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THE SOCIAL CONTEXT AND LEARNING PROCESS IN NETWORKS: EVIDENCES ABOUT THE GENOLYPTUS NETWORK

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Abstract:

Executives and academics have recently pointed to networks as the locus of innovation. They state that competition now depends on the positioning of companies within networks. However, it is also known that networks have brought about a high number of ruptures. Even though literature on the theme has increased enormously, there is still space for research that would seek to empirically assess which mechanisms are adopted in networks that will allow their coordination and avoid undesirable ruptures. Thus, this article focuses both on analyzing the coordination framework set up and the management and coordination tools available within the Genolyptus Network. The origin of such tools is assessed and the role sectorial elements play in choosing and delineating them are highlighted. The article also seeks to stress how important it is to establish mechanisms that will allow learning to take place at the network level - an element that is thought to be a core one in evolutionary literature.

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INTRODUCTION

Although organizational literature has traditionally been supported by studies at the company level when it deals with innovation management, there is growing evidence that shows that "networks" make up a critical unit to analyze such a context (Dyer and Nobeoka, 2000; Powell, Koput and Smith-Doerr, 1996; Dyer and Singh, 1998). Such a change in the focus of investigating the innovation process stems from the recognition on the part of these authors of how important inter-organizational learning phenomena are to innovation (March and Simon, 1958; Powell et al, 1996; Levinson and Asahi, 1996). Networks allow greater flexibility, less commitment of resources and greater capacity of response, besides enhancing the capacity to deal with knowledge/information and making it possible to access new technologies and resources offered by partners (Britto, 1999). As a matter of fact, the potential for innovation is enhanced within such environments by taking advantage of capacities that can be added through the creation of systematic relationship channels with other organizations.

However, despite the fact that the setting up of networks has grown considerably in the last decades, literature on the theme is also filled with examples of failures. The difficulties inherent in this kind of structure, such as mistrust, knowledge asymmetries, the lack of hierarchy, information and goals, plus the absence of specific coordination tools, are among the factors pointed out as being the major ones responsible for failures (Park and Ungson, 2001; Dyer, Kale and Singh, 2004). Thus, together with studies being carried out on innovative processes in networks, there have been increasing efforts made in a quest to understand the organizational management processes of these structures. It is believed that the success of such arrangements is linked to the establishment of organizational tools, and that learning them can reduce current rates of rupture. Furthermore, mapping and understanding such tools can lead to stronger relationships of trust among the agents involved, which will allow increased knowledge exchanges, minimize asymmetries and eliminate opportunistic behaviors.

The current study aims to understand which are the coordination flows that permeate a knowledge-intensive network in the Brazilian paper and pulp industry and which management mechanisms have been adopted. The focus of this analysis is on the network and on its management tools. Thus, we seek to identify the forums through which coordination processes have occurred. More particularly, we stress the importance of sectorial elements in choosing and delineating such tools and support the idea that they stem from a learning process that has accumulated through the long years of experiences the network being studied has gone through.

First of all we present the concept of networks that has been adopted and the importance of the learning processes and of the context of evolutionary reading. The network being analyzed is then presented. The third part discusses the main elements that make up the network management system and the main forums through which flows among agents have occurred. Finally, we assess the weight of the industry in delineating the interaction patterns that were found within the network and the learning mechanisms that were adopted. Thus, we seek to add empiric evidence about how important coordination tools and sectorial elements are in shaping interaction and learning patterns in network environments.

NETWORKS AND LEARNING PROCESSES FROM THE EVOLUTIONARY POINT OF VIEW

The present study defines the word networks as a set of interactions and knowledge and information exchanges carried out by organizations within a cooperative environment, as proposed by Cimoli (2002). Therefore, networks are viewed as the locus of formal and/or informal relationships among organizations. Authors such as Ring and Van de Ven (1994) include in this category agreements among companies, joint ventures, research pooling, franchising, etc. Gulati and Gargiulo (1999) consider that alliances, as they stem from relationships established among companies, are also part of such a context. As the analysis proposed focuses its attention on the cooperation relationships included therein, the word network will from now on be used with this meaning, that is, networks for cooperation among organizations.

