of this mechanism has been widely discussed in Jha [18]. It has a fundamental role in discovering new knowledge about opportunities and technologies, helping new ventures to obtain funding and influencing new perspectives and entrepreneurial skills. Social capital depends on the established connections and culture existent in the network. These aspects create an atmosphere of trust among the agents, that is a basic condition to encourage the sharing of scarce resources among entrepreneurs, investors and other entities [26].

The material aspects are related to the physical conditions necessary for the establishment of the startups ecosystem. According to Audretsch and Belitski [5], the infrastructure of the region can influence connectivity and the recognition of opportunities. The facilities offered by the region can make it more attractive to a greater number of entrepreneurs, local and regional authorities, researchers and academics, educational institutes and other supportive agents promoting community development [27].

The universities and research centers in the region act as providers of new technologies and catalysts of market opportunities. They form human capital and are responsible for the development of new academic ventures and spin offs [6]. In turn, the companies can establish partnerships with universities, absorb the skilled workforce or seek solutions collaborating with startups. The formed partnerships promote the monitoring of new technologies, facilitating the absorption of knowledge and the generation of competitive differentials [10].

The existence of formal support institutions helps regulate the governance model for the operation of the ecosystem. The government also has a relevant role in the community. Their actions establish important incentives for the emergence of new businesses through measures that can reduce bureaucracy, provide efficient administrative services, and prioritize resource allocation and financial support [17, 6, 26].

The availability of investment funds is determinant for the development of entrepreneurial communities [17]. Such kinds of financing include public funds, venture capital, angel investors, family, banks, self-financing, friends and incubators [28]. Another important startup ecosystems' requirement is the existence of a consolidated market with specific needs. The perceived demands on interactions with potential clients facilitate the identification of opportunities and the perception of value creation. The target audience creates an early validation mechanism that reduces the costs of launching novelties and boosts business growth on a scale [5, 26].

4 Methodological Approach

This paper presents a mapping of startup ecosystems of state of Rio de Janeiro, defining the technical and social profile of its participants and their relationships.

As presented, such aspects are crucial for understanding network behaviors [5]. Our approach was divided into 4 stages: (1) Data collection; (2) Classification and clustering; (3) Building of graphs; and (4) Analysis and visualization.

The first phase corresponds to the extraction, structuring and storage of the raw data. The data about the enterprises and support institutions were collected from the website of the ReINC⁴. ReINC is a non-governmental organization in support of entrepreneurship that aims to leverage the economy through incentives for innovation [?]. Considering the development of social computing, much of social interaction is nowadays mediated by information technology [23]. So, we chose LinkedIn⁵ because it is a online social network of business that connects professionals from all over the world, providing relevant information that allows a view of the profile of its members. The entrepreneurs' profiles from LinkedIn were used to extract social data of the startup ecosystem.

From database of ReINC, it is possible to identify the location, sectors and development stage of the ventures. It also has details about their products or projects and general data about their responsible. While LinkedIn data reveals social information from entrepreneurs, such as: their academic and experience background, explicated interests, and recommendations for users' skills. The recommendations provide some evidences of user engagement and reputation in the network, whilst expressed interests help characterize the profile of the entrepreneur [13].

During the second phase, the data collected and structured in the previous step are submitted to procedures for eliminating redundancies and disambiguating terms. We used the taxonomy of knowledge areas provided by CAPES⁶ and the taxonomy of productive niches defined by REINC itself. We also used a non-supervised k-means clustering algorithm to aid in the categorization of terms. To increase the reliability of the results, the base was inspected by pairs of researchers.

In the third phase, the relationships among the participants of the startups ecosystem are mapped through graphs. Several aspects are represented by graphs, such as affiliations and geolocation, interests, and competencies. The affiliation and geolocation graph allows to identify startups linked to the same incubator or technology park. In this way, we were able to analyze projects that share the same culture and norms and visualize their location. It also is possible analyze the relevance and power of incubators for different sectors. This graph points the sectors that attract most attention in the community. As ReINC represents a regional ecosystem, through this map, it is possible to determine degrees of distance between actors in the network, helping in the identification of potential partnerships.

