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A study of CNPq Research Groups and Incubators for creating academic spin-offs at UERJ, RJ, Brazil[1]

PARALLEL 4

New business models for incubators in STPs

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Executive Summary
This article aims to map the interactions of research groups with incubators and other internal and external stakeholders at the State University of Rio de Janeiro - UERJ, to identify the possibility of innovation for the creation of academic spin-offs. This university was chosen because it is a public, a state school and considered a great teaching, research and extension institution, currently ranked 11th (RUF, 2013). Therefore, it presents a broad level of generalization regarding the results of this research. This analysis was performed in the post-innovation law scenario, in the 2009-2011 period, with a representative sample of 346 research groups registered by the 2010 Census with the National Council of Technological and Scientific Development - CNPq and the four incubators at UERJ. The results indicate a low level of interaction (approximately 10%) of the UERJ groups with the incubators and companies (incubated and spin-offs).

1. Introduction

In Brazil, the current post-innovation law scenario has been designed for implementation by the main actors involved within the context of its scope (universities, companies and governments), through numerous developmental actions.
These actions present a broad spectrum, which can be exemplified: 1) in the legal context: through the elaboration of C,T&I public policies, which include, for example, the strengthening of the national and regional innovation systems, through the promulgation of state laws and innovation programs to encourage scientific and technological development, mainly those launched by foundations that support research - regional FAPs, many of them in partnership with the federal government; 2) in the productive context: by the companies, especially technology-based companies - EBTs, academic spin-offs, that are growing, expanding investment in R,D&I and creating business strategies with a focus on technological innovation, preparing technical staff to raise funds for innovation; 3) in the scientific context: universities (through scientific and technological institutions - ICTs, where higher education institutions - IES included) have been organizing to manage the transfer of knowledge to the market, through the implementation of institutional policies that include the internal regulations of this law, as well as mobilization and interaction with the other actors in the university knowledge network, including, in particular the incubators and parks.
This proposal aims to map the interactions of research groups with incubators and other internal and external stakeholders to UERJ, to identify the possibility of the creation of technology-based companies - EBTs, characterized as academic spin-offs. The research presents a broad level of generalization of the results as a result of the fact that it was conducted in a large institution for teaching, research and extension, a public, state school ranked 11th by the *Folha de São Paulo* newspaper (RUF, 2013) and 35th among the best universities in Latin America in an international list published by Quacquarelli Symonds University Rankings (QS University Ranking Latin America, 2013).
Specifically, the objective was to obtain information from the networks characterized by actions aimed at entrepreneurship, technology and innovation, with a view toward the development of the regions, remaining focused on technological innovation.
The data collected in this survey increased the institutional knowledge about the benefits generated for society based on the results of the interaction network, comprised of the academic research groups, the incubators and the companies (incubated and spin-offs).
The scope of the analysis covers the implementation of the mapping in the post-innovation law scenario, for the 2009-2011 period, identifying the interaction of the actors of the UERJ knowledge network: a representative sample of 346 (three hundred forty-six) research groups registered in the Directory of Research Groups in Brazil and evaluated by the 2010 Census, by the CNPq, which is a Brazilian federal agency, the four (4) university incubators and internal and external actors at UERJ.
The results indicate a low level of interaction (approximately 10%) of the research groups with incubators and companies (incubated and spin-offs). Other types of university-business-government interaction with a focus on the research groups and incubators could be explored upon further development of this survey.
The relevance of this paper can be seen in the fact that the research identified some characteristics of new business models for incubators in science, research and technology parks (STPs), especially those that house academic spin-offs.
In this model, the networks show the levels of interaction of the actors who produce knowledge within these organizational structures, primarily university, government and companies, where incubators act as mediation agencies, which focus on the success of innovative projects, originating most of the time with the so-called "quasi-company" research groups and the university laboratories (ETZKOWITZ, 2003).

The research about these existing gaps and the clarity of the possible solutions that are found can demonstrate the effectiveness of this argument, which orients this paper.