The origin of such structures, according to Kogut (1988), is linked to three factors: reduced transaction costs; business strategies; and organizational learning. Kogut and Zander (1992) add to such motivations the issue of transferring tacit knowledge among organizations. Along the same lines, Mowery, Oxley and Silverman (1996) emphasize the learning issue. Powell (1998) and Park and Ungson (2001), on the other hand, point to strategic factors such as improved market positioning and reduced rivalry, among others. Other authors like Lorenzoni and Lipparini (1999) add factors such as enhanced productivity efficiency, shared risks linked to R&D, access to new markets and skills, time saved in developing new products, among others.

Compared to other theoretical approaches to the theme, from the evolutionary focus the setting up of company networks is referenced not only to achieving static efficiency stemming from positive externalities in relation to production and transaction costs, but also to dynamic efficiency associated to enhancing the innovative potential made possible by integrating multiple competencies within those arrangements. Simultaneously, particular emphasis is then given to the socio-cognitive learning processes that consolidate as a result of such cooperative relationships (Britto, 1999).

Thus, from a neo-Schumpeterian point of view, learning is the main variable to be analyzed within cooperative strategies. According to Lemos (1999), the learning process within networks can happen through production (learning-by-doing); through commercialization and use (learning-by-using); during the quest for new technical solutions at R&D units or at less formal instances (learning-by-searching); and through interactions with external sources such as raw material suppliers, consultants, universities, research institutes, agencies and government laboratories, among others (learning-by-interacting) (Lemos, 1999:134). Networks also offer opportunities for learning-by-learning. This process involves learning about the partners, about the process of setting up networks, about achieving results and establishing common goals (Larson, 1992; Doz, 1996).

The effectiveness of this learning process, however, demands specific investments from the networked companies, such as, for example, the development of a common language, communication channels, conflict-mediating forums, the creation of procedures and codes that will make it possible to generate and circulate knowledge, among others. In this paper these are called coordination tools.

Britto (1999) highlights the setting up of mechanisms to minimize conflict, such as internal task allocation and a clear policy of results sharing, besides the setting up of channels that will make it feasible to exchange the most diverse kinds of knowledge that circulate within the network, among which we should highlight knowledge about network coordination.

Developing clear coordination processes for networks contributes towards creating continuous relationships among companies. Such effect increases their absorption capacity vis-à-vis the amount of internal investments made, as it makes it possible to make the cognitive patterns and search procedures adopted by network members compatible (Cohen and Levinthal, 1989; Britto, 1999). Furthermore, the spillover effect must be taken into account, and it is reinforced by the existence of systematic interlinking channels among the agents.

On the other hand, as networks encompass companies with differing goals, values, cultures, practices and management styles, it is possible to encounter different challenges to its management, mainly those that are linked to communication, coordination and knowledge sharing. These can even be rather acute when networks involve competitors. Dyer and Nobeoka (2000) point out three aspects as being the core ones in the capacity of networks to generate cohesive ties among partners so that they can broaden the possibilities for success within such arrangements, and these are: the issue of the capacity to motivate members to share knowledge; the elimination of opportunistic behavior; and the optimizing of the important knowledge search and selection processes. According to the authors, creating mechanisms that will deal with such dilemmas within the network is the best way to guarantee that goals will be fully achieved in these arrangements.

Although the neo-Schumpeterian school is an important reference in understanding the learning process in networks, some of the main advances in the theme had been produced by authors from complementary theoretical perspectives, the so-called evolutionary ones. Among them we should mention the knowledge-based view (Kogut and Zander, 1992; Grant, 1996): dynamic capabilities (Dierickx and Cool, 1991; Teece, Pisano and Schuen, 1997; Leonard-Barton, 1998) and organizational learning. What these schools have in common is that they reinforce how important learning processes are to companies, mainly learning that originates within networks. These authors also believe that company competitiveness is linked to their capacity to structure themselves as a learning system. Another view that must be mentioned as an important reference is the resource-based view (Barney, 1999), which, although it does not distinguish between knowledge and other company resources, it is actually the foundation of many of these currents.