⁴ ReINC – Network of Promoters of Innovative Enterprises Agency. Available in <http://reinc.org.br>

⁵ LinkedIn. Available in <http://linkedin.com>

⁶ CAPES – Brazilian Foundation for Coordination for the Improvement of Higher Education Personnel. Available in <http://capes.gov.br>

The interests graph maps the subjects that generate greater affinity for the entrepreneurs. The topics may be related to companies, groups, educational and research institutions or even personalities.

Finally, the competencies graph represents skills and endorsements about entrepreneurs. The identification of the skills and recommendations about entrepreneurs as well as the capacities necessary for the development of the products and services offered represent an important source of information about the members of the entrepreneurial ecosystem. These aspects of participants are related to their prestige and reputation. The identification of a complementary competence can help in the formation of partnerships or broaden synergies.

The analysis of the formed networks is performed in phase four. The concepts and metrics associated with generated graphs were defined in order to support this step. The social network analysis metrics are used to know the basic characteristics of the network topology to infer the following characteristics: local productive vocation, influence of location, profile of entrepreneurs, reputation, competence and expertises in the network.

4.1 Related Work

The mapping of startup ecosystems was carried out in Arruda et al.[4]. However, its goal was to detail the structural characteristics of the startup ecosystems: the basic conditions for the success of the communities. It did not discuss the influence of relationships among community. The description of the communities was also carried out in Isenberg [17].

The analysis of relationships in business ecosystems was discussed in Basole et al.[7]. The authors identified the segment, total number of partner collaboration, number of collaborations, specialties, and trust in a business ecosystem. The graph visualization model supports an intelligent management of partnerships and decision support. They did not address the specificities of startup ecosystems, but the issues raised in these studies elucidate important points about the relationships and the impact of interactions.

5 Results Obtained

The present study used as object the entrepreneurial community of the state of Rio de Janeiro. It represents an important entity of the federation, being the second richest and most populous state in Brazil[16], illustrated in Figure 1. The data collection process was carried out between February and March 2018. The last update identified in the ReINC database was in August 2017. It is important to consider the dynamic nature of the entrepreneurial community, so that the results obtained represent a snapshot this period. It was identified 18 incubators and 7 technology parks, 132 startups, as well as 227 graduated ventures and 27 associated companies. They act in 14 different sectors: agribusiness, biotechnology, design/creative economy (CE), drugs & health, education, energy, oil & gas (O&G), engineering and robotics, environment, food & beverage, information

and communication technologies (ICT), industrial technology, logistics, mining & earth sciences, and solidarity economy, as shown in Table 1.

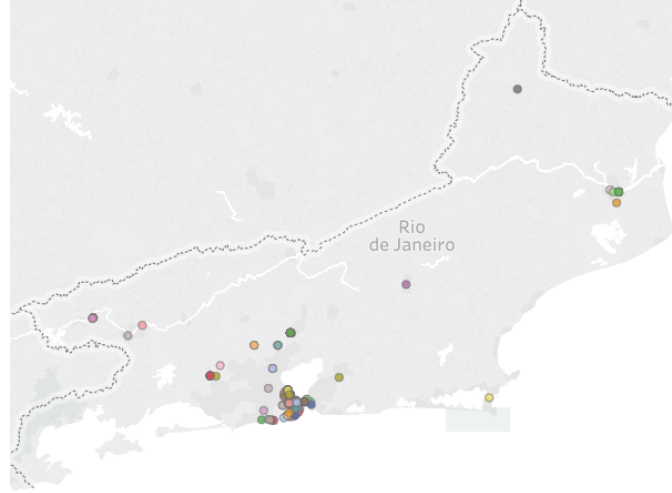


Fig. 1. Startup Ecosystem of State of Rio de Janeiro.

