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The contemporary world is structured by means of social and economic relationships, where there is not much room for isolated or particular actions. Therefore, the term “collaborative networks” has been broadly used to describe a system which has agents who try to create synergy in a competitive or non competitive environment. The purpose of this article is to present Brazilian initiatives related to collaborative networks, such as the main projects, researching groups and governmental action programs. It gives special emphasis to the collaborative research network denominated “Institute Factory of Millennium”. Topics requiring additional research are also identified.

1. INTRODUCTION

Collaboration is not a recent term. In his book (Williamson, 1975), Williamson already maintained that manufacturing companies could prosper by establishing external partnerships when purchasing goods or services, instead of producing internally. This paradigm was scattered even more through ‘outsourcing’, now called ‘lean organization’, where managers reduce the organization spheres by passing them to outsourcing companies, thereby seeking to eliminate inefficient services.

In this context, a collaborative network might be considered an alliance constituted by several entities (e.g.: universities, companies, governmental organs and people) geographically distributed and heterogeneous, regarding their operational, cultural environments, social capital, but which perceives in collaborative work a form to increase revenue and competitiveness, as well as to share resources and acquaintances (Camarinha-Matos & Afsarmanesh, 2008).

Addressed as a class of collaborative network, research networks are also known as teaching, research and development laboratories, where research groups are formed by multidisciplinary teams chosen for essential concerns and competences.

The purpose of this article is to present a study about initiatives that Brazil has undertaken, related to collaborative networks. The article begins with an introduction about collaborative networks and their dimensions. Next, there is a review about networks of collaborative research, denominating them according to their relationship level. A study about Brazil’s initiatives in collaborative networks is presented. Special emphasis is given to the collaborative research network denominated Institute Factory of Millennium: a project which is part of the

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“Millennium Institutes Program”, supported by the Ministry of Science and Technology. It is a national scope network which associates 800 researchers in 39 research teams, allocated in 32 colleges and universities.

The following topic discusses the term collaborative research networks and shows the main related classes.

2. COLLABORATIVE RESEARCH NETWORKS

2.1 Introduction

In the last years, an increasing number of research projects have been created and made possible under the forms of collaboration, where different institutions assume specific tasks with the purpose of reaching a determined result.

In this context, the research networks (Weisz & Rocco, 1996) have been typically mentioned as “unphysical” centers, which rely on communications means to promote the interaction of members with complementary qualifications. A network usually counts on multiple sponsors and, frequently, has its duration limited to the time needed for achieving their goals.

2.2 Classes of research networks

Next, the main classes of research networks presented in literature are highlighted.

- *Distributed networks*: is a subtle linking of different research and teaching organizations, related among each other, without the presence of a central agent (Figure 1). In this type of network, each organization member participates and conducts a specific area of their competence. Likewise, responsibilities are equally shared among all participants.

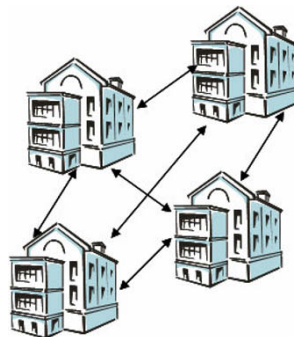


Figure 1 – Example of distributed research networks

- Networks with a central organization:* in this kind of network, an organization has the role of a leader of their network’s activities (Figure 2). The central organization is connected to geographically distributed institutions which act in diverse fields that might have special interests in the research subject. This opportunity probing is performed through the central organization.

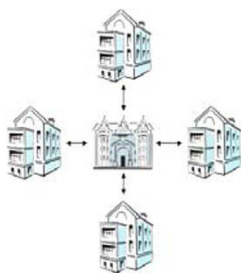


Figure 2 – Example of research network with a central organization

- Research-and-Teaching Interchange Network:* is a network which congregates different groups and organizations about teaching projects and limited-term researches, in a given interest field (Figure 3). A typical case is one where a research and teaching interchange network sets tasks which are interests of several groups.

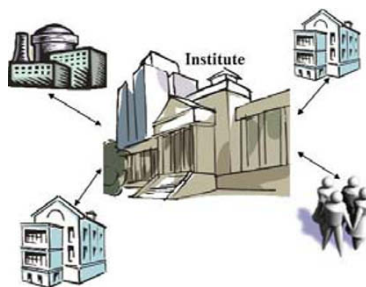


Figure 3 – Example of interchange research network

3. BRAZIL IN A GLOBAL CONTEXT OF COLLABORAIVE NETWORKS

3.1 Introduction

The transformations of global contemporary society have demanded, from companies, universities and research centers, greater dynamism and flexibility when

producing their goods and services. Within this context, collaborative networks appear as a way to fulfill these demands with improved accuracy and quality.

Many global manifestations have been shown with regards to collaborative networks (ECOLEAD: <http://virtual.vtt.fi/virtual/ecolead/>; CODESNET: <http://codesnet.polito.it/>; SOCOLNET: <http://www.uninova.pt/~socolnet/joomla/>), or even efforts to systematize it as a scientific discipline (<http://www.uninova.pt/~thinkcreative>). The objective of the next topic is to introduce Brazilian initiatives in the setting of collaborative networks.

3.2 Brazilian initiatives about collaborative networks

Brazilian efforts undertaken in the context of collaborative networks are presented next.

- *VIRTEC*: Molded according to the context of virtual organization and based on the trust criterion (Bremer et al., 2001), it was developed at the São Carlos Engineering School Center of Advanced Manufacturing (<http://www.numa.org.br>) and comprises nine small companies, which offer products and services with a high aggregated value.
- *São Carlos's Cluster of High Technology*: it is the result of an initiative by local companies to establish São Carlos as a technology-reference city, focused on software development, and based on forming collaborative work among companies, assistance agencies, universities and the government (<http://www.clustersaocarlos.com.br>). Through contracted formal agreements, the Cluster seeks the following objectives:
 - Improving the developing process of softwares for companies, through the definition of models based on better practices for collaborative work and state-of-the-art in management tools for the developing process of softwares;
 - Creating free software solutions, using licenses for the produced artifacts and the integration of pre-existent, publicly available modules;
 - Creating models to enable the application of processes and tools in other companies of the Cluster.
- *VIRFEBRAS*: the Brazilian VO of Tooling Companies (<http://www.virfebras.com.br>) is an initiative by the University of Caxias do Sul and composed of a group of tool-making companies that work cooperatively, proposing solutions for molds and matrixes.

Concerning research teams in collaborative networks:

- *GSIGMA*: The Manufacturing Intelligent Systems Group was created in 1996, and its objective is to work in research subjects relevant to industrial areas focused on problems associated with the paradigm of organizations in collaborative networks.

- *REDECOOP*: The Cooperation Networks and Knowledge Management Group aims at identifying opportunities and obstacles related to generation, diffusion and knowledge management through inter-organizational networks (<http://www.poli.usp.br/pro/networkcoop/>), under the context of market globalization and industrial restructuring with the advent of the dry/quick/flexible production paradigm.
- *GEI*: The Integrated Engineering Group (<http://www.numa.org.br/grupos.htm>) is composed of researchers (teachers, majoring and post-majoring students), whose objective is to develop collaborative projects with other entities in the following topics: product development management, product life cycle, reference architecture for networks, process modeling, quality management, logistics and optimization of production processes.

Concerning governmental support programs in collaborative networks:

- *PIPE/FAPESP*: the Technological Innovation Program in Small Companies exists since 1997 and aims at supporting the development of innovative researches on problems in science and technology, to be performed in companies with up to 100 employees and that have a high potential for commercial or social exchange, enabling them to associate with academic researchers in technological innovation projects (<http://www.fapesp.br>).
- *CONSITEC/FAPESP*: the objective of the Sectorial Consortium for the Technological Innovation program is to stimulate collaboration by research teams with agglomerated companies, to study relevant subjects and to solve technology problems caused by common undertakings (<http://www.fapesp.br>).
- *RHAE/CNPQ*: the Development of Human Resources for Strategic Activities, supporting technological innovation, was created in 1988 and its purpose is to promote improvements in companies, stimulating entrepreneurial associations and sectorial technological entities, which in turn develops plans and technological development programs (<http://www.cnpq.br>).
- *Millennium Institutes*: the Millennium Institutes Program is an initiative from the Ministry of Science and Technology. Its function is to increase the options to finance more comprehensive and relevant projects of scientific research and technological development. Meant for promoting the formation of research networks throughout the national territory, the program seeks scientific and technological excellence in any knowledge field.
- *FINEP*: the Brazilian Innovation Agency (<http://www.finep.gov.br/>) is a public company subordinated to the Ministry of Science and Technology, with the purpose of promoting and financing innovation, scientific and technological researches in companies, universities, research centers, mobilizing financial resources and integrating instruments to support the country's economic development. Among the main programs, we have:

- *COOPERA*: the Cooperation Program among ICTs (STIs: Science and Technology Institutes) and companies; it establishes financial support for P&D projects and innovation among companies and science and technology institutions.
- *PPI-APL's*: the Research and Local Productive Arrangements Supporting Program establish the financial support for activities developed by the science and technology institutions, facing technological assistance, service rendering and solving these companies' technological problems, creating characteristics agglomerated by local productive arrangements.

4. THE INSTITUTE FACTORY OF MILLENNIUM

4.1 Introduction

Concerning collaborative research networks, the Millennium Institutes Program is a Brazilian initiative from the Ministry of Science and Technology. This program's objective is to increase the options to finance more comprehensive and relevant projects of scientific research and technological developments.

Among the projects approved in the program, we have the Institute Factory of Millennium (<http://www.ifm.org.br>), whose objectives may be understood as the proposition, development and dissemination of mechanisms to increase competitiveness and scientific and technological knowledge of manufacture industries, especially those dedicated to capital goods, installed in Brazil.

In practice, the IFM is a collaborative research network composed by 800 researchers in 39 research teams allocated in 32 Major Teaching Institutions.

4.2 The IFM Network concerning innovation and learning

One of the main objectives of the research network IFM is to prepare individuals for technological advances, created and systematized by the network. Among these transference mechanisms are:

- *Courses and workshops*: these are specific subjects where the students perform pragmatically inside the project, thus increasing their learning capacity.
- *Assistance*: IFM interventions on companies are different from consultancies, since new concepts are applied, making the company a "storehouse", where new advances are validated.
- *Development of real-time scenarios*: Environments are developed to simulate real companies. Scripts are used to simulate what would happen in real cases of technology application. Roles are defined on these scripts and distributed among the participants. Thus, a real application of new technologies is experienced.

- *Creation of high technology companies around IFM:* the business environment around universities (technology parks and incubators) is used, promoting the generation of undertaking actions.
- *Development of academic/entrepreneurial works:* it enables the development of researches related to practical problems.
- *Self-teaching web environment:* acquirements that are more suitable to capital goods companies are systematized, simplifying their assimilation and usage. It constitutes a free, structured collection of guides, tools, templates, white-papers, case descriptions, on-line courses and evaluations and virtual scenarios.

Since the beginning of its operation, the network has interacted with over 400 companies in the manufacturing sector, resulting in close to 50 university research projects (Master’s and Doctorate), becoming effective on solutions for the productive sector. With regards to innovation, the projects linked to MFI have resulted in 17 industrial technology patents, with publication of more than 280 articles in scientific journals, as evidence of the innovative potential of the network and the capacity for improving the productivity of domestic companies.

4.3 IFM Network Research Operation

In order to meet the network objectives, the undertaken actions should be divided as follows:

- *Work Packages:* identified as WPs, they foresee accomplishing actions which integrate the network nodes (entities which are part of the network) proposing solutions for previously identified problems. WP’s contemplates:
 - *Subprojects:* identified as SPs, they foresee, one by one, a tasks list which is allocated to one or more researchers to be fulfilled.

The following figure (Figure 4) represents a work package (WP05) with its respective related subprojects (SPs 01 to 06).

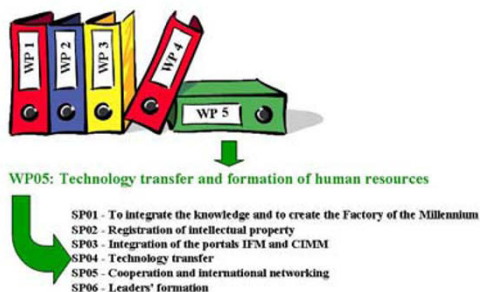


Figure 4 – Example of IFM structure

Subprojects might involve surveys, benchmarking, development of sites, laboratorial experiments, machine tests, application of innovations in companies, development of equipments, and many others.

The conception of working with work packages and subprojects results from the experience of IFM's researchers in previous projects, since it:

- Supports integration between network nodes.
- Contextualizes and focuses programmed actions, gathering them around confirmed problems or the ones detected through field surveys in order to bring up the sustainability of the productive chain capital goods.

5. CONCLUSION

This article highlighted the initiatives of Brazil on the collaborative networks. The main projects, research groups and government support programs were described. An emphasis on Collaborative Research Network – IFM was provided, presenting its goals, action models, innovative aspects and contributions. As ideas for further work, there is a need to emphasize that since the economic leverage of Brazil is represented by small and medium-sized enterprises, a point that must be undertaken by the research network includes economic and social aspects of the country. The problems of small and medium-sized organizations help the research network to train human resources with a more realistic view of the market, with a clear understanding of the business itself, possessing information and communications technologies (ICTs) and a greater reach to generate innovations.

6. REFERENCES

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