The Importance of the Context in Learning Processes

Evolutionary authors believe that the characteristics of the context that involves networks strongly influence not only the coordination tools within networks but also knowledge generation and sharing among participating organizations, thus directly influencing the exit of such cooperation strategies (Lyles, 1988). Granovetter (1985) stresses the importance of the social context in shaping control social mechanisms, indispensable tools in managing complex structures such as networks, as they are always subject to instabilities occasioned by assessment asymmetries on the part of

agents and also to opportunistic behaviors. According to the author, the "embedded" characteristic of these relationships can create behavior patterns that will discourage opportunistic behaviors vis-à-vis relations defined purely by hierarchy. Context bears direct influence on control social mechanisms such as trust (Gulati, 1995; Nooteboom, et al, 1997), relational capital (Dyer and Singh, 1998; Walker, Kogut and Shan, 1997; Arino and De La Torre, 1998), history, or chances for repetitive partnerships and interactions (Gulati, 1995). Such aspects promote greater reciprocity and strengthen arrangements, as they enhance mutual trust and partner reputation while also allowing them to learn about coordination tools.

In the view of Gulati (1995), repetitive alliances can lead companies to act loyally and also impact governance in future partnerships. The broad preference reported for setting up networks with previous partners indicates that trust acts as an element to safeguard against the opportunistic behavior. Thus, the more the companies interact, the more trust and cohesive bonds there are among the institutions. According to the author, cohesive bonds may be the only source of information on partners' trustworthiness. We can add the possibilities to transfer coordination tools that will lead to better communication, knowledge transfer, greater learning, etc.

METHODOLOGY

The current study was based on the research carried out for three years in the Brazilian Network to research the Eucalyptus genome (Genolyptus). As it dealt with observing and analyzing an ongoing contemporary¹ phenomenon whose limits between the external context and internal network events are not clear, we have opted for the explanatory case study methodology (Yin, 2005).

This case study involved representatives from all the companies², 5 universities and a government agency involved in the Genolyptus project. Overall, 42 interviews were carried out totaling 65 hours of transcriptions. All the network memory, represented by over 3200 e-mails exchanged by members of the network and all the official documents produced, such as meeting minutes, reports, contract, etc., were analyzed. Although in-loco observation of the interaction process was the recommended strategy (Yin, 2005), the members' geographic dispersion brought an essentially virtual character to the network, so that the analysis of the above mentioned documents and e-mails was very close to the day-to-day interaction among the agents.

The case was developed in three stages. On the first one we sought to assess the structures and the way the network worked based on interviews with some of its members. On the second stage we analyzed all the e-mails exchanged among members since the time before the network was set up, and also all the other official documents that were produced. This analysis was of fundamental importance to identify the processes, flows and other management tools that were present in the network. New interviews were then carried out with representatives from the companies and the universities. The interviews sought to assess the role of some interaction channels in the learning process and how important the management tools that had been identified were to the knowledge exchange that occurred among the agents. We also sought to assess the existence of some tools to store and

replicate knowledge on network management. The interviews with university representatives sought not only to verify the object being studied but also to contextualize the relationships among universities, companies and other research institutes in the Brazilian paper and pulp industry.

THE PAPER AND PULP INDUSTRY

According to data supplied by Bracelpa³, the Brazilian paper and pulp industry consists of 220 companies that account for about 1.4% of the domestic GDP and directly employs over 110.000 people. Brazil currently produces 55% of the world's eucalyptus pulp and it is the world's largest exporter of short fiber pulp; it also has the highest forest productivity in the world. While the maturing period for forests ranges between 6 to 7 years in Brazil, it takes between 30 to 40 years in Europe and between 11 to 12 years in Chile and in the Iberian Peninsula before the trees can be cut down.

