

Interaction between the University and Industry in the Aim to Build a Regional Environment for Innovation: A Survey about the Perception from Industry¹

André Ferreira

Fluminense Federal University, Brazil;
andre.ferreira10@gmail.com

Marcelo Amaral*

International Institute of Triple Helix, Spain and Fluminense Federal University, Brazil;
mgamaral@gmail.com

Pítias Teodoro

Fluminense Federal University, Brazil.
pitiasteodoro@yahoo.com.br

Maria Antonieta Leopoldi

Fluminense Federal University, Brazil.
leopoldi@uninet.com.br

* Corresponding author

Abstract: This work is part of a research study about the University-Industry-Government linkages in a region outside the metropolitan area of a fast economic developing country. The research question is how to turn a newly created University campus in an entrepreneurial university. The theoretical framework is the literature of regional development and Triple Helix approach. The objective is to comprehend the relationship between actors in the region. The case study is the new campus of Federal Fluminense University in the Region of Medium Paraiba River Valley, south of State of Rio de Janeiro, Brazil. The research was structured in two parts: a survey with the University's faculty staff and a survey with companies located in the region. It's possible to conclude that University has been low influence in the regional development until now.

Keywords: Innovation; University-Industry-Government linkages; Regional Development; Entrepreneurial University; Triple Helix; Brazil

1 Introduction

In the last years Brazil is experiencing an expansion of public universities, mainly outside metropolitan cities, to stimulate the regional economic development. The emergence of a knowledge based society demands a new kind of university, not only as a human resources supplier, but as a promoter of innovation and economic development (Etzkowitz, 2008). The challenge is how turn a regional university, which has low linkages with productive sector needs (MCT, 2002), in an entrepreneurial university, enlarging the mission from knowledge dissemination to their application in the benefit of society. The case study is the Campus of Volta Redonda (PUVR-UFF), part of Federal Fluminense University, the fifth biggest university of Brazilian public system. PUVR-UFF was created in May, 2004 in the expansion program from the Ministry of Education. In 2010 it has around 2,000 students in undergraduate (Engineering and Business Management Schools) and graduate courses (Master/PhD in Metallurgical Engineering and MBAs). PUVR-UFF has 111 members in the academic body, 73% with PhD. The campus is in the Region of Medium Paraiba River Valley (RMRPV), south of the State of Rio

¹ Authors would like to thank the Carlos Chagas Filho Foundation of Research Aid of the State of Rio de Janeiro (FAPERJ), the Vice Presidency of Graduate Programs, Research and Innovation of Fluminense Federal University (UFF/PROPPi) and the International Institute of Triple Helix (IITH) for the research support.

de Janeiro. A strategic region, in geographic and economic terms, because is situated among the two main Brazilian metropolis – Rio de Janeiro and São Paulo. Several heavy industries are situated there, as Volkswagen/MAN Trucks, Peugeot-Citroën, Saint Gobain, Votorantim, National Steel Company - CSN, GEFCO and Galvasud. Besides, the region hosts a large tissue of small and medium companies with metal-mechanical vocation in its thirteen municipalities summarizing 851.982 inhabitants and the highest GDP/per capita of the State.

The research question is how to turn a newly created University campus outside a metropolitan area in an entrepreneurial university, incorporating in the mission the transformation of knowledge created and accumulated in products, processes and services to society. The theoretical framework is the literature of regional development and Triple Helix approach (TH). The TH focus is the interaction between economic actors, modeled as University, Industry and Government spheres (UIG) spheres. The objective is to comprehend the relationship between UIG in a region outside metropolitan areas of fast economic developing country².

Based on this, the research focus is different from a traditional innovation system analyses. The case study is looking for signals of connections/relations among actors and spheres, not only based on the traditional inputs and outputs of science & technology (as R&D expenditures or patents). The idea is to map the flow of knowledge creation. The types of interaction; the barriers and opportunities; the beliefs of academy members and business men; and the role of institutions in the innovation process were studied. References to these traditional indicators are done but the objective is to comprehend the process dynamic and how improve it. To reach the target surveys were applied in each U-I sphere.