Most of the observed startups are involved in knowledge intensive ventures. This is related to the profile of the entrepreneurs, because the diversity of entrepreneurs leads to more creative spaces [25]. Professionals with a high level of education and experience are key factors for the success of business. In communities in which projects of greater complexity are developed, there is a great concentration of masters and doctors. In the COPPE/UFRJ, which is maintained by the largest federal university in Brazil (UFRJ⁷), it has the highest percentage of masters and doctors among its entrepreneurs: 76.4%. Then there are the incubators of the UFF⁸, with 58.3% and the Instituto Gênesis by Puc-Rio⁹, with 50% of scientists managing projects.

With regard to the area of activity of the enterprises, there is a great concentration in the areas of ICT, creative economy and environment. There are ICT startups in almost every technology incubator because they do not require so much infrastructure resources. Merely the thematic incubators do not have ventures of this nature: Bio Rio is focused on biotechnology; Rio Criativo/SEC incubator just supports creative economy projects; INEAGRO incubator aids agribusiness; and social incubators (ITCP, ITECS, ITESS) work specifically with solidarity economy.

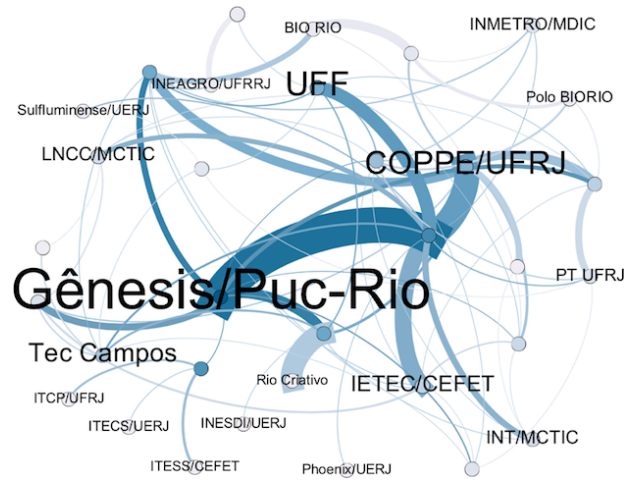
⁷ UFRJ – Federal University of Rio de Janeiro

⁸ UFF – Federal Fluminense University

⁹ Puc-Rio – Pontifical Catholic University of Rio de Janeiro

Table 1. Distribution of Business by Incubators and Sectors.

	Total of Business	Agribusiness	Biotechnology	Design/CE	Drugs & Health	Education	Energy, O&G	Eng. & Robotics	Environment	Food & Beverage	ICT	Industrial Tech.	Logistics	Mining & Earth	Solidarity economy
Inst Gênesis/Puc-Rio	94	0	0	15	1	9	6	1	9	2	50	0	0	0	1
COPPE/UFRJ	86	0	3	4	3	2	13	4	12	0	36	9	0	0	0
IETEC/CEFET-RJ	34	0	0	1	1	3	1	2	1	1	24	0	0	0	0
UFF	31	1	0	2	2	0	1	1	2	1	20	0	1	0	0
Rio Criativo /SEC	31	0	0	31	0	0	0	0	0	0	0	0	0	0	0
BIO RIO	20	0	12	0	0	0	0	1	7	0	0	0	0	0	0
Tech Park of UFRJ	16	0	0	0	2	0	10	0	0	1	2	0	1	0	0
INT/MCTIC	13	0	0	0	1	0	0	1	1	0	9	1	0	0	0
TEC CAMPOS	12	0	0	3	0	1	0	0	1	1	3	0	1	2	0
LNCC/MCTIC	11	0	0	0	1	2	1	0	0	0	6	0	0	1	0
INEAGRO/UFRRJ	10	8	0	0	0	0	0	0	2	0	0	0	0	0	0
Polo BIORIO	9	0	5	0	3	0	1	0	0	0	0	0	0	0	0
INMETRO/MCTIC	6	0	1	0	2	0	0	0	2	0	1	0	0	0	0
ITESS/CEFET-RJ	4	0	0	0	0	0	0	0	0	0	0	0	0	0	4
Sulfluminense/UERJ	3	0	0	0	0	0	0	0	0	0	2	0	1	0	0
ITCP/UFRJ	3	0	0	0	0	0	0	0	0	0	0	0	0	0	3
Phoenix/UERJ	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0
INESDI/UERJ	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0
ITECS/UERJ	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Total	386	9	21	57	16	17	33	10	37	6	154	10	4	3	9