Besides its natural advantages, notably as to climate and soil, part of such competitiveness stems from the development of a sectorial innovation system (Malerba, 2004) that made it possible to select and disseminate modern forestry technologies (Souza and Oliveira, 2002). As illustrated by Bracelpa data, the great technological challenges the industry faces are jointly met by companies, research institutions and universities. This pattern of action added scale to the forest research process and made it possible for the associated companies to have easier access to innovative techniques and technologies in the various areas that make up forest production.

Data from PINTEC⁴ reinforce the propensity of companies in this industry to cooperate in arrangements for innovation, when compared to the domestic average. One third of the companies in this industry will point to their competitors as an important source of innovation information, while cooperation strategies are currently used by over 15% of these companies. This percentage comes down to 10% for other industries in the country. Part of this proximity among companies is related to the existence of research institutes headquartered at some large universities which will bring together companies in the industry. These institutes are mentioned by agents as being the great promoters in knowledge sharing among universities and companies through their various forums such as thematic meetings, cooperation projects, consulting, etc. The importance of this sectorial context cannot be minimized when the management tools used in the Genolyptus Network are assessed.

THE GENOLYPTUS NETWORK

The Genolyptus network was a pioneering project in Brazil in terms of its capacity to articulate recognized competencies in the productive sector and in research institutions around a domestic network of pre-competitive research. The knowledge involved in the project was broad and multidisciplinary. Its goal was to discover, sequence, map and determine the functions of genes that are economically important and that belong to the *Eucalyptus* species, and so incorporate genomic genetic

technologies in the forestry enhancement and production programs while emphasizing the wood production process.

Among the factors mentioned as the main motivators to create the network we can highlight project cost sharing and the learning possibilities that contact with competing companies and industry experts made possible.

The points that made it feasible to setup the network the way it was conceived are linked to the characteristics of the industry, to the historic pattern of interrelationships among the organizations and also to the technical characteristics of the research and the technology involved. Among these factors we can highlight:

- A strong history of generating gains and competitiveness in the forest industry through research on genetics and improvements, which made internal negotiations at companies easier for additional investments in the area;
- A lack of great differences among companies in the technical area the project concentrates on - molecular improvement -, which allowed companies of different dimensions to come together in a pre-competitive format;
- Sharing in the technical design of the project, which dealt both with basic scientific research that interested the universities and with experimental improvements, which interested the companies.
- The existence of consensual and credible leadership and technical competencies in both the academic and private fields;
- Countrywide presence and strong representativeness of the productive sector in the project, which led to a feeling of an "elite group" and strengthened trust bonds among the institutions that took part in the project.

Thus, the size of this project should not be underestimated, not only for the scientific and technological challenge it faces but also in terms of its structure, which encompasses 14 companies, 7 universities and Embrapa (3 centers) throughout the country. All these institutions were coordinated by Embrapa. The participating institutions are presented below.

Table 1 - Institutions Participating in the Genolyptus Network

Companies	Universities and Research Centers
Aracruz Celulose S.A	Embrapa (CENARGEM, CNPF and CNPAF)
Suzano Celulose S.A.	The Catholic University of Brasília
Ferro Gusa Carajás S.A	State University of Campinas
Celulose Nipo-Brasileira S.A.- CENIBRA	Santa Cruz State University
International Paper do Brasil Ltda	Federal University of Goiás
Jari Celulose S.A.	Federal University of Lavras
Klabin S.A	Federal University of Viçosa
Lwarcel Celulose e Papel Ltda	Federal University of Rio Grande do Sul
Rigesal Celulose, Papel e Embalagens Ltda	
Veracel Celulose S.A .	
Votorantim Celulose e Papel S.A .	
Zanini Florestal Ltda	
V&M	
RAIZ - Grupo Portucel Soorcel	

