

STRATEGIC PLANNING OF COOPERATIVE RESEARCH NETWORKS

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Abstract *¾ The development of cooperative research networks requires the collaboration among partners with different visions about the timing and goals of a research project. In some cases, even competitors are invited to take part in the same initiative, making ground to lack of communication and/or loss of interest in the outcome of the research. During the establishment of the Metal/Mechanics network of the RECOPE program, one large step toward the increase of interaction and collaboration was achieved through one sequence of meetings and short courses on project management and team organization. After these steps had been covered, the strategic planning of the network was carried out, producing a significant improvement in the relationship of the participants. The paper will present examples of benefits resulting from such planning and will highlight the limitations so far observed.*

Index Terms *¾ Cooperative research, networks, strategic planning.*

INTRODUCTION

The formation and the expansion of cooperative research networks have been under way in Brazil during the last 4 years, through an initiative, called the RECOPE program, in which Universities and Research Centers constitute a network and, in agreement with one or several Industries, develop research in a topic previously defined [1]. Initially funded mostly by the Brazilian government, as part of a program for the development of engineering, PRODENGE, the aim of the RECOPE program is to focus on emerging technologies, so that even competitors can take part in the funding of the projects, in such a way that the networks may become self-sustainable in the long run [2]. One of the networks, dealing with Advanced Processes of Metal/Mechanic Transformations (MM), has succeeded in the objective of establishing several cases of Industry-University interaction. The MM network is composed by 5 sub-networks, involving a total of 172 researchers (including students and technical staff) from 17 research institutions spread along 5 states of Brazil. The selection of research topics resulted in a total of 18 projects involving 32 industries. The sub-networks are:

- innovation on the reduction of iron ores;
- steel: new products and processes;
- near net shape manufacturing;
- improvement in the surface properties of metals;

- advanced machining processes.

It is agreed by most of the participants, that a large contribution to the successful interaction among partners in this network derived from a series of meetings and short courses on project management and team organization, which ended up, last year, with the strategic planning of the network and sub-networks. During the annual workshop of the network, one first evaluation of the strategic planning results was done, with a very positive outcome. A more detailed examination of the whole process is currently underway, with a large chance of having it applied to other networks in the RECOPE program.

TECHNOLOGY AND COOPERATIVE RESEARCH

The fast rate at which technology evolves in most areas, together with the large amount of innovations introduced in the market as a consequence of the globalization of the world economy and production, has exposed organizations to international competition. As a result, new ways for dealing with these challenges and opportunities have to be developed. During the last decades, the industrialized countries have tried several arrangements to stimulate innovation, the reduction of R&D costs, and the optimization of their technical and scientific potentials [3,4]. These attempts led to joint efforts for technological development, involving the conception and implementation of cooperative R&D projects, developed by partnership arrangements of enterprises, research institutions and universities. For that matter, the partners involved agree to commit financial and human resources in exchange for access to project results and information produced. In general, this kind of arrangement aims at the development of technologies in their pre-commercial stages [5]. Examples of such initiatives are the EUREKA program in Europe and the Engineering Research Centers in the USA.

In Brazil, the tradition of cooperative research had been, for quite a long time, restricted to the scientific community, which is, out of necessity, always open to collaboration, both at the national and international levels. As for the University-Industry interaction, however, the attempts for collaborative research in the past have been made in a much smaller scale, mostly resulting from isolated initiatives, and the outcome has not been always positive. It suffices to say, at this point, that one potential reason for the lack of success in this interaction may rest on the absence of an efficient

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management of the available resources, which are in general scarce and limited. Another difficulty arises in the definition of deadlines. Having different approaches and time scales for solving problems, the industrial and academic partners should base their interaction on very clear definition of objectives, goals and deadlines. An open and extensive discussion of the issues under investigation, the results to be delivered, and the limitations to be faced must, therefore, be an essential part of the elaboration of joint projects.

