Research Project: Interaction between universities and research institutes with industrial companies in Brazil – "Interaction point" case study: Materials and Metallurgy Engineering and Metallurgical Companies[*]

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Summary:

The purpose of this research is to investigate the relationships between Research Groups in the Materials and Metallurgical Engineering (scientific dimension) and industrial companies in the Metallurgical Sector (technological dimension) in Brazil.

From the theoretical approach of the "National System of Innovation", we intend to analyze the interactions between the Research Institutes and companies to identify the explanation Power accomplished by such elements as: a) area of knowledge, b) industrial sector of such companies, c) the technological demands from the industry, d) the public policies of incentives to the iterations, and e) the forming characteristic of such research groups, in establishing this relationship between universities, research institutes and the industry.

For such, it will be studied the iterations, identified in the CNPq Directory of Research Groups, among research groups in the area of Materials and Metallurgical Engineering and Matallurgical Companies.

The iteration methodological analysis is broken into four modules. Subject review, information survey in the CNPq Directory of Research Groups and other databases, results analysis of the research that will be undertaken, through the application of questionnaires, following models developed by the *Yale Survey* and *Carnegie Mellon Survey* and structured interviews with the personnel involved in R&D in the companies together with the research groups.

Introduction, Justifications and Objectives

In the last decades, the relationship between universities and research institutes and companies has been the subject of growing concern in the academicals research, as well, has also been the target of different public policies that intend to stimulate and

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strength the proximity between the scientific and technological dimensions in the economy, relating users and producers of innovation. Such interests and practices are based in the innovation perception as the product of multiples iterative processes between persons and economical institutions, that is, of his systemic character and in the conception that the innovation production and diffusion are *sine qua non* conditions to the economic development.

From the theoretical point of view, the union of the systemic approach, the perception about the centrality of the innovation in determining the competitiveness and, consequently, the productive and techno-scientific structures of different countries, would originate, in the mid 80, the concepts of National System of Innovation (NSI). Such concept refers to a set of institutions (firms and their R&D departments, universities, research institutes, government agencies, development agencies, schools etc.) linked to the research activities, teaching, production, creativity, appropriation and diffusion of innovation in the national territory (Freeman, 1982; Lundvall, 1985).

In your many facets, the NSI approach created complementary approaches such as the "sectoral systems", "local systems" or "technological systems" that contributed for a clearer understanding about the innovative process. In all of the above, the interaction of industries (those responsible for innovation) with universities (responsible for the qualification of human resources and realization of basic research and its application) and the research institutes (responsible for the basic research and its application) occupy a central role and develop stimulus mechanisms that intensify these interactions representing a broadening of the production capacity of knowledge, promoting a innovative potential in the society.

Consequently, identifying the patterns of interaction, the impacts of scientific and technological knowledge produced in the universities and research institutes and the evaluation done by the industries regarding that set of knowledge, specifying the forms of transfer and the density of the flow of knowledge between the components of the SNI, determining the different roles to be played by those involved and evaluating the efficiency of the government policies related to the promotion of interaction, has been the objective of several studies developed in many countries.

Studies such as these, which, regardless of their different instruments and objective of analysis, point out the impossibility of obtaining single answers to the proposed inquirers, this data that the involved areas of knowledge and the active sectors of the industry, as well as, the historic path of NSI's, your degree of maturity and the general institutional structure, are determining factors of standard and the liveliness of interaction (Klevorick et al, 1995; Cohen et al, 2002; Meyer-Krahmer e Schmoch, 1998; Mowery e Sampat, 2005; Dosi et al, 2005; D`Este e Patel, 2007).

In spite of the relevance of such theme and the studies already developed, the knowledge about relations between companies and universities in Brazil is still germinating. From this very point sprouts the problem of this research: investigating

the pattern of relationships between the technological and scientific dimensions of the Brazilian NSI.