1. The data mapped by the Brazilian government (Information System Intellectual Property Policy - FORMICT, CNPq, referring to block 2) - innovation policies, intellectual property and technology transfer, do not include the benefits that universities could have from surveying the network that encompasses the knowledge exchange relations of the university research groups with the incubators, companies and other partners in an understandable way and capturing the actions directed toward entrepreneurship, technology and innovation, with a view to developing regions.
2. Not all exchanges of knowledge and other interactive activities are monitored or are under the control of the university administration; so only an analysis of the actors of the UERJ knowledge network could provide a more comprehensive picture about the concern of researchers (students, technicians and teachers) to transform the knowledge produced into an innovative artifact, capable of being marketed.
3. The need to increase institutional knowledge of the benefits generated for society, from the results of the interaction with the network made up of academic research groups, the incubators, companies and other partners foreseen in the innovation law.

The originality of the topic and its approach is seen in the absence of academic publications on this subject in the country.
This paper is structured as follows: the present Introduction, the Theoretical Framework, the Methodology, the Case Study, the Conclusion and the References.

2. Theoretical Framework

The theoretical framework of this research project is comprised of seven (7) interconnected themes, as follows: the entrepreneurial university; the triple helix; the networks; the incubator; the technology-based companies and spin-offs; the "quasi-company" research groups; and the innovation systems.
With regard to the entrepreneurial university, this theoretical concept is the result of the evolution of the organizational model of the university over the past centuries. This process of transformation of universities has been conceptualized in different ways, such as a change in the "social contract" between the university and the State (GUSTON & KENISTON, 1994); as a shift between modes of knowledge production (GIBBONS ET AL., 1994); as the emergence of the triple helix model (LEYDESDORFF & ETZKOWITZ, 1996). In addition to these cited works, numerous articles on university models suggest the so-called "entrepreneurial university" (CLARK, 1998; SLAUGHTER & LESLIE, 1999; ETZKOWITZ, 2004).
The literature also shows there is great heterogeneity among the current university models, but that without a doubt the external knowledge networks, even though only informal, could become the seed for "contractual" and "formal" knowledge exchanges in the actions of knowledge transfer from university to society, leading to the creation of spin-offs, licensing agreements with large enterprises and the maintenance and expansion of the university's "business" links. (CLARK, 1998 and 2004). The author used the term entrepreneurial university as a social characteristic of the academic system; i.e., the entire university, its departments, research centers, colleges and schools actively seeking innovation as a way to expand its impact on society.
Based on research in Europe, Clark (1998 and 2004) identified five elements that characterized organizational change towards becoming an entrepreneurial university: 1) a core management group determined to comply with the university-business-government interaction; 2) a developed region, going beyond the traditional boundaries of universities, with technology transfer offices, interdisciplinary research centers, among others; 3) a context of diversified funding; 4) faculty and students stimulated toward university-industry-government interaction; 5) an entrepreneurial culture integrated with the university.
In Brazil, it can be said that the political will for the transformation of the universities is demonstrated through the effective implementation of mechanisms to integrate, for example, the legal context of innovation, which includes a set of laws ranging from the Federal Constitution through to the law of innovation, as well as programs, projects and actions to induce the scientific and technological development of the country, all aimed at social and economic growth based on innovation.
Now the vocation and conviction of the faculty and researchers of the entrepreneurial university are demonstrated in the knowledge network of the university and its university-business-government (triple helix) interaction activities focused on innovation. However, the universities still run into difficulties: one is the academic community's resistance to change. Only the development of the

interaction of academia with the productive sector and the government will favor significant changes in the form of knowledge production, and principally if these interactions have been designed to economically and socially develop the region where these universities, companies and governments are established.

It will be up to the entrepreneurial university to comply with the task of promoting economic and social development through new organizational structures, such as interdisciplinary, multidisciplinary or even trans-disciplinary centers. These structures allow the generation of new disciplines, technology transfer offices, entrepreneurial schools, venture capital groups, incubators, junior companies and laboratories that, in turn, originate theses, publications and patents as a result of their interaction with the productive sector. Thus, this university that has been emerging will guarantee the inclusion in the global market of the entirety of its faculty and student body, totally in step with regional demand.