Source: The author

The Framework of the Network

The organizational framework of the Genolyptus Network was basically integrated by coordinators, both general and subproject ones, and by the administrative and technical deliberation organs, respectively the Deliberation Council and the technical Committee. The financial and accounting management of the network was under the responsibility of an external organ, Funarbe⁵. To this relatively simple network coordination framework we can add some other tools that guaranteed the establishment of clear rules and guidelines that shaped its *modus operandi*, and among such we can highlight the covenant signed among the companies (contract) and the work plan. The first one dealt with issues linked to financial and genetic material contributions on the part of the institutions, the network's governance framework and intellectual property. The second one established the sharing of tasks and also each member's goals, and these were structured according to nine interlinked subprojects.

Coordination

The option was made for decentralized coordination. Project coordination was shared among a general coordinator and the coordinators for the nine subprojects that made up the network. They were responsible for executing the established physical schedule of goals, and they answered directly to the Deliberation Council on how the project was being developed. Coordination for most of the subprojects was shared so as to distribute tasks and maintain a "backup system".

The subprojects were set up a based on segmenting the project's global objectives into specific knowledge areas. Subproject coordination was then handed to researchers from the universities whose technical competence and expertise in the area were widely recognized. However, coordination for subproject 1 remained in the hands of the companies, who rotated 12-month mandates.

Despite such division of coordination tasks, the role of the network's general coordinator was of fundamental importance both as to technical definition, task allocation, overseeing, event organization, encouragement and motivation of network members, administration (except financial), besides intermediating with the governmental organs that finance the network.

The Deliberation Council and the technical Committee

The Deliberation Council was made up of two representatives from each company (the official one and a substitute) and its function was to deliberate about administrative and technical issues, as described in the internal guidelines. As the most important organ in the network's functional framework, and being made up of representatives from all institutions, it worked as a guarantee that all institutions had their say in defining the strategies to be adopted. The Technical Committee was made up by representatives from the deliberation Council and its job was to guide and assess the technical tasks carried out within the network.

THE MANAGEMENT TOOLS THAT WERE ADOPTED

The analysis carried out revealed the existence of several flows that happened through the most diverse forums within which agents interacted. No structural gaps were identified (Ahuja, 2000) in the network being studied, that is, the relationship among all the agents involved in the network was carried out directly and there were no intermediaries or a central knot. For didactic reasons, we opted to segment these flows among those that dealt with the coordination process and with those of the knowledge generation and transfer within the network. These processes are broader categories that encompass all the flows and forums through which that kind of knowledge circulated within the network. Figure 1, below, represents the networks' functional framework. The coordination flows generally obeyed this structure (up-down). We highlight the network's general coordinator, who is responsible for the coordination flows that were found to be the most important ones. On the other hand, Figure 2 shows the network framework from the perspective of the knowledge flows that circulated among the agents that made up the network. The paths taken by the flows that were identified are represented by lines. The central position occupied by the universities focuses on the fact that 8 out of the 9 subprojects are based on the universities. The network's general coordinator (represented by Embrapa) is directly responsible for one of the subprojects and is the one responsible for the knowledge related to network coordination, and so its weight is highlighted.

