Science Domains in the Federal University of Rio de Janeiro: Analysis and Visualization of Knowledge and Skills (2000-2008)

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Introduction

The understanding of scientific performance, in any level of analysis, must consider the socio-economic and historical context of the society in which researchers and their institutions are inserted (Spinak, 2001). This holistic view of scientific activity has been used by several authors in recent years, mainly in works dedicated to the study of scientific domains, as the one proposed by Hjørland & Albrechtsen (1995). The authors define domains as "thought or discourse communities, which are parts of society's division of labor" (Hjørland & Albrechtsen, 1995, p. 400).

In scientific domains, either institutional or sectorial, such as universities, communities share, among other aspects, a single political, social and cultural context. Additionally to the universality of basic forms of thought and disciplinary practices, this causes each institution to set its own style of doing science because of the peculiarities of scientific practice conditioned by the context in which it develops (Vessuri, 1995)

In Brazil, most of the scientific production is developed in public universities (Leta et al, 2006), especially in graduate programs. Much of these institutions are characterized by presenting a multidisciplinary profile and by being fragmented in colleges, institutes and departments. The thematic diversity and structural complexity of these institutions make the identification of their academic profiles and standards not an easy task.

Starting from the assumption that the scientific output of a university would be represented by the set of scientific production it generates, its profile and the scientific standards would be determined by scientific standards and profile of each of the specific institutional domains where research activities are developed. In this context, the study of scientific literature from the point of view of domains becomes relevant. This approach can allow each university to know in depth the scientific potential of its constituent units, generating reliable and objective data that can be used to support its own decision making processes.

Nevertheless, this type of study requires comprehensive and updated database, preferably with public access and apt to identify, over time, the institution's knowledge and skills.

The Federal University of Rio de Janeiro (UFRJ) is one of the largest public universities in Brazil. Since 1998, it has developed a comprehensive database, in which its organizational structure is represented and where teaching involvement and research results are registered (Figueiredo, 2006). This database is called EspaçoSIGMA.UFRJ. Although it has not been extensively used for investigation proposals, we believe that inferences about scientific performance of UFRJ from the perspective of its domains

may provide some breakthrough and distinctive institutional features.

Objectives

The intended study aims to investigate the institutional domains at UFRJ in order to identify (1) networks of scientific competence of the institution and (2) the trajectories of its scientific community.

Methodology

Information registered in EspaçoSIGMA.UFRJ in the period 2000-2008 will be main source of data for the study. The institutional domain of UFRJ will be examined under two dimensions: (1) the quantitative and qualitative dimension of intellectual production and (2) the structural dimension and networks. Some quantitative techniques, such as bibliometric analysis, and qualitative techniques, such as records and interviews, will be used for the first dimension. A network analysis, using statistical programs and considering data on co-authorship, will be carried out for the second dimension.

The main methodological steps are presented in Table 1.

→	→	→	→	
Extracting data	Defining the unit of analysis	Selecting the main variables	Distributing information	Representing results
SEARCHES	LEVEL	VALUES/ FREQUENCIES	SPACE REDUCTION	INTERACTION
Sigma.UFRJ Sigma.UFRJ .Foco	Centers (CCS, CT, CCMN, Graduate Programs)	Attributes (Knowledge and Skills): Citation Co-citation Co-authorship Clusters	Cluster analysis Factorial analysis Multi-dimensional scaling (MDS) Network analysis	Visualization of domain *Software Pajek*

Table 1: Main steps for the analysis and visualization of UFRJ's domains.

Results

Preliminary results of the analysis of network show that it is possible to group definitive domains in the case initially the intellectual production of the Federal University of Rio de Janeiro classified in 5

great areas of the knowledge (Figure 1): Exact and Earth Sciences (cadetblue, 292 papers), Biological Sciences (cornflowerblue, 489 papers), Engineering, (green, 365 papers), Health Sciences (red, 560 papers), Humanities (yellow, 314 papers).
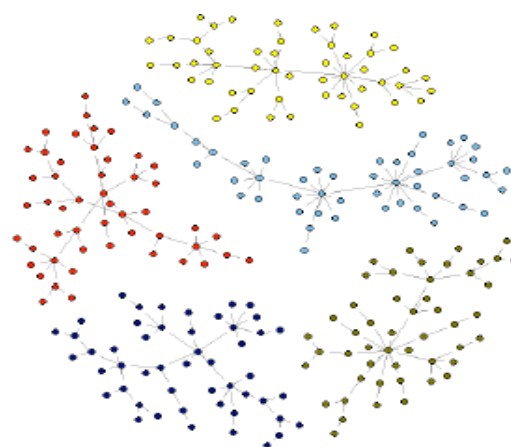

Figure 1: Network based on co-authorship Intellectual production of the UFRJ classified in 5 great areas of the knowledge. Each color refers to great areas of the knowledge. (2007).

Nevertheless, when the level of interaction between two of these great areas of the knowledge (biological sciences and health sciences) is investigated we can note external links, which may represent another level of domain (Figure 2).
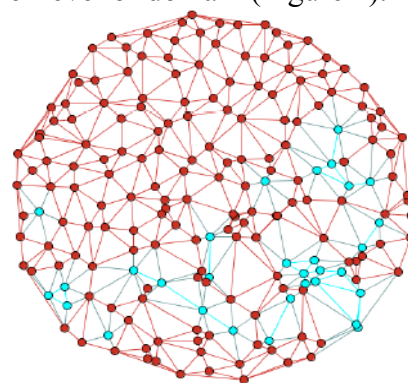

Figure 2: Network based on co-authorship among two of the five 5 great areas of the knowledge. Each color refers to great areas of the knowledge.

Discussion

Studies on institutional domains can provide inputs to improve the quality of

management, monitoring and evaluation of activities performed by any institution.

In this case, we are investigating the domains of one of the most prestigious and large university in Brazil. The set of information that comes out of this study may contribute to the identification of scientific profiles of the university, pointing out its capabilities, its fields of excellence and research lines, making it possible to verify the level reached by each of this aspect and to adjust institutional policies.

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