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Motivational Factors of Companies that Establish Cooperation with Institutes of Science and Technology

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RESUMO

Technological innovation is deemed strategic for organizations and nations to achieve and sustain competitive advantage. One of the most effective means for companies to achieve these innovations is through the relationship with universities. Thus, this study aimed to identify the main factors that motivate companies to establish this partnership. Hence, a descriptive study was elaborated, in which respondents are companies that have some level of cooperation with universities and institutes of science and technology. The results obtained show that the main reasons are, according to their importance: (1) to strengthen the technology, (2) to search for new sources of creativity, (3) to obtain expertise in market-oriented technologies, (4) to acquire new technologies; (5) to reach skilled labor, (6) to train their human resources, and (7) to develop new products. Furthermore, this study found that the less important factors are related to social reasons; this finding deserves further investigation in future studies.

KEY-WORDS: University-industry cooperation. Technological innovation.

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Fatores Motivadores de Empresas que Estabelecem Cooperação com Institutos de Ciência e Tecnologia

RESUMO

A inovação tecnológica é considerada estratégica para que organizações e nações alcancem e sustentem a vantagem competitiva. Um dos meios mais efetivos para que as empresas obtenham essas inovações é por meio da relação com universidades. Nesse sentido, neste estudo o objetivo foi hierarquizar os principais fatores que motivam empresas a estabelecer esse tipo de parceria. Para tanto, foi realizado um estudo descritivo cujos respondentes são empresas que mantêm algum nível de cooperação com universidades e institutos de ciência e tecnologia. Os resultados demonstraram que os principais motivos são, por ordem de importância: (1) fortalecer a tecnologia; (2) buscar novas fontes de criatividade; (3) obter *expertise* em tecnologias para o mercado; (4) adquirir novas tecnologias; (5) acessar mão de obra qualificada; (6) capacitar seus recursos humanos; e (7) desenvolver novos produtos. Ademais, neste estudo verificou-se que o fator de menor importância está associado às razões sociais, que merecem ser mais bem investigadas em estudos futuros.

PALAVRAS-CHAVE: Cooperação universidade-empresa. Inovação tecnológica.

1 INTRODUCTION

Technological innovation is considered strategic so that organizations and nations achieve or sustain their competitive advantage. Through it, it is possible to differentiate among the competitors and conquer new markets, generate value to customers and shareholders and also obtain greater gains. In this sense, Cruz (1999) attests to the importance of seeking the competitiveness through innovation, stressing the need to appreciate it even more, especially in Brazil.

In the country, the main source of new knowledge is not in companies, but the universities and Institutes of Science and Technology (ISTs), unlike the United States, for example, because in that country companies also have an important role in contributing for the generation of knowledge, favoring the conversion into products and/or services for the society, through innovation. On the other hand, it is observed that, in the Brazilian model, it is still tenuous the approximation of the knowledge generating institutions (Universities and ISTs) with organizations that have the role of transformation of this knowledge into products and services, despite of the undeniable potential for generating value that can arise from this relationship.

This potential can be checked when doing an analysis of scientific publications growth and technologies, environment of strategic generator of new knowledge and innovation, predominantly conducted in the context of the stricto *sensu* graduation programs in Brazil. According to Capes (2010), at the triennial period from 2007 to 2009, Brazil has published 284,983 articles in indexed scientific journals. Whereas in 2012, this production was 171,969, 34% more than in 2010 (Capes, 2013).

This growth has been accompanied by the expansion of the system of stricto *sensu* graduation program in the country. In 2010, 50,411 masters and doctors were awarded, number that jumped to 60,910 in 2012 (Capes, 2013), representing an increase of approximately 20% in three years. This potential is checked, therefore, through the increase of the intellectual production in quantitative and qualitative terms, in addition to the increase in the number of professionals certified in these programs, that

receive training for the conduct of scientific and technological research in institutions and organizations. In addition, it should be pointed out that these actors might play an important role in intermediation between the academic world and the market, driving technological progress.

With this development, the possibilities for organizations to take advantage of this knowledge for practical application are unquestionable. As highlighted by Cruz (1999), Science does not become technology spontaneously. In this sense, the role of business as producers of innovation gains more importance, both with respect to their competitiveness, as well as with regard to the Science and Technology independence in the country.

Thus, the relation between university and company becomes a strategic issue, because it allows the company to transform knowledge into innovation created by research institutions, setting, in this way, a win-win relationship, which needs to be stimulated and strengthened. For this reason, Cruz (1999) states that it is necessary to create a culture of research in the business world.