Finally, we can say that the entrepreneurial university is an interdisciplinary, matricial organization, based on fields of expertise, with facilities for teaching, research and extension, focused on the production of knowledge and its transfer to society; it is the main player for fostering local development.

The triple helix is a fundamental concept, whose metaphor represents an interaction mechanism that enables the actors — university, business and government — to create the synergy between themselves and the other social actors in a developmental network. This network, located in an innovation system, promotes progress through the entrepreneurial attitude, the technological modernization and, consequently, through innovation.

Networks are defined as systems composed of nodes and the connections between them (MOLINA, 2005). Network analysis has been expanding in recent years, although there is an important epistemological debate about its position in scientific and technological research. It is true that networks create common knowledge between different areas of expertise and transform tacit knowledge into explicit knowledge. Furthermore, the relationships between the actors who participate in the networks are part of the existing capital in societies, just as capital serves as the basis for economic and social development. The networks generate what Braczyk et al. 1998 call an environment favorable to the association economy and, consequently, the knowledge economy.

The organizational structures of the university work in a network and enable knowledge and new technologies generated by it — through own research, in partnership with companies or in spin-off companies — to be integrated into the productive sector, improving and innovating goods and services for society.

On the other hand, the university-business-government interaction permits technological research activities in partnership as well as with consultants and advisers, offering the faculty and students constant experience and modernizing opportunities. This experience lets the academic community present to students and discuss with them not only the theoretical aspects of the subject, but also practical aspects of their current field of expertise, thereby contributing to the formation of a professional with a differentiated skill set. The university's knowledge network is made up of the organizational structures that work with entrepreneurial activities, technology and innovation and the aim is to transfer knowledge to society.

The incubators are organizations that harbor startup ventures, usually derived from scientific research, and whose projects involve innovation. Such organizations provide spaces and subsidized services to the entrepreneurs, who own their incubated companies (LALKAKA, 1990).

In Brazil, the extremely positive results of this movement to encourage entrepreneurship through incubators and technology parks in Brazilian universities, throughout their 20 years of existence, can now be evaluated, according to a recent study by ANPROTEC, 2006, through the following indicators: a.) currently, there are more than 400 incubators and 10 technology parks in operation, distributed in 25 states and deployed on or near all of the country's important universities; b.) incubators engage more than 6,300 innovative companies, among incubated (2,800), associated (2,000) and graduated (1,500); c.) in turn, these innovative companies, together, generate more than 33,000 highly skilled jobs; d.) the economic impact can be assessed by the fact that the estimated sales in 2006[2] of the incubated companies was R$ 400 million and revenues of the graduated companies was R$ 1.6 billion, generating total revenues of R$ 2 billion that year; and e.) the estimated public investment, at three levels (federal, state and municipal), for setting up and

[2] These refer to the latest data from the Panorama of the incubators in Brazil published by ANPROTEC.

operating the incubators and technology parks over the last 20 years reached R$ 430 million, while the estimated tax revenues generated annually by companies is R$ 400 million.
The technology-based company – EBT, according to FINEP, 2010, is a "company of any size or in any industry that bases its competitive strategy on technological innovation." It also defines an EBT as a spin off, as: "a new company formed by a larger group to explore new developments or recent market opportunities and in which both the management team and the venture capitalist also have an ownership stake in its capital stock."
The "quasi-company" research groups act as entities-companies within entrepreneurial universities, lacking only a direct profit to make them a company, (ETZKOWITZ, H. & LEYDESDORFF, L., 2000; H. VAN TONGEREN & AG DORÉE, 1997; DANIEL LOCKTON, 2005).
In the development of the sciences, teachers should be the leaders of the research groups, fostering the training of scientists through the production of knowledge supported by technical laboratories where this work is developed. As the size of the research group increases, teachers who were formerly only involved in the development of the research are required to devote a considerable part of their time to organizational tasks.
Innovation systems (according to Freeman, 1974; Lundvall, 1992, Nelson, 1993; Edquist, 1997) are sets of elements and structures of a nation, in the case of national systems, that assume specific roles in the production, transmission and storage of knowledge for innovation. Such systems are characterized by their ability to interact, through the articulation of these elements for the production of knowledge, its dissemination and use, competitively and profitably. Edquist, 1997 cites that *"innovation systems (national and regional) represent a new approach to the study of innovation in the economy that has been emerging in the last decade."*