Figure 1 - A functional drawing of the network

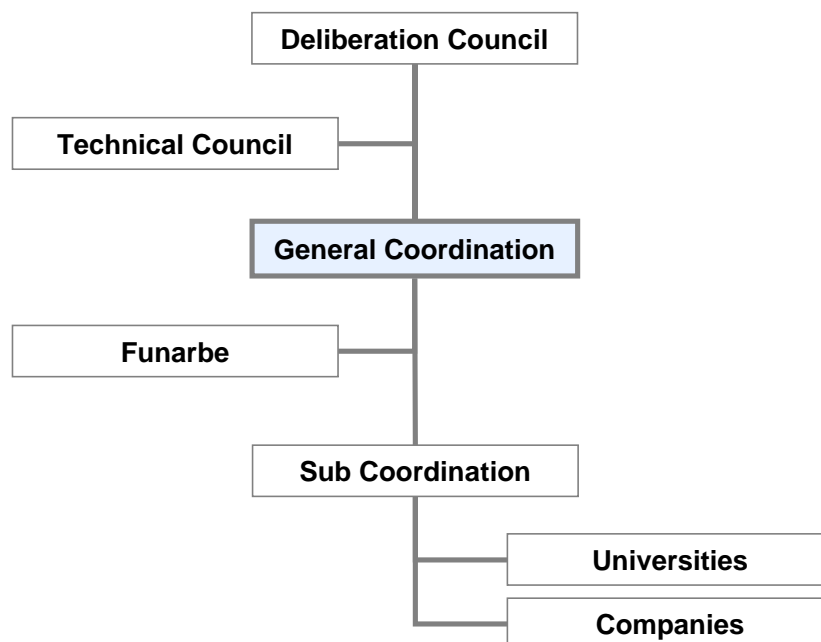
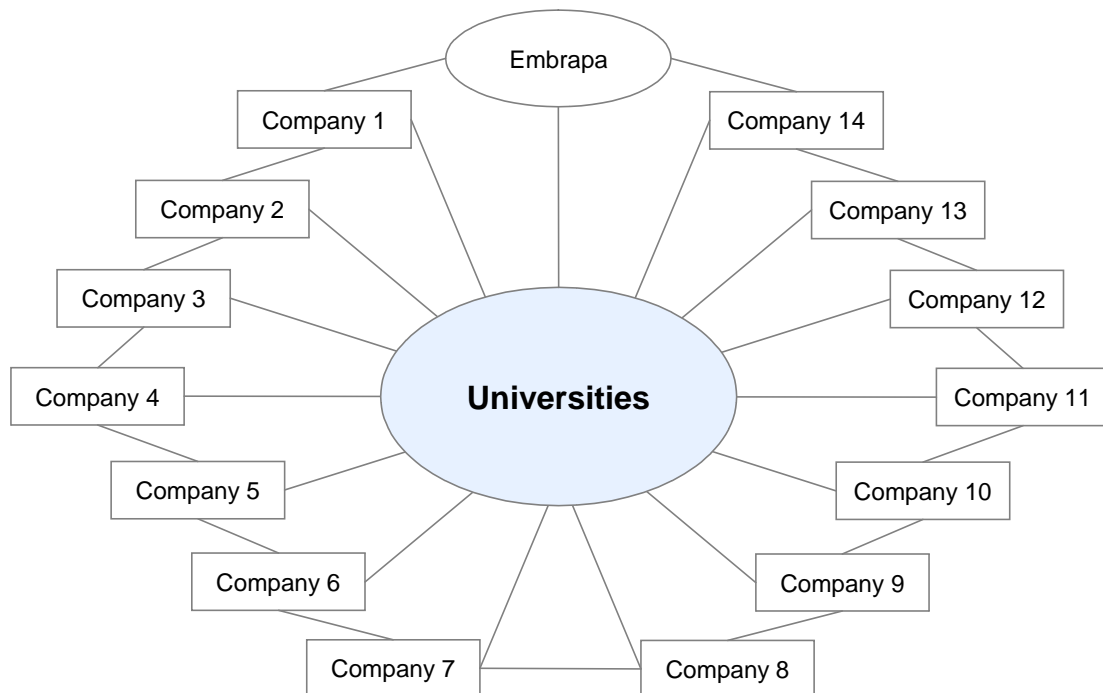


Figure 2 - The network's and knowledge framework



Source: The author

The next sessions seek to present the forums and the mechanisms that made possible the learning flows in each one of the processes that were identified within the Genolyptus Network.

The forums and the network's coordination mechanisms

Although it is characterized by informality, the Genolyptus project counted upon a set of governance mechanisms that made the procedures adopted clear and gave a framework and coordination capacity to the network. According to the analysis carried out, the main coordination flows within the network happened in the decision-making, communication and dissemination, control and leadership processes.