2 University-Industry Linkages: The second academic revolution in Brazil and the emergence of an entrepreneurial university oriented to the regional development

The Universities are in a cultural transformation playing a significant role in an emergent knowledge-based society. This transition process, called second academic revolution, which is the addition of an economic and social development role in the University mission, is occurring in many countries (Etzkowitz, 1994, 2001). In Brazil, it has an additional component: the public research universities (BPRUs) are a tool to spread knowledge, research and economic development to the countryside (Amaral and Silva Filho, 2008).

The TH thesis argues that the University after the second academic revolution is able or must be an entrepreneurial university and the basis of regional development.

“a research base with commercial potential, a tradition of generating start-ups, an entrepreneurial ethos on campus, policies for defining ownership of intellectual property, sharing profits and regulating conflicts of interest and participation in regional innovation strategy.

.....

Knowledge spillover from universities promotes regional development, through commercialization of research and provision of new firms, human resources and new ideas.” (Etzkowitz & Zhou, 2007).

The BPRUs were created between 1920s-1960s with a teaching mission. In the 1960s they started to incorporate research activities with graduate programs. Since the 1990s, the economic development model has emphasized managerial efficiency and innovation to improve the competitiveness of firms. A set of interaction activities were established, as technological services (tests, measurements, consultancies, information services), education services, joint research projects with companies, projects carried out by incubated ventures and jointed-projects with ‘junior’ companies – consulting firms organized by students with faculty staff coaching (Maculan & Mello, 2009).

² Triple Helix approach was proposed by Henry Etzkowitz & Loet Leydesdorff to explain the relationship between the economic actors. They modeled three spheres to represent knowledge creators (University or academy, public and private R&D centers, etc), knowledge users (Industry - companies that use knowledge to produce goods and services) and the regulation/stimulus process done by the Government and its policies and agencies. There are also several hybrid organizations as a resultant of TH linkages. The reference to UIG is a simplification of a complex and dynamic process. See more at <http://www.triplehelix8.org> or <http://triplehelix.ning.com>

As a consequence, technology based incubators, science parks and technology transfer offices (TTOs) were created in the BPRUs (Etzkowitz et al, 2005). Two types of technology transfer patterns emerged reflecting different levels of cooperation and involvement (Maculan & Mello, 2009):

- The knowledgeable participant, aware of the commercial potential of technology plays to translate the knowledge to Industry, and
- The seamless web, that articulates the integration of academic research carried.

An entrepreneurial university encompasses teaching, research and service for society, not in a linear process but in a constant retro-alimentation of trilateral cooperation. Academics plays role adding value in companies and this learning process improve education quality and research focus. It's a continuous and fundamental process of acquiring, packing, dissemination and creating knowledge.

There's a wide literature about innovation and local/regional development, as Piore & Sabel (1984), Saxenian (1996; 2007), Storper (1997) and Cooke (2006; 2007), analyzing the types of interaction, incentives, barriers and recent performance. This idea is also the core of TH approach, originally designed in the high-tech technology transfer process (Etzkowitz, 2008). The TH of University-Industry-Government linkages can be also a metaphor to analyze the economic development of regions (Etzkowitz & Leydesdorf, 1996). From the literature three relevant points were identified:

- The knowledge based economy cannot be limited to the high-tech sectors (as microelectronic, communication, pharmaceutical and software), in the medium and low-tech sectors (food, raw materials or textile) the learning and innovation are also significant and the sources of knowledge are many times along the value chain (Cooke, 2007);
- The concept that Universities plays a central role in the economic development is useful in the modernization of low-tech companies (Etzkowitz & Leydesdorf, 2000);
- The local context has importance as a space where the collective identity is produced and reproduced, the mutual trust is reinforced and effective and flexible networks of economic and cognitive relationships supports the creation and diffusion of knowledge (Cooke, 2007; Saxenian, 2007).

In the Brazilian case, most part of the regional economic development activities is organization, decodification and diffusion of knowledge to modernize the productive process of small and medium companies. The Brazilian experience in the last ten years joined the concept of entrepreneurial university with the policy of regional economic development (Etzkowitz et al, 2005; Amaral et al, 2009).