Given this scenario, it is possible to observe initiatives in establishing different levels of partnerships university/ISTs and companies. In this sense, this study has as research question: **What are the main factors that lead companies to seek technological partnerships with the Science and Technology Institutes?** To this end, we sought to achieve the following research objective: **To rank the reasons that lead companies to the decision to establish partnerships with Institutes of Science and Technology**. In Table 1, it is listed the operational definitions of the research question terms.

TERM	DEFINITION
Factors	These are the motivating factors by the companies in terms of the following categories: (1) obtaining and sharing resources in research and development; (2) access to technology and technological support; (3) association of image and to the practice of social responsibility; (4) objectives related to the market issues and products development (Porto, 2000, p. 74).

To be continued

Continuation

Companies	They are private organizations that have cooperation process formalized with ISTs.
Technological Partnerships	"Formal cooperation of companies with universities and research institutes, with the purpose of promoting incremental or radical improvement, in products or processes, transfer technology or provide specialist service, formalized through an agreement, contract or other legal instrument that defines the goal of the research and establishes the responsibilities of the parties, even though in a generic way, and indicates a timeframe for it to be completed" (Costa, ortho P& Feldhaus, 2010, p. 110).
Institutes of Science and Technology (ISTs)	Organ or entity of the government which has the institutional mission, among others, to perform activities of basic or applied research of scientific or technological nature.

Chart 1: Operational definitions of the terms of the research question

The ranking is meant to identify the main reasons that lead organizations to establish partnerships with the ISTs. These reasons were grouped in sets of motivator elements, called factors.

This study is justified because, so that this type of interaction to be effective, it is necessary to understand the reasons why the actors involved in the process seek to establish partnerships. This understanding may subsidize the establishment of policies, mechanisms and actions that foster these partnerships at its various levels.

2 THEORETICAL FOUNDATION

2.1 MANAGEMENT OF INNOVATION

In a globalized world where companies, corporations and even countries compete fiercely for customers and markets, being innovative is a matter of survival. The Decree 5,798, which regulates the Law 11.196 (better known as the Good Law) defines innovation as "the conception of new product or manufacturing process, as well as the aggregation of new features or characteristics of the product or process that involves

incremental improvements and effective gain in quality or productivity, resulting into greater competitiveness on the market" (Decree no. 5,798, dated 7 June 2006).

The technological innovations in products and processes (TPP), in accordance with the Oslo Manual correspond to technologically new implantations or to technological improvements in products (goods and services) and processes (OECD, 2005, p.23). Tidd, Bessant and Pavitt (2008, p. 30) define innovation in product as "change in things (products/services) that a company offers" and process innovation as "changes in the form in which the products/services are created and delivered."

The implantation occurs only when you are introduced to the market (product innovation) or used in the production process (process innovation), involving a series of scientific, technological, organizational, financial and commercial activities. To be considered innovative in TPP, it is necessary for the company, during the review period, to have implanted products or processes that are technologically new or with substantial technological improvement, without the need for it to be unpublished in the world (OECD, 2005, p.70).

Innovation is not carried out randomly and, because it is a process of high complexity, high risk and uncertainty, it is necessary the use of procedures and appropriate methodologies and an efficient system to produce the results targeted by the company. This process must be managed in a careful way in order to produce results, such as how to make inventions into innovations, that is, in products commercially viable in the market (Freeman & Soete, 1997, p. 6).

The management of innovation is an organizational process which, according to Tidd et al. (2008), involves three basic pillars - knowledge, information and creativity -, whereby the profitable alternatives (more) value (new technologies) are managed integrally The authors say that the following processes are considered essential for achieving breakthrough results: planning, allocating, organization and coordination of factors.

In addition, when approaching the innovation process in a structured way, it is necessary for the company to set initially a strategic

positioning, from which it will be launched an innovation strategy with the main targets to be achieved within the scope to launch innovative products to conquer markets, higher profitability and satisfaction of the *stakeholders*. The modern concept of management of innovation transcends the limits of the departments of research and development, involving all interfaces of the organization (Jonash & Sommerlatte, 2011). It is a cultural and continuous process, in which the three pillars mentioned above interact synergistically.

Since that the creation of innovative projects involves the generation of knowledge, the innovation manager can search for it in the internal environment or external to the company. In the last case, some possible means may be strategic partnerships, licensing of technologies and *joint ventures* (Hitt, Ireland & Hoskisson, 2012), characteristic of organizations that turn to the *inovação aberta* (*open innovation*), through the transition from a model of domestic innovation to a model that includes the collaboration with institutions and organizations in the external environment seeking to foster research, development and innovation (Enkel, Gassmann & Chesbrough, 2009). In this study, the focus falls specifically on the partnership of companies with ISTs and