According to the interviewees, the decision making flow was made up by tools that privileged information symmetry and consensus among members. Thus, much was invested in debates by means of broad discussions that were carried out by e-mail and face-to-face meetings. The face-to-face meetings were split between formal ones that happened once a year, the ones that were part of the subproject, and the informal ones that happened vis-à-vis more complex situations that involved differences of interest and diverging opinions.

However, the coordination tools were not seen as rigid rules, and the main forums within which they were carried out were the informal ones such as contact through e-mail, telephone calls and nonscheduled meetings. Despite the flexible characteristics of its management framework, some tools were adopted by the coordinators so as to guarantee that goals were met, such as periodic summary reports on activities, goals reports, visits and continuous follow-up, besides the responsibility for preparing

knowledge "leveling" activities within the projects they coordinated. In the same way, the work plan and the schedule annexed to the contract were pointed out as being greatly important to imposing quantifiable goals to members and they were made into guidelines for technical and management tasks within the network.

Due to the inexistence of a formal hierarchy, the number of members, the diversity of interests among, mainly, the universities and the companies, and the informal characteristics of the relationships that were established, the role of the coordinator in leading the debates, encouraging the network and guiding tasks was very strong. It was observed that his actions were greatly focused on encouraging the network, in the development of relationship capital among members, in establishing consensus within the decision-making process, in minimizing information asymmetry and, consequently, conflict.

THE LEARNING PROCESSES AND THE IMPORTANCE OF CONTEXT IN DESIGNATING THESE TOOLS

One of the aspects we defend in this article is that the context within which networks are inserted exert influence on all the established coordination tools. That is, due to previous situations, agents are capable of learning, selecting and repeating tools, which will imply in their repetitive use within contexts that are thought to be similar.

In the specific case of Genolyptus, the industry within which the members of the network are inserted in was remarkable for a history of relationships that conditioned them to adopt certain tools.

This context was characterized by an industry that:

- understood that its competitive development was a function of the cooperation agreements and joint developments that are established,
- was underscored by personal relationships within which the reputation of the agents was valued both in technical and behavioral terms, and
- was made up by a restricted community of technicians/executives that was continuously transferred to other organizations.

It is also worth stressing the existing relationships between universities and research institutes, and between these and the companies. Such relationships not only reinforced the three aspects mentioned above but also reproduced them in the new members that would enter the industry.

By taking advantage of the cooperative sectorial environment, the Genolyptus Network managed to generate strong identity in relation to its goals and values, which led to tools that were compatible with the goals of the network and its coordination. At the same time, the coordination tools created were shown to be effective in minimizing the aspects that could destabilize the relationships and the work carried out within the network. We can also add that this history of interactions added another characteristic to the tools, that is, their informality.

Therefore we should highlight the influence of the network design itself, which privileged work sharing and responsibilities among members as well as the democratic characteristics of the decision making processes that were created. These were of significant import in maintaining motivation among members and eliminating opportunistic behavior.

By spelling out a clear work sharing policy, the contract also contributed to eliminate opportunistic behavior. The establishment of a collective domain for all the knowledge generated within the network, and its direct implications, such as the general agreement among participants to open the doors of their laboratories to all network members; producing a single and collective database with online access to the genetic map generated; a collective discussion forum for any kind of discussions; the distribution of hard disks containing the project's full technical database; the project's virtual page, which stored all the documents produced by the network, whether technical or financial; and other mechanisms, all these made accessible to the members of the network, at any time, all the knowledge and know-how produced through the project. Such requirements constituted the price of entry into the network, and those who signed into it were willing to open their doors and share their knowledge.

Thus, the characteristics of the tools presented stemmed from the proximity among the companies in the Brazilian paper and pulp industry. The remarkable history of interrelationships among the companies and the countless contact points they exhibited generated a close relationship, mutual knowledge and trust between the companies and the other organs in the industry throughout the years. This made it possible for network instruments to be used flexibly without, however, bringing up uncertainties as to the behavior of the members. Although there were punishments against opportunistic behavior provided for in contract, such as a "free ride" behavior or omitting oneself from carrying out tasks, this would bring the loss of prestige and trust among other members, which would compromise future possibilities of cooperation agreements with these companies and turn into a disastrous aspect from the point of view of the company's competitiveness within the sectorial context.