In the low-tech sectors the UI linkages are less frequent and, in general, oriented to solve current problems and develop new products (Cooke, 2007). Brazilian companies at low-tech sectors haven't demand for the state of art technologies. At many cases access information/knowledge to improve production standards are more important to sustain competitiveness (Tigre, 2007; Yusuf, 2007). The Ministry of Science and Technology recognize that Brazil cannot underestimate the effects to national competitiveness from incremental innovations (MCT, 2002). Many times, in developing countries, science and technology capacities are used to identify and select opportunities generated abroad. The role of a national innovation system in the periphery is to follow the international technological flows (Albuquerque, 2009).

An increase in complexity of levels of organizational infrastructure is concomitant with the devolution of power from the national level and creation of new regional entities. This transformation includes efforts to incentive UIG actors to undertake joint innovation projects and to enhance clusters by encouraging a broader set of Local Productive Arrangements.

“Encouraging a meta-innovation process, activating areas of society that had been distant from innovation, allows the triple helix model to be realized in developing countries where it had been a normative rather than an analytic concept. The process is more complex than simple organization and technology transfer. The same organizational mechanism can play a completely different role in innovation, depending upon the actor(s) that promote its introduction and the context into which it is introduced. The incubator was adapted to Brazilian circumstances as new actors entered onto the incubator scene and adapted the mechanism to realize their objectives.” (Etzkowitz et al, 2005).

3 The Surveys: One Target, Two Perspectives

The research was structured in two stages. The first one executed was a survey with the University sphere (PUVR-UFF) to investigate the role of University in the local development (partially published in Ferreira et al, 2009). In the second stage, a survey was conducted with companies located in the region (Industry sphere). The comments of each survey were done in the respective item. A third section with analyses will be also presented, to confront the two perspectives.

Survey one: The academic body viewpoint

The research identified the academic body viewpoint about the University's role for the creation of technology and innovation to the regional development. The key points collected were:

- The types of interaction between University research groups and Industry, as training, technical consulting, development of prototypes, equipments, systems or software, basic and/or applied scientific research, technology transfer (based on National Council of Scientific and Technological Development – CNPq database);
- The barriers in the U-I interaction, as cultural differences, different goals, the lack of incentives within the Universities, administrative procedures and red tape, the lack of experience in deal with industry, rewarding structure and amount of available time of the researches (Rapini, 2006).

The survey was done with a printed questionnaire distributed to the faculty staff and compiled between February and March of 2009. Some additional interviews were done to complement information. The data collection was conducted with 95 professors and, from this amount, 80 questionnaires were fully completed and useful to be analyzed. Based on the population homogeneity it's possible to assume that this sample of 80 will give real information for all 111 members of the faculty staff.

The respondents are 76% male and have forty two years old, in average. However, 74% of the respondents have less than this age. The amount of years in the University is around six years, in average, and 73% are PhD or has postdoctoral studies. Part of faculty staff members has less than three years in PUVR-UFF. This isn't enough time to develop high-level U-I interactions.

About the interaction with companies 46% answered positively. It's a meaningful number, but as PUVR-UFF is composed by two schools where companies are central elements in the study perspective (Engineering and Business Management) the expectation was higher. It's possible to conclude that PUVR-UFF has an intermediate interaction level. What must be emphasized is 91% of the 80 researchers agreed that part of the work's charge in the BPRUs can be dedicated to the U-I linkages. So, It's positive because shows a low cultural barrier and indicates that cooperation can increase.

A relevant question is about the type of interaction. The U-I linkage in RMRPV is in a low-medium level, based in the transmission of existent knowledge by training and consulting, with 53% of activities. The R&D activities have less relevance, only 22% of activities. It's not new due to the historic evolution of engineering school, created in the 60's to train workforce.

Analyzing the University propensity to interact with Industry, 47% of the researches pointed the absence of incentives and work conditions as main barriers. The absence of clear rules and ideological beliefs are less relevant. From the viewpoint of barriers from the faculty staff, the researchers pointed the low level of knowledge about the U-I interaction mechanisms. The researchers also agreed that more time should be dedicated to interaction/cooperation activity, but the lack of time didn't appear as a relevant barrier.

From the viewpoint of barriers addressed by companies, the researchers supposed the predominance of low level of knowledge about benefits that could be profited by the interaction/cooperation. This low level is directly related with the lack of interest by the companies and an absence of an active action from University to be recognized. It could characterize a cultural distance between U-I.