3. Methodology

The methodology of this research project, described below, consisted of an exploratory, quantitative and qualitative survey, divided into four (4) steps as described below:
1) general approach - presentation of theoretical concepts that make up the subject: entrepreneurial university; triple helix; networks; incubators; technology-based companies and spin-offs; research groups, called "quasi-companies"; and national innovation systems;
2) data and information collection for the period 2009 and 2011 - implementation of a semi-structured questionnaire about the activities of interaction and types of collaboration in a representative sample of the research groups. The size of the sample was determined randomly using the specific formulation proposed in Castro and others, (2011), cited below:

$$n = \frac{(1{,}96)^2\,(0{,}5)^2\,N}{(1{,}96)^2\,(0{,}5)^2 + N\,e^2}$$

where: n = sample size (percentage of the sampled population); N = size of the population sampled; e = 0.05 assuming a level of reliability with a safety margin of 5%; the value of 1.96 = the value of the normal distribution, assuring accuracy of 95% and a value of 0.5 = significance level expected for the calculation of sample size.
Found n = 53% of the population sampled, thus obtaining a representative sample of 186 research groups to be surveyed. In addition, the distribution of the same percentage for the interviews in the three sets that comprised the research analysis was observed. This new calculation was performed in order to ensure representativeness of the sample in the three different analysis sets, chosen to be applied in the interviews, which are shown in Tables 1, 2 and 3, along with the number of research groups that comprise a representative sample.
Table 1 presents the first analysis set, consisting of research groups from nine (9) CNPq Knowledge Areas that exist in the UERJ: Agricultural Sciences; Biological Sciences; Health Sciences; Exact and Earth Sciences, Humanities Sciences, Applied Social Sciences; Engineering; Linguistics; Letters and Arts; and Technologies.

Table 1 – CNPQ KNOWLEDGE AREAS THAT EXIST AT UERJ AND REPRESENTAIVE SAMPLE

CNPQ KNOWLEDGE AREAS THAT EXIST AT UERJ	NUMBER OF RESEARCH GROUPS OF CNPQ KNOWLEDGE AREAS THAT EXIST AT UERJ	REPRESENTAIVE SAMPLE OF CNPQ KNOWLEDGE AREAS THAT EXIST AT UERJ (NUMBER OF INTERVIEWS)
Agricultural Sciences	01	01

Biological Sciences	35	25
Health Sciences	47	18
Exact and Earth Sciences	43	26
Humanities Sciences	109	57
Applied Social Sciences	42	22
Engineering	40	17
Linguistics; Letters and Arts	28	15
Technologies.	01	01

Source: SR2/UERJ Available in http://www.sr2.uerj.br/sr2/depesq/grpesq/grpesq2010_area_certificados.html, accessed on 20th January, 2011 and Mesquita and Terra, 2013

Table 2 presents the second analysis set, composed of research groups from four (4) UERJ Sectorial Centers: BIOMEDICAL CENTER - CBI; CENTER FOR EDUCATION AND HUMANITIES - CEH; SOCIAL SCIENCES CENTER – CCS; and SCIENCE AND TECHNOLOGY CENTER – CTC.

Table 2 – RESEARCH GROUPS FROM UERJ SECTORIAL CENTERS AND REPRESENTATIVE SAMPLE

UERJ SECTORIAL CENTERS	NUMBER OF RESEARCH GROUPS FROM UERJ SECTORIAL CENTERS	REPRESENTATIVE SAMPLE OF RESEARCH GROUPS FROM UERJ SECTORIAL CENTERS (NUMBER OF INTERVIEWS)
CBI	87	44
CEH	120	37
CCS	52	57
CTC	87	43

Source: Mesquita and Terra, 2013.