**Fig. 2.** Distribution of Sectors among Startup Builders.

The incubators and technology parks have predominant sectors, as shown in Figure 2. The ecosystem builders with the greatest number of enterprises have greater relevance in the network. However, the diversification of areas also impacts on the importance of the institution. For instance, the UFF incubator, which has 31 projects, has a greater betweenness centrality than the COPPE/UFRJ incubator, which has 87 projects. On the other hand, Rio Criativo/SEC incubator, despite having the same number of projects, because it is sectorized, its betweenness centrality is zero. The technology parks have attracted the attention of large companies from several sectors, specially on the Oil and Gas area and the development of Medicines, next to UFRJ.

The recommendation of skills found in LinkedIn demonstrate the social skills of their users. The most frequent and connected user commonly have more recommendations. Therefore, this indicator provides information about its competencies and the recognition of the professional in the community in which it participates. The skills were grouped into classes adapted from the knowledge taxonomy of CAPES. Figure 3 illustrates the most frequent recommendations per incubator. Observing the eigenvector centrality, it is possible to perceive which nodes have the greatest impact on the network. Table 2 details the 5 incubators in which their competencies generate greater influence in the community and the most important terms cited. Despite having more recommendations than Rio Criativo/SEC, IETEC/CEFET-RJ is less relevance in this aspect. This is because Rio Criativo/SEC behaves as a boundary specialist.

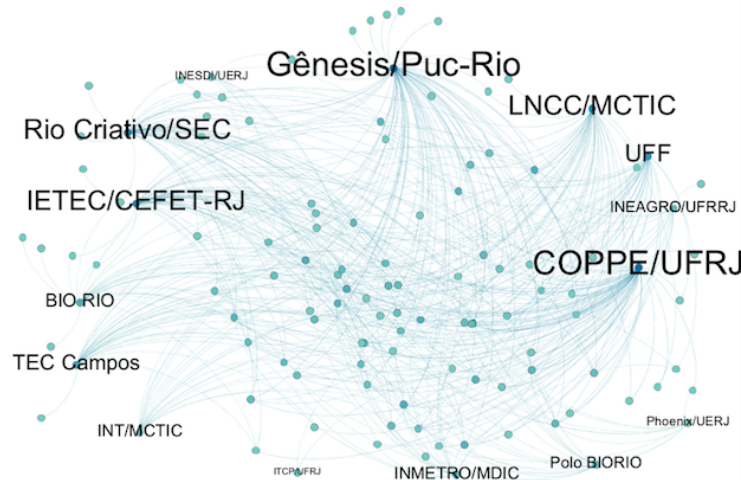


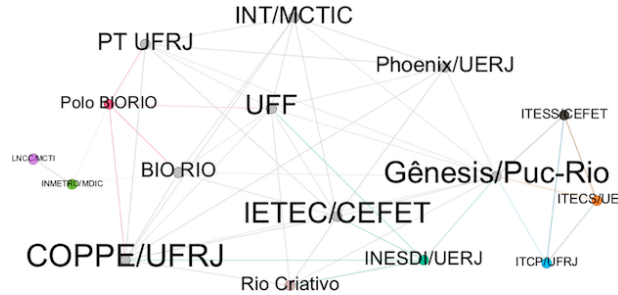
Fig. 3. Recommended Skills in Startup Builders.

The graph of geolocation links the ecosystem builders that have common sectors and that are within a certain radius of distance, represented by Figure 4. The parameter was adjusted by the maximum distance between entities

Table 2. Most Recommended Skills per Startup Builders.