Other fact identified in the survey that shows a potential of improvement is the low level of knowledge about laws and mechanisms to finance innovation and U-I linkages in Brazil. In the survey 71% of researches don't know or when knows don't use these instruments. In the case of Good Law the situation

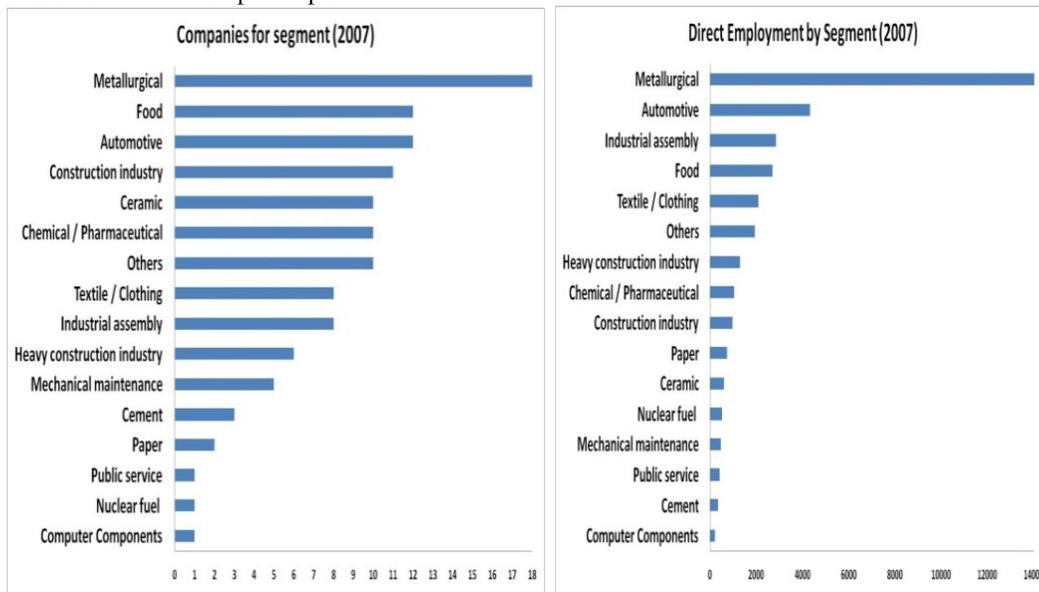
is worst, probably because it's the newer one, sanctioned in 2006. Just in case of Sectorial Funds the situation is a little better. The Universities applies a lot of infra-structure and research projects to the calls based on this set of funds ³.

At this point there's not enough information about the utility of research executed to the industry. It's complex to evaluate this question but some data are being collected to allow this process. The research focus, oriented to local questions, is a key point to improve U-I linkages.

Survey two: the Industry viewpoint

Based on the database from the Industrial Association of Rio de Janeiro (FIRJAN, 2007) were selected a sample of 118 RMRPV companies with at least 50 employees. The predominant sectors were metallurgical, automotive and food (see Chart 1). We can point also a nuclear fuel and 3 pharmaceutical companies. From the sample twenty are multinational companies (12 from Europe, 7 from USA and 1 from Asia) and thirty one companies are exporters.

Chart 1: RMRPV companies profile



The second survey was an individual interview with a sample of eighteen RMPV companies. It was a non-probabilistic sample selected based on the economic relevance. All economic sectors identified in the region have at least 1 company. However, the predominant sectors were metallurgical and automotive. A semi-structured guide was used in the interviews, with 3 parts:

- General information - segment of activity, gross and net revenues, employees, etc (summarized at table 1);
- Innovation activities - based on the indicators from the Brazilian survey of innovation – PINTEC led by the National Institute of Geography and Statistics – IBGE (IBGE, 2005); and
- University-industry linkages - if the company executed any kind of cooperation with University in the last three years and what is the perception about difficulties and facilities in this process to use external source of knowledge.

³ Sectorial Funds is a set of 15 governmental funds created since 1998 that finances R&D activities (projects and infra-structure). The Good Law is a package of economic regulations to create subsidies and stimulus to the companies invests in R&D. The Good Law is a consequence of the Innovation Law from 2004.