Table 3 presents the third analysis set, composed of research groups of thirty (30) UERJ Academic Units: School of Nursing – ENF; Faculty of Medical Sciences - FCM; the Roberto Alcantara Gomes Institute of Biology -IBRAG; Institute of Social Medicine – IMS; Institute of Nutrition – NUT; Faculty of Dentistry – ODO (Note: these 6 Academic Units comprise the CBI UERJ, cited earlier); Institute of Psychology - PSI; Institute of Arts - ART; Faculty of Education – EDU; Faculty of Social Communication - FCS; Baixada Fluminense College of Education - FEBF; Faculty of Teacher Education of São Gonçalo - FFP; Institute of Physical Education and Sports - EDFIs; Fernando Rodrigues da Silveira Application Institute - CAP; Institute of Letters - ILE (Note: these 9 Academic Units comprise the CEH UERJ, cited earlier); Faculty of Law - DIR; Faculty of Administration and Finance - FAF; School of Economics – FCE; Faculty of Social Work - FSS; Institute of Philosophy and Human Sciences - IFCH (Note: these 5 Academic Units comprise the CCS UERJ, cited earlier); School Of Industrial Design - ESDI; School of Oceanography - FAOC; College of Technology - FAT; Engineering College – FEN; Faculty of Geology - FGEL; - Institute of Physics - FIS; Institute of Geography - IGEOG; Institute of Mathematics and Statistics - IME; Polytechnic Institute - IPRJ; Institute of Chemistry - THU, (Note: these 10 Academic Units comprise the CTC UERJ, cited earlier). Observation: Nowadays, UERJ has 31 Academic Unit, meanwhile the Academic Unit named Earth Science Institute - GEO was not considered because it doesn´t have any research group.

Table 3- RESEARCH GROUPS OF UERJ ACADEMIC UNITS AND REPRESENTATIVE SAMPLE

UERJ ACADEMIC UNITS	NUMBER OF RESEARCH GROUPS OF UERJ ACADEMIC UNITS	REPRESENTATIVE SAMPLE OF UERJ ACADEMIC UNITS (NUMBER OF INTERVIEWS)
ART	9	5
CAP	4	2

DIR	9	5
EDU	31	17
ENF	8	4
ESDI	2	1
FAF	4	2
FAT	2	1
FAOC	4	2
FCE	3	2
FCM	16	8
FCS	11	6
FEBF	8	4
FEN	24	13
FFP	26	14
FIS	13	7
FSS	13	7
IBRAG	37	20
IEFD	2	1
IFCH	23	12
IGEOG	11	6
ILE	18	10
IME	9	5
IMS	17	9
IPRJ	7	4
NUT	5	3
ODO	4	2
PSI	11	6
FGEL	5	3
QUI	10	5

Source: Mesquita and Terra, 2013.

3) survey of the interaction of the UERJ knowledge network actors — the data obtained in the questionnaires were transformed into matrixes and the UCINET software was used to consolidate them in graphics representing the relations developed within the network, and finally

4) dissemination of the results - dissemination through articles published in journals, conferences and national and international seminars and lectures in academic weeks, among others.

In order to better assess the interactions of research groups with incubators, a question that explained the difference of these interactions between the incubated and spin-off companies was included in the questionnaire applied.

4. The Case Study

4.1 UERJ's Characteristics

It was in the 1990s that UERJ initiated its more important activities targeting entrepreneurship, technology and innovation, with a view to the economic and social development of the country, the state of Rio de Janeiro and localities around the regional campuses within the State in which it operates.

UERJ has four (4) incubators, all technology-based and duly associated with the National Association of Entities Promoting Innovative Enterprises - ANPROTEC and the Incubators Network of Rio de Janeiro - REINC, which belongs to the Rio de Janeiro Technology Network - REDETEC. The characterizations of these incubators are shown in Table 4 below: (see year of founding in publications from the AEDAs, in column 1 of the previously cited Table 4).