Learning about Networks

Although studies about the networked learning process generally focus on learning-by-interacting processes, the increasing importance of cooperation strategies to the innovative process and companies has made their competitiveness increasingly dependent on learning-by-learning processes⁶, that is, on their learning capability about managing cooperation relationships (Lastres and Ferraz, 1999). Such learning enables companies to develop mechanisms to transfer, copy and recombine knowledge. In the same way, it makes it possible for them to identify partners, set up networks and renegotiate them.

At the level of the Genolyptus Network, specifically, no explicit forums or mechanisms were identified that had been drawn up with the goal of retaining this kind of learning. Nevertheless, it was noticed that such knowledge could be found deposited in the research institutions that promoted and coordinated network setup in the industry, passing knowledge on to the cooperation projects tacitly, or even in a codified way, through contractual models and structures. The proof is that, according to the

interviewees, it is possible to identify great similarities among the tools used in the most diverse networks setup within the industry.

Another important transfer and accumulation locus mechanism of this knowledge were the network members that, as has been previously mentioned, made up a small number of members.

Thus we can state that the relevant analysis context in the case of the Genolyptus Network was related to the industry or to the sectorial innovation system, as it was responsible for a large part of the characteristics of the interaction mechanisms that could be observed among companies, institutes, universities and the government in the Brazilian paper and pulp industry. Such results were confirmed by the interviewees who, for the most part, pointed out that the Genolyptus tools stemmed from its members' previous experiences in other networks and cooperation programs within the industry. Their transference to external contexts, however, was assessed cautiously by the respondents. According to their answers, transfer was conditioned to observing three aspects: the characteristics of the knowledge, the relationships established by the agents and the characteristics of network coordination. That is, the possibility of transferring such patterns to new networks was associated to reproducing the social context the network was inserted in.

CONCLUSION

The present articles sought to map the set of tools used to coordinate networks and the learning process that permeated an important research network in the Brazilian paper and pulp industry. Actually, we sought to analyze the role of the sectorial elements in choosing and shaping the network coordination tools and also the social control mechanisms adopted to minimize opportunistic behaviors. As it was possible to verify, the identity that emerged stemmed from the history of interaction in this sectorial environment, which not only conditioned its choice of tools but also leveraged its learning due to its repeating the established arrangements throughout.

We believe that this article has contributed empiric evidence on the importance of management mechanisms and of the context that delineates the interaction patterns and learning processes of agents within a network environment. However, it must be mentioned that such results cannot be generalized to networks in other industries due to all the particularities of the context of the Brazilian paper and pulp industry.

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¹ The Genolyptus Network was launched in February, 2002. Initially, it was supposed to last until July, 2007. However, the project's continuity through an international agreement led its sick kitties to carry on up to 2008.

² Only one of the companies involved in the project did not take part in the study.

³ The Brazilian association of pulp producers.

⁴ Technological Innovation Industrial Research developed by the Brazilian Geography and the Statistics Institute (IBGE).

⁵ Fundação Arthur Bernades, which is linked to the Federal University of Viçosa – UFV. It was Funarbe that intermediated relations with Finep, which financed the project, as to supplying periodic reports and financial statements, as well as relations with companies in funding and managing financial resources.

⁶ A concept that is very close to that of learning-by-learning is that of the alliance capabilities (Heimericks and Duysters, 2004; Simonin, 1997; Doz, 1996). Although they analyze the level of the company and the set of relationships that they have, studies on alliance capabilities offer a great contribution to understanding the network

management process, as they propose to study the role of these capabilities and their components (experience, tools and previous knowledge about networks) in the success of these operations strategies.