Table 1: Profile of Researched Companies

Segment	Capital Source	City	Export Company?	Type	Workforce		Sales 2009 (R\$)
					Direct	Indirect	
Paper	USA	Pirai	Yes	Private Capital	550	102	129.600,
Automotive	Europe	Resende	Yes	Private Capital	588	2536	5.800.000,
Metallurgical	Brazil	Barra do Pirai	Yes	Private Capital	294	67	396.653,
Nuclear fuel	Brazil	Resende	Yes	State-owned	933	400	292.976,
Food	Brazil	Volta Redonda	No	Private Capital	78	-	NI
Food	Brazil	Porto Real	No	Private Capital	1005	15	260.000,
Metallurgical	Europe	Barra Mansa	Yes	Private Capital	1261	500	NI
Metallurgical	Brazil	Volta Redonda	Yes	Private Capital	8467	9220	10.504.554,
Metallurgical	Brazil	Barra Mansa	Yes	Private Capital	102	1	NI
Pharmaceutical	Europe	Resende	Yes	Private Capital	220	80	NI
Sanitation	Brazil	Volta Redonda	No	Public Service	405	37	33.519,
Automotive	Brazil	Resende	Yes	Private Capital	180	-	NI
Automotive	Europe	Porto Real	Yes	Private Capital	670	80	NI
Computer Components	Brazil	Pirai	No	Private Capital	90	100	NI
Metallurgical	Brazil	Barra Mansa	Yes	Private Capital	1363	791	NI
Cement	Brazil	Volta Redonda	No	Private Capital	29	21	NI
Automotive	Europe	Itatiaia	Yes	Private Capital	830	60	NI
Metallurgical	Brazil	Barra do Pirai	Yes	Private Capital	1658	50	NI
Total					18.723	14.060	17.417.302,00

A new product is one whose fundamental characteristics differ from the all of old products manufactured by the company. At this level innovation is to the company, not necessarily to the market or in the sector (OCDE, 1997). Based on this concept of product innovation the survey checked which kinds of innovations were done in the RMRPV companies. From respondent of 18 companies the survey found:

- 15 incremental innovations at products portfolio;
- 7 new products to the national market (however existent at international level);
- 6 new products in the company's portfolio (however existent at national level);
- 3 new products in the international market; and
- 2 companies had two or more kind of product innovation.

About the responsible for the development:

- 6 companies answered the own company autonomously,
- 4 companies answered other company from the same group,
- 2 companies answered the own company in cooperation (with other companies or university); and
- 2 companies answered other companies or universities.

About the process innovation, 16 of the respondents companies informed that executed innovations. It was identified:

- 9 occurrences related to innovations in equipments, software and techniques to support the manufacture process (as performance measurement, quality control and certification, and improvement of an ERP system);
- 8 occurrences about innovation on fabrication methods (or assemblage), with relevance to a Lean system implementation in two companies; and
- 5 occurrences related to innovations in the logistics systems.

In terms of relevance, only 1 company implemented a process innovation in world level. Other 7 companies implemented process innovation new to the company but already in use by other companies in the national market. For 4 companies the process innovation implemented is new in the national market but existent in the world level.

These process innovations showed a strong collaboration with local actors. In this way, 7 companies executed by themselves independently, 5 answered that the process innovation was realized mainly by other companies or universities; 2 companies executed by cooperation with other companies or universities. There's no development coming from other companies from the same group.

When asked about how they finance innovation activities, the majority of the companies (11) finances at least 80% the investment in innovation with own resources. They informed that don't know about funding opportunities, most part of them offered by the government. In the same way, the companies in the survey don't use the benefits of laws to implement innovations. They answered that knows the possibilities of U-I interaction but they don't know the legal mechanisms to finance this kind of investment or to obtain aids and subsidies. Table 2 summarizes the research funds origin.