Table 4 - Characteristics of the UERJ Incubators and Parks

Source: The author, 2013.

4.2 Analysis of Results

Based on the data obtained in the interviews, it was possible to draw up matrixes and utilize the UCINET software to analyze the interaction configuration in the light of the objective of the study, to analyze the knowledge network and the possibility of the creation of spin-offs.

UERJ Incubators and Technological Parks[3]	**Present Academic Link**	**Directions of the UERJ Regional-Campi**	**Productive Sectors**[4]
Academic Program of Technology-based Firms - IEBTec (AEDA nº. 043/1994 modified by AEDA nº. 03/1995)	Rio de Janeiro Polytechnic Institute - IPRJ	Nova Friburgo	Information Technology, Civil Engineering, Biothecnology, Computer Graphics.
Incubator of Technology-based Firms and Tradicional Sector – IEBTST (AEDA nº. 008/2002)	Médio Paraíba Regional Campus	Resende	Automotive and Chemistry
George Eastman Development Center of Technology Innovation - (AEDA nº. 031/2011)	Médio Paraíba Regional Campus		Technology and Innovation
PHOENIX Incubator (AEDA nº. 004/2003)	Engeneering Faculty - FEN	Rio de Janeiro	Information Technology and Engineering
Design Firms Incubator-DESIGN.INC (AEDA nº. 002/2007)	Superior School of Industrial Design - ESDI		Design

Figure 1 shows a network structure that demonstrates the interaction of the UERJ research groups, distributed by CNPq knowledge areas, showing the incubators and spin-off companies. One can see that only the Health Sciences, Engineering, Applied Social Sciences, Exact Sciences and Earth and Human Sciences interact with any of the four university incubators. Furthermore, when analyzing the number of interactions, it appears that seven research groups in the fields of Sciences and Earth Sciences and four research groups in the field of Human Sciences have some continuing interaction with the four incubators; whereas, in other areas previously cited there is only one research group interacting with incubators. It also can be seen that one research group in the field of Engineering and one other group in the field of Applied Social Sciences maintain interaction with the academic spin-offs.

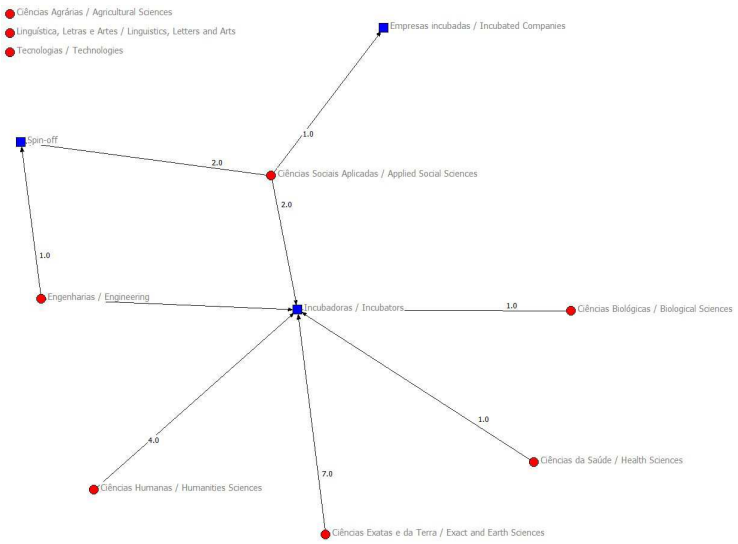
It is interesting to note that none of the research groups cited in this paper interacts with an incubated company that is not a spin-off. This fact could be explained because spin-offs originate in some type of research developed within the institution, and therefore they interact with university research groups right from birth, unlike the other incubated companies that need to build such bonds.

The following fields of knowledge do not interact with either the incubators or academic spin-offs: Agricultural Sciences, Linguistics, Letters and Arts, and Technologies.