	Eigenvector			
	Endorsements	Skills	Centrality	Most cited skills
Instituto Gênesis/Puc-Rio	9268	1076	1	Planning; Entrepreneurship; Management
COPPE/UFRJ	7115	887	0,971	Management; Planning; Business
Rio Criativo /SEC	1557	264	0,755	Games; Audiovisual; Communication
IETEC/CEFET-RJ	1972	330	0,742	Telecom; Development Tools; Engineering III
LNCC /MCTIC	3860	205	0,737	Marketing; Social Tools; Planning

belonging to the same region of the state, the metropolitan region. It was used 30 kilometers, which is the distance between the BIO RIO incubator, located in the capital and INMETRO incubator, located in an adjacent municipality. Proximity between hubs can stimulate informal relationships among their participants [5]. The centrality degree of this graph determines the incubators or technology parks with the best possibilities of establishing relationships in the network due to their location. According to the weighted degree calculated, the five best located institutions are: COPPE/UFRJ, Instituto Gênesis/Puc-Rio, IETEC/CEFET-RJ, UFF and UFRJ Technology Park.

**Fig. 4.** Influences of Geolocation and Sectors per Startup Builders.

The graph of interests analyzes which subjects are tracked by the entrepreneurs on LinkedIn. In this network, the nodes represent entrepreneurs and the edges represent the affinities between them. Affinity was established as a certain number of interests in common. We used 5 interests as parameter. The resulting graph, illustrated in Figure 5, shows the predominance of affinities among entrepreneurs linked to the same incubator. The culture of the incubator may have an influence on this indicator. However, there are similarities between entrepreneurs of distinct and distant incubators. In these cases, either the academic or experience background of the entrepreneurs were similar.

Regarding the limitations, this study, like any other, has several limitations and threats that may affect the validity of the results. Concerning to the construction validate, the approach relies on the participating of entrepreneurs in

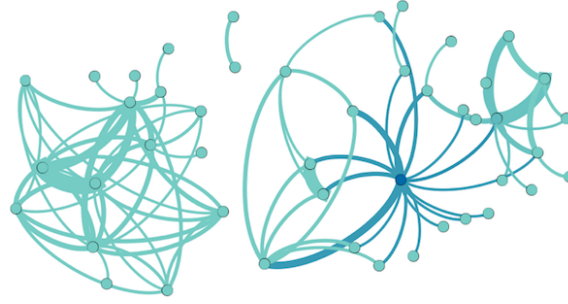


Fig. 5. Entrepreneurs with Similar Interests.

some social platform. Despite being a widely used nowadays, it generates an important bias. Moreover, this experiment there was no statistically established population. Because the entrepreneurial community is dynamic, new participants may have been added over time, making it difficult to accurately represent the ecosystem.

6 Concluding Remarks

Entrepreneurial communities are habitats where different actors coexist and interact by seeking resources and partnerships to develop ventures. This diversity can give rise to more innovative businesses [25, 1]. However, managing resources in the network may not be a trivial task. There are a number of sociocultural and material aspects that must be considered to enhance integration and provide greater network efficiency. Therefore, it is necessary to have mechanisms that help in understanding network behaviors.

We presented a mapping of the startups ecosystem of the state of Rio de Janeiro using an approach based on social network analysis. The profile of entrepreneurs, incubators and technology parks were identified according to technical and social aspects. The use of social network analysis was a good solution to broaden understanding about some implicit aspects of entrepreneurial communities. The main contribution of this paper is building of a process of mapping, that can be used in others startup ecosystems.

In future work, we intend to increase the understanding about interactions in startup ecosystems through a more detailed investigative analysis. We are currently working on the mapping model, creating different views of the ecosystem according to the actor's profile - entrepreneur, ecosystem builders or investors. It is also necessary to improve the metrics used in this article and develop tools that facilitate the execution of the method. The aim is to give participants the entrepreneurial community a broader view of the possible partnerships and networking management mechanisms of cooperation.

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