Table 2: Funding Sources to Innovate

Types of funding sources to innovate		No of companies
Bank loans		-
Private	Own Capital	11
	Venture Capital	-
Laws (incentives, subsidies and grants)	Tax incentive Law of Informatics (Law 10.664, Law 11.077)	3
	Tax incentive to R&D and innovation (Law nº 8.661 and Cap.III Law nº 11.196)	2
	Financing to buy machines and equipments in innovation projects	1
	Financing to R&D projects in partnership with University or research institutes	1
	Subvention to R&D and professional insertion of researches (Law nº 10.973 e Art. 21 Law nº 11.196)	-
	Grants to the researches in companies	-
Total		18

Based on the survey 13 from 18 companies executed activities classified in the U-I types. These 13 companies registered 27 occurrences of interaction, predominantly activities with low-tech intensity, as tests and training (13 occurrences - 48%). Activities with high technological intensity, as R&D and product/process development, had 8 occurrences (30%). Activities classified as middle level in the intensity of technologic aggregation, as consulting (technical and managerial) had 5 occurrences (18%). There was only 1 case of interaction using financing mechanisms to support R&D. The survey didn't found several types of interaction as: developing of companies/projects in incubators, software developing, unpaid license for academics, equipments developing and a formal process of technology transfer from University to Industry (like patent licensing).

When asked about the initiative to develop an interaction, 80% of companies said that it was a company initiative. Most part of them has internal R&D competencies (not necessary organized in a R&D department of center). In the sample there's no case of interaction initiated 100% from University. Companies interviewed in the survey cited 22 Universities as partners. The most cited, with 3 occurrences each, were University of São Paulo (USP), Pontifical Catholic University of Rio de Janeiro (PUC-Rio) and University of Campinas (Unicamp). Federal University of Rio de Janeiro (UFRJ) and

Federal University of São Carlos (UFSCar) appear with 2 occurrences each. PUVR-UFF was cited by 2 companies and the interaction was laboratorial tests.

The interactions were managed by the University Foundations (8 occurrences), through services contracts, and formal agreements (3 occurrences). There was 1 situation of formal agreement directly with the professor and other occurrence not officially formalized.

When asked to choose in a list the 3 most relevant barriers the respondents pointed at all 10 problems as: lack of knowledge about possible contributions from University and the response time (6 citations each); absence of appropriate interlocutors in the Universities and R&D not applicable to the company's activities (4 citations each). These results reinforce the importance of improvement in the University articulation capacity. A special and urgent attention must be given to the relationship with the Industry to disseminate University competencies and how to access these assets. This is the way to make the available knowledge contribute to the innovation process.

Two surveys: confronting perspectives

The BPRUs are organized in a tripod mission of teaching, research and extension (or outreach). However, in general, there's not an administrative staff and processes to support all the activities which affects negatively the response time to the different society demands. Inside the BPRUs these 3 activities goes separately, in autonomous departments with own characteristics. This structure was adequate to deal with purposes defined at other times, not related with the Industry linkage. Nowadays, it's clear (in the opinion from both sides U-I) the absence of an interlocutor that knows and uses the appropriate languages to translate the different languages and interest. The result is a set of incomplete interactions with the society, what's dangerous to the University recognition as a key element of modern society. However, this common actor can be an impossible dream, because the complexity of the environment is so great that one interaction actor cannot concentrate all the interaction. Maybe the right way is to define a set of clear rules to steer the relationships.

Not only the creation of a department, as a nucleus of technology innovation (NIT), forced by the Brazilian Innovation Law from 2004, will solve the question. The University must have an active role. Workshops, technical visits, fair trades and congress are examples of activities to narrow U-I. But probably the best way is to attract companies to the campus, not only in incubation processes but in activities that allow the exchange of experiences. This will enable the share of quotidian problems and orient the search for efficient solutions. This experience will also improve teaching standards with real examples from Industry. In sum, BPRUs are predominantly involved in teaching and self-oriented research activities. Data from PINTEC shows, with some exceptions, similar behavior in whole country (IBGE, 2005). The second academic revolution is a process to be built.

In the case of PUVR-UFF this research identified a passive or reactive role in the interaction process. The behavior of professors and research groups is contradictory when they inform that want to cooperate with industries however unknown interaction laws and mechanisms. If they really want to cooperate they are capable to find and learn these mechanisms. However, it's possible to comprehend this nonsense by the absence of an official/formal structure in PUVR-UFF to deal with innovation management. Different from UFF's campi at Niterói city, which has incubators, technology transfer office and an Agency of Innovation to coordinate the institutional policy. But, as pointed above, not only the structure (technology commercialization or external relations area) will solve the all questions related. It's fundamental a change of mentality, which is not a problem in this case, and a action.