Figure 1 - Network of the Research Groups grouped in the existing CNPq Knowledge Areas at UERJ with the Incubators and Companies (incubated and academic spin-offs)

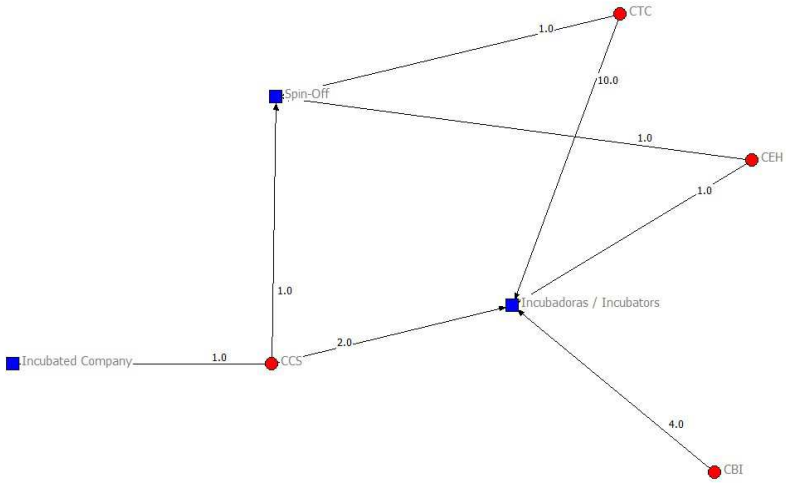
[3] The documents named: AEDA, accessed by www.uerj.br, was these that created the incubators ans parks.

[4] Source: Interviews with the Incubators`Managers, 2012



Source: Soares, Cruz and Terra, 2013

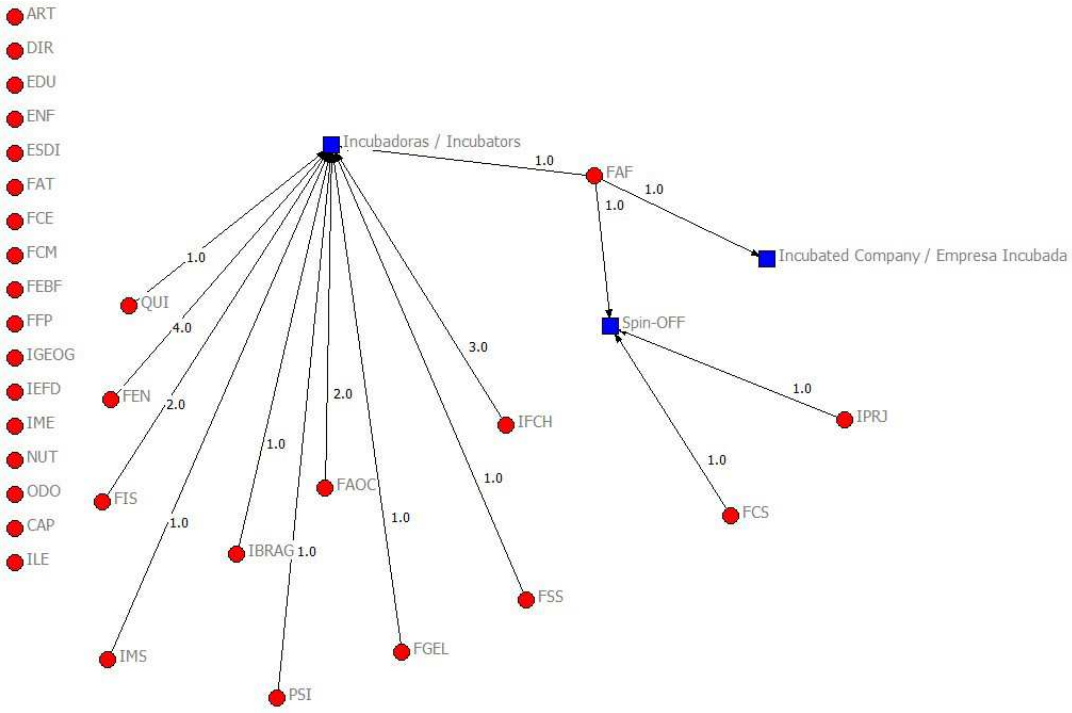
Figure 2 - Network Research Groups grouped in the Sectorial Centers with the UERJ Incubators and Companies (incubated and academic spin-offs)