Despite the many problems to be faced during the establishment of a cooperative program, the success attained in many countries is a sure indication that in the future such kind of approach will be used in an increasingly frequent way. Due to the current state of internationalization of the economy, industries from many countries are facing competition from international companies, demanding from them a large effort to attain efficiency levels comparable to those of their global competitors [6]. This is the situation of the Metal/Mechanic sector in Brazil, which has been under a strong attack from the international competition, having lost 15% of its share in the GNP during the last five years. One example of a segment heavily affected by this new pattern of competition was that involved with the production of auto parts. Since the introduction of the auto industry in the country, in the late fifties, this sector had a strong participation of national companies. Many of them had been created in the beginning of the car industry installation in the country to provide the parts needed by the auto manufacturers. Although the auto industry was basically controlled by foreign producers, there was a stimulus for the manufacturing of parts in the country, due to an industrial policy favoring the substitution of imports, in order to preserve the balance of payments. Protected by this policy, the national industry of auto parts was able to remain alive, but one consequence of this policy was the lack of modernization. During the first 3 decades, the car manufacturers just kept the production of old models, designed with slight changes, year after year. In fact, the auto industry in Brazil consisted basically of assembly lines, until the eighties, when the global competition among the manufacturers and the start of internationalization of the production gave rise to the fabrication of cars with new designs, some of them "made in Brazil". As the globalization proceeded, this was one of the first sectors to be affected, with the introduction of the concept of world car. According to this concept, the assembly and the production of parts could be spread around different countries, if that would reduce the total cost while keeping the necessary quality of the product. This trend was reinforced in the nineties, when the Brazilian government cut drastically the tax for the importation of cars, opening the market to the external competition. The first consequence was the gradual displacement of the national producers of auto parts, which were overtaken by their international competitors or went out of business. The second was the increase in participation of foreign auto producers in the

national market, many of them installing their assembly lines in Brazil. Therefore, the situation right now is not favorable to small and isolated enterprises, which were able to compete in the past thanks to the protectionism of the legislation. On the other hand, the myth of globalization is now under revision, since in many industrial sectors, including that of automobiles, manufacturing and services activity is organized regionally, not globally. This is a result of the fact that, while multinational enterprises are the engines of international business, their strategies are regional [7]. In sectors such as those involving automobiles and chemicals, the majority of the products produced in one region are sold within that region. In short, there is a large window of opportunity for the recovery of the auto parts producers in those countries where the market is significant and the technological aspects (equipments and production processes) can be combined with the management and administration of resources, to enhance the competitive capacity. Considering that the establishment of a culture of cooperation has proved to be an efficient way to reduce costs, it may also be used to increase the productivity of partners involved in the production of goods and in the development of new technologies based on innovation. It is therefore one potential solution for the recovery of those sectors, such as the Metal/Mechanic in Brazil, which have comparative advantages but have been failing in their struggle to remain competitive.

NETWORK FORMATION: AN INCREASING TREND

One powerful tool for collaboration and interaction is the formation of networks. It represents a new paradigm for cooperation and has become available in the last few years, thanks to the continuous development of communications devices that are revolutionizing the connectivity of the society and reshaping the education, the enterprise and the culture. The available interaction, allowing instantaneous universal communication is expected to evolve dramatically in the next few years, when the convergence of computers with all communication devices –satellites, telephone, TV, and wireless devices- become a reality [8].

While cooperative arrangements in the past were mostly motivated by possible reduction in costs and risks, the increasing connectivity brought about by the communication revolution has opened new ways for interaction among research groups, strengthening the possibilities of collaboration even for long distant partners. One distinctive asset in the formation of networks, is the possibility of joining complementary and geographically distributed competencies to develop cooperative research. Such arrangement results in a clear optimization of human resources and infrastructure, allowing the constitution of strong teams that may address problems of large complexity or multidisciplinary nature, usually extrapolating the capacity of isolated groups. Taking into consideration all the

above mentioned reasons, it can be expected, in the near future, that the concept of networking will evolve as one of the most important tools for technological development [1], and will be a significant asset in the realm of the University-Industry interaction.