The low knowledge about laws and mechanisms to promote U-I linkages are similar from both viewpoints. It's just an indicator of the low level of interaction. There's not data series available to analyze the evolution of U-I linkages along time, but based on interviews and newer research projects and groups (4 of them created in the last 3 years) allow a supposition that there's an increasing tendency of high-level interaction. It's a mid-term tendency dependent of adequate work conditions (as space, administrative staff, laboratories and equipments).

From the Industry sphere, RMRPV have a typical industrial configuration of least developed countries, efficient but not dynamic. The company hasn't interaction with the University in several categories as:

developing of incubated ventures/projects, software developing, hiring researches (unpaid license of BPRUs staff), equipments developing and technology transfer. These characteristics require special efforts from all actors from TH spheres. The policies from developed economies many times cannot be used as example and/or inspiration. The trade-off between innovation (and development of new products and services in a global level) and modernization (new products and services in a local level and/or manufacturing in a global level) are configured and difficult to be solved. In a first moment the strengthen of U-I linkage is able to develop less intensive activities, but learning processes, as learning by doing and learning by cooperating, can improve the competencies to build high-tech and dynamic U-I linkages.

In the few U-I cooperation activities identified in the case studied, the cited Universities (out of RMVRP area) are the most recognized in Brazil in term of academic excellence and reference in many knowledge fields. This concentration can result to the country in a distinction between a small group of University leaders versus a big list of followers, what could be bad to the development of new centers of excellence and to spread of the knowledge creation process in the countryside. It's a paradox to the policymakers, because at the same time they have to concentrate resources in the best research group and disperse the knowledge creation process. It affects also the UI relationship because will concentrate the possibilities of linkages creation in few University actors. It's also a key question to the PUVR-UFF how to migrate from U-followers group to the U-leaders list.

A methodological question to be pointed in the interpretation of TH approach is related to the absence of Government analyses on this paper. The research focused only in the U-I linkages, assuming that the Government has an active posture to incentive the interaction. This seems a different configuration of TH. It's not the mode I neither mode III (Etzkowitz & Leydesdorff, 1997). It's much more like U(+g)–I(+g).

5 - Final remarks

This work is part of a research study in course about the UIG linkages in a region outside the metropolitan area of a fast economic developing country. In the case of PUVR-UFF it's possible to conclude that University has been low influence in the development of the RMRPV until now. There's no information about any patent application, knowledge/technology transferred to the industry or process/product improvement. Maybe in a deeper research on the training and services contracts signed with the Universities more relevant activities could be found.

There's no any reason to say that PUVR-UFF is or is in a way to be an entrepreneurial university. In the main *campi* of UFF this process is in progress (Amaral & Silva Filho, 2008). Maybe PUVR-UFF must be more involved the activities developed in the UFF's headquarter and replicate this movement in the RMVRP. In other direction maybe PUVR-UFF has to find an own way to deal with industry interaction. According the research, academic culture or ideological barrier won't affect this process, probably because part of the faculty staff comes from previous industry work experience.

The expectation is to consolidate research groups embedded with entrepreneurial spirit – the quasi-firms – and so the second academic revolution will arrive at PUVR-UFF. There are promising ideas and strategies with potential to leverage the contribution of University to the regional economic development, not only with regard to the University programs and projects managers but also to the models of U-I relationship already tested at UFF and other Brazilian universities. The question is how long this maturity process will take. Any discontinuity on the process can turn PUVR-UFF in a teaching school with irrelevant research and decreasing fund raising as a consequence of the low degree of interaction with Industry.

6 - References

Albuquerque, Eduardo da Motta. "Scientific Infrastructure and Catching-Up Process: Notes about a Relationship Illustrated by Science and Technology Statistics." *Revista Brasileira de Economia* 55, Sept./Dec. 2001, pp.545-566.

- Amaral, Marcelo and Sérgio Mecena da Silva Filho. "An Entrepreneurship University under Open Innovation and Triple Helix Influences – The design of a technology transfer model and the search for a useful and sustainable innovation framework for universities in underdeveloped and developing countries: A Brazilian Study." Proceedings of 19th ISPIM Conference, Tours, June 15-18, 2008.
- Cooke, Philip, Carla de Laurentins, Franz Tödtling, and Michaela Tripl. *Regional Knowledge Economies: Markets, Clusters and Innovation*. Cheltenham: Edward Elgar, 2007.
- Cooke, Philip et al. *Constructing Regional Advantage, Principles, Perspectives, Policies*. Brussels: European Commission, 2006.
- Etzkowitz, Henry. *The Triple Helix: University-Industry-Government Innovation in Action*. New York: Routledge, 2008.
- Etzkowitz, Henry. "The Second Academic Revolution and the Rise of the Entrepreneurial University". *IEEE Technology and Society Magazine*, Summer 2001. pp. 18-29.
- Etzkowitz, Henry. "Academic-Industry Relations: A Sociological Paradigm for Economic Development" in: *Evolutionary Economics and Chaos Theory*, edited by Loet Leydesdorff and Van de Besselaar. London: Pinter, 1994.
- Etzkowitz, Henry and Chunyan Zhou. "Regional Innovation Initiator: The Entrepreneurial University". Theme paper of 6th Triple Helix Conference, SSRN Web site <http://www.nus.edu.sg/nec/TripleHelix6/>, accessed September 2009.
- Etzkowitz, Henry, José Manoel Carvalho de Mello, and Mariza Almeida. "Towards "Meta-Innovation" in Brazil: The Evolution of The Incubator and The Emergence of a Triple Helix." *Research Policy* 34, 2005, pp. 411–424.
- Etzkowitz, Henry, and Loet Leydesdorff. "The dynamics of innovation: from National Systems and "Mode 2" to a Triple Helix of university–industry–government relations". *Research Policy* 29, 2000, pp. 109–123.
- Etzkowitz, Henry, and Loet Leydesdorff. "The Triple Helix University-Industry-Government Relations: A Laboratory for Knowledge Based Economic development. European Association". *Study Science and Technology Review* 14, n. 1, 1997, pp. 14-19.
- Ferreira, André et al. "The Insertion Of The Public University In The Process Of Innovation And Regional Development - A Case Study In Brazil". Proceedings of VII Triple Helix Conference, Glasgow, June 16-19, 2009.
- FIRJAN. *Catalog of Industries of the State of Rio de Janeiro*. Ed CD-ROM. Rio de Janeiro: FIRJAN, 2007.
- IBGE. *Pesquisa Industrial de Inovação Tecnológica 2005*. Ministério do Planejamento, Orçamento e Gestão. Instituto Brasileiro de Geografia e Estatística - IBGE. SSRN Web site <http://www.pintec.ibge.gov.br/>. Accessed September 2009 (in Portuguese).
- Maculan, Anne-Marie, and José Manoel Carvalho de Mello. "University start-ups for breaking lock-ins of the Brazilian economy". *Science and Public Policy* 36, march 2009, pp 109–114.
- Ministério da Ciência e Tecnologia. *Livro Branco - Ciência, Tecnologia e Inovação*. Brasília: MCT, 2002 (in Portuguese).
- OECD. *Oslo Manual – A Proposed guidelines for collecting and interpreting*. Bruxelas: OECD Publishing, 1997
- Piore, Michael J., and Charles F. Sabel. *The Second Industrial Divide: Possibilities for Prosperity*. New York: Basic Books, 1984.
- Rapini, Márcia Siqueira. "Interação Universidade-Empresa no Brasil: Evidências do Diretório dos Grupos de Pesquisa do CNPq". *Estudos Econômicos* 37, jan-mar 2007. pp. 211-233 (in Portuguese).

- Saxenian, AnnaLee. *The New Argonauts: Regional Advantage in a Global Economy*, Cambridge: Harvard University Press, 2007.
- Saxenian, AnnaLee. *Regional Advantage: Culture and Competition in Silicon Valley and Route 128*. Cambridge: Harvard University Press, 1996.
- Storper, Michael. *The Regional World – Territorial Development in a Global Economy*. New York: Guilford Press, 1997.
- Tigre, Paulo Bastos. *Gestão da Inovação: A Economia da Tecnologia no Brasil*. Rio de Janeiro: Campus, 2006 (in Portuguese).
- Yusuf, Shaid. “University-Industry Links – Policy Dimensions” in *How Universities Promote Economic Growth*, edited by Shaid Yusuf and Kaoru Nabeshima. Washington DC: World Bank, 2007.