Source: Soares, Cruz and Terra, 2013

The Figure 2 presents a network structure that demonstrates the interaction of UERJ's research groups, distributed by the university's Sectorial Centers with incubators and spin-offs. It can be seen that the research groups of all the Sectorial Centers (CTC, CEH, CCS, CBI) interact with the incubators and companies (incubated and spin-offs), although the number of interactions are different: CTC - 10 interactions; CBI - 4 interactions; CCS - 1 interaction and CEH - 1 interaction.
It is worth mentioning that at the CEC and CEH only one research group in each of these Sectorial Centers interacts with a spin-off company, while none of the 186 research groups studied of the four UERJ Sectorial Centers mentioned interacts with an incubated company.

Figure 3 - Network Research Groups of the Academic Units with the UERJ Incubators and Companies (incubated and academic spin-offs)



Source: Soares, Cruz and Terra, 2013

The Figure 3 shows a network structure that demonstrates the interaction of the UERJ research groups, located in the Academic Units of the university's Sectorial Centers, with the incubators and companies (incubated and spin-off). In the analysis of these networks, one also sees that the low level of interaction (only 40%) of these UERJ research groups relates to incubators and spin-off companies, and also it is observed that none of the 30 Academic Unit research groups indicated having a relationship with the incubated companies. Only two UERJ Academic Units have a research group, one in each of them, interacting with a spin-off company and only 10 Academic Units have relationships with the university incubators. It is also possible to verify that 17 Academic Units don´t interact with incubators or companies.

5 Conclusion

The structure of the network is considered an appropriate way to observe the practice of organizational alliances, such as collaborative activities among research groups with incubators and firms (incubated or spin-offs).

In the interviews applied, a low interaction level among the network´s actors was found.

Of the total of 186 research groups interviewed, only 16 interact with the incubators and only two interact with incubators and spin-off companies. No group reported interaction with the incubated companies.

One could mention, for example, the CTC, whose research groups interact the most with the incubators. This probably is due to the academic ties shown in Table 2, since all four of the UERJ incubators are academically linked to the Academic Units comprising this Sectorial Center.

It should be noted that these results obey a timeline (2009-2011) and that the interviews encompass a significant sample of the UERJ research groups, but not its entirety.

It should also be emphasized that the interviews were conducted with the leaders and/or deputy leaders of the groups from the sample and not with the other members of the research groups.

The most prominent areas of knowledge in the connections of the nodes with the incubators are: Exact and Earth Sciences (7), Human Sciences (4), and Engineering (3), whereas the spin-off companies only interact with one group in the field of Engineering and one Applied Social Sciences group.

When analyzed from the viewpoint of the Sectorial Centers, the Center for Technology and Sciences - CTC and the Biomedical Center - CBI are the leaders, with the CTC interacting with 11 incubators and the CBI with four.

With regard to the academic units, the College of Engineering - FEN has four research groups interacting with incubators and the Institute of Philosophy and Human Sciences - IFCH has three.
Based on these three analysis sets, we conclude there is a tendency for the research groups with academically linked incubators to be ahead of the other areas regarding the issue of technological entrepreneurship and innovation.
To achieve a higher level of innovation and a greater number of incubated companies and spin-offs with more technology inserted into their business models, some efforts should be directed to technological entrepreneurship education as an elective subject. This would be universal but not conflicting with the workload expected in the educational projects of all of the UERJ courses. The establishment of Inter-, Trans- and Pluridisciplinary Councils in the incubators would be welcome as a means of dissemination of the actions related to technological innovation.
Because they are extension projects, the incubators could rely on the UERJ Individual Teacher Plan course load and, thereby, boost the impact of the knowledge produced in the university.
It can be inferred that the results for all of the research groups do not differ significantly from the above.

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