Characteristically, networks do not necessarily consist of buildings, corporate shells or an organization. Networks may be no more than a discussion list, a web-site or a sequence of seminars. Moreover, networks rely heavily on communication systems, as institutions or individuals that are geographically apart may join efforts on common interest projects, making use of the increasing speed of communication for transmitting bigger masses of data, or real time distance processing. Networks also tend to depend on multiple sponsors. Contrarily to traditional institutions that have one main source of funding, different agencies or clients may fund networks. Finally, networks have a limited life span, as they are not expected to live beyond their mission. Once their objectives are attained, as long as there are no other aims, they are adjourned. Thus, networks do not risk becoming outdated.

Variations in overall social, economic, political and especially technological conditions require deep changes in the paradigms that have ruled human activities. The process of technological innovation and the way technological production is organized has been no exception. The possibilities of single organizations were outpaced. Networking has been one response to those changes.

MOTIVATION FOR STRATEGIC PLANNING

There is an interplay between networking and strategic planning. While there are both economic and strategic motivations that drive participants into networking, the effectiveness of a network can be enhanced through an adequate practice of strategic planning. In this section, the strategic results of networking are discussed in the first place, followed by the justification for a strategic planning of the networks.

During the formation of a cooperative research network, strategic objectives are important even though investors more easily grasp financial or economical reasons. One strategic motive is the sharing of uncertainty. Technology is a long term and high-risk investment. Network participants, however, share risks. Furthermore, the overall risk is reduced by the fact that different approaches contribute to enhance the chances of success. Another strategic purpose for joining networks is reducing time to market: The fact that many participants join efforts in common interest projects results in shorter time to obtain commercial results. Besides, business participants put pressure on academia to reduce time in solving a problem, whereas theoretical results from academic participation help closing in towards a solution. Another reason for taking part of networks is cross-fertilization. The main frontier for technological innovation

is the combination of different fields of knowledge or technologies. Many breakthroughs occur when different technologies are combined. Networks are a mechanism for bringing organizations with differing areas of interest to collaborate in joint efforts. Sharing expertise is another strategic result from networking. As technology becomes increasingly more complex and interdisciplinary, one single organization is seldom able to tackle technological problems or opportunities by itself. Networks congregate organizations with differing capabilities and facilities.

One more strategic result from networking is the possibility for monitoring environmental changes, as a network is a sample of the universe in which an organization thrives. Suppliers, customers, competitors, academia and other partners collaborate on common interest projects within a network. Therefore, a network provides the means for an organization to monitor changes in its business environment, and to be aware of opportunities that arise. One immediate outcome of the possibility of monitoring the business environment is market access and positioning. Since networks are a sample of the business environment of an organization, they help them to plan their market strategies.

As can be deduced from the above discussion, a large fraction of the benefits promoted by networking relates to strategic goals. It is quite reasonable, therefore, that the gain in productivity expected from such organization must be guaranteed by the efficient management of the available resources [6]. Hence, one present concern of the coordinators of such networks must be the development of an administration oriented to fulfill the organizational purposes. There are several factors necessary to promote the desired productivity, and their importance will vary, according to the organization. In any case, manpower, available technology, administrative infrastructure, and organizational structure are relevant factors for any enterprise. While manpower and technology are essential assets to obtain efficiency (doing right), they do not warrant effectiveness (doing the right thing). The effectiveness can only be achieved if the objectives of the organization are accomplished, and even further, if the actions have been articulated and oriented by organizational purposes. Therefore, a critical question when discussing competitiveness is whether the organizational purposes are in fact worthy, in such a way that the continuity of the organization can be guaranteed. The strategic planning is one of the tools that may provide conditions for the continuity of the organization, not only in the long run, but also for the short term actions required by the fast dynamic changes of environment, characteristic of the modern times. The faster are the changes, the more critical is the role of the strategies.

In the next section, a strategic planning exercise of the MM network will be presented. This was the first step of the process, involving only the coordinators of the network and subnetworks. Later, each subnetwork carried out its own

strategic planning. Some results of the planning have already been tested during the past year, and will also be discussed.