Accordingly, coming forth from a basic hypothesis, already pointed out in international studies, that there are national and sectoral specificities in the definition of characteristics and results obtained due to interactions between universities and companies, the objective of this research is to reveal the different dimensions of interactions between Research Groups belonging to the Metallurgical Engineering and those of Materials and Metallurgical Companies (EngMM-ME) in Brazil. The choice of such economic sector and area of knowledge came forth due to its high interactive results. According to the data of 2004 census from the CNPq Directory of Research Groups, the intertwinement EngMM-MM has a greater density of interaction present in the base of its data (number of companies about the groups of research with relationship, 42/43)[1].

In order to reach the general objective, four objectives were specified, being the following: 1) mapping the interaction and the flow of knowledge within them; 2) find out the characteristics of the research groups and interactive companies; 3) identify the opinions of the representatives of the research groups and companies regarding the interactions; 4) evaluate the impacts of the interactions.

As fundamental theoretical and methodological references were adopted by the Neo-Schumpeterian Evolutionary Theory and the approach of the Innovation Systems whose primary thinkers were already identified are: Richard R. Nelson, Sidney G. Winter, Bengt-Ake Lundvall, Christopher Freeman, David C. Mowery, Wesley W. Cohen, Keith Pavitt, Charles Edquist, Alvin K. Klevorick e Giovanni Dosi.

As reference for field research it was taken into consideration the Yale Survey (realized in the 80`s) and Carnegie Mellon Survey[2] (during the 90`s) and exposed in Klevorick et al. (1995) and Cohen et al.(2002) respectively.

Methodology

The research can be divided into four distinct modules, as: review of literature, characterization of companies and research groups, analysis of questionnaires answered by the leaders of research groups and coordinators of R&D of the companies, personal interviews with groups of research and representatives of R&D of companies.

[1] Regarding the criteria of evaluation of the interactivity and the model of analysis of the information contained in the Council of the Groups of Research of CNPq, see: Rapini and Righi, 2006.

[2] The survey to be carried out by the team of the Thematic Project Fapesp 2006/58878-8, to which this research is connected, has as basic references the Yale Survey and the Carnegie Mellon Survey whose questionnaires were provided and adapted to the specification of the Brazilian NSI.

Considering the specificities of the object of analysis of this research, the interactions between universities and research institutes in the area o metallurgical engineering and materials with metallurgical industries of Brazil, were defined five axis for the bibliographical research: 1) Neo-Schumpeterian Evolutionary Theory; 2) National and Sectoral Systems of Innovation; 3) Learning Processes and Knowledge Transfer; 4) Historical and Technological path of EngMM-EM in Brazil; 5) Surveys about the National System or Sectoral Innovation and Interaction University-Company.

The second module of the research aims at identifying the sectoral profile of the metallurgical industry and of the courses of metallurgical engineering and of materials in Brazil. To do so, there will be used information of several bases of pre-existing data such as: RAIS – Annual Relation of Social Information, IBGE - PIA – Annual Industrial Survey, IBGE - PINTEC – Industrial Research of Technological Innovation and Ministry of the Development, Industry and Commerce and Central Bank of Brazil (regarding the competitive performance of the sector). The data about teaching and research in the metallurgical engineering area and of materials will be obtained in the databases made available by the Ministry of Education and organs connected to him (INEP, SESU and EDUDATA), CNPq – National Council of Scientific and Technological Development and CAPES – Coordination of Improvement of People of the Superior Level.

In the third module the applied questionnaires will be analyzed to the leaders of the groups and leaders of the R&D in the companies, by the Team of the Project Interactions of Universities / Institutions of Research with Industrial Companies in Brazil in order to identify the standards and results of these interactions, as well as, the opinion the participants have about the interactions.

Finally, the fourth module consists of the delineation of the interactive and innovative profile of the Groups of Research and of the Metallurgical Companies constituent of the " points of interaction ", through the information survey in the database of the CNPq Council of the Groups of Research and structured interviews with the people in charge by the activities of R&D of the companies and with the members of the Groups of Research to be selected.

The combination of strategies of case study and research in multiple database will make possible an accurate identification about the competitive and innovative behavior of the metallurgical companies as well as of the sectoral innovation system.

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