MM NETWORK STRATEGIC PLANNING

The first step of the strategic planning was an exercise to delineate the mission and strategic actions of the MM network [9]. The following stages were developed:

- Identification of basic purposes, particularly the mission and distinctive characteristics;
- Identification of strengths and weaknesses, opportunities and risks, critical factors for success, competitive profile, coordination gap, and vulnerabilities;
- Mapping of present and potential products and services, attractivities, capacity and domain of related technologies, human resource and associated factors;
- Selection of priority for strategic actions;

The exercise was conducted following the above mentioned stages, and was heavily based on the interactivity of the participants. Although aimed as a first part of a more complete process of strategic planning, several decisions have been made and are being implemented in the network. A brief description of the resulting planning follows:

Mission

To increase the competitiveness of the Brazilian metal/mechanic industry, through the integrated action of research groups and enterprises, for the development of emerging technologies, generation and diffusion of information, training and service rendering that promote the national competence.

Distinctive Characteristics

- Industrial experience of the network participants .
- Capacity to raise funding.

Strength

- Synergy and complementarity of competences.
- Consolidated groups.
- Multi and Interdisciplinarity.
- Governmental support.
- Alternatives sources of funding.
- Amplitude of action.

Weakness

- Inexperience in network activity.
- Unstable manpower and overload.
- Difficult sharing of equipments by distant partners.
- Inconstant funding.
- Individualist culture.
- Redundancy of competences.
- Communication difficulty.

- Discontinuity of projects by industrial partners.
- Lack of control of projects developed in the network.

Critical Factors for Success

- Organizational structure.
- Financial resources.
- Marketing.

Critical Factors for Competitive Profile

- Organizational structure.
- Synergy.
- Strategy.

Mapping of Products and Services

A long list of services and products was developed, involving most of the activities normally developed in universities and research centers, such as training and consulting. It was well characterized that the main client of the network is the Steel industry, which has demands for almost all areas within the network. The Automotive sector also has a significant participation in the projects of the network.

Strategic Actions

- Marketing plan.
- Strategic planning of each subnetwork.
- Action plan for continuity of the network.
- Membership system for affiliation.
- Improvement of organizational structure.

The strategic actions were distributed among the coordinators and a chronogram was established for the short term (next 3 or 6 months) and for the next year. The exercise took place in April 2000. During the following 3 months, each subnetwork developed its own strategic planning. By July of 2000, most of the short term actions had been implemented. In December of 2000, during the annual workshop of the network, the strategic planning was evaluated by all participants, with a very positive result. Some actions are still in progress, but it is quite clear that the effectiveness of the network has been considerably enhanced after the members took part in the strategic planning and had a chance to discuss and commit their participation in the activities of the network. It has been proposed to apply the same exercise of strategic planning to other networks of the RECOPE program. However, since some networks have very distinctive characteristics, each one may require a different approach. In some networks the area of activity is essentially academic, while in other cases, the potential clients are governmental agencies, at the municipal, state or federal levels.

The strategy that is being considered is to proceed with the training of interested members on basic concepts of project management and team organization, as it was done with good results in the MM network.

CONCLUSIONS

Cooperative research has been used in the last decades to reduce R&D costs and to optimize the available technical and scientific potentials. With the present connectivity of the society, allowing instantaneous universal communication, networking has become a very powerful tool for interaction. However, even with the best human and scientific resources at their disposal, effectiveness of a network can only be achieved if the objectives of the organization are accomplished. In order to guarantee the realization of the goals, some basic training on project management and team organization must be considered. A strategic planning is one of the tools that may be used to provide a vision of the organization, not only in the long run, but also for the short term actions required by the fast dynamic changes of environment, characteristic of the modern times. In Brazil, the formation of cooperative research networks is underway for the last 4 years. One of the networks, dealing with the Advanced Processes of Metal/Mechanic Transformations, has succeeded in the objective of establishing several cases of Industry-University interaction. As part of the implementation of the network, an exercise of strategic planning was carried out, involving:

- Identification of basic purposes, particularly the mission and distinctive characteristics;
- Identification of strengths and weaknesses, opportunities and risks, critical factors for success, competitive profile, coordination gap, and vulnerabilities;
- Mapping of present and potential products and services, attractivities, capacity and domain of related technologies, human resource and associated factors;
- Selection of priority for strategic actions;

The resulting action plan has been almost completely accomplished, with satisfactory results, and the extension of this exercise to other networks is now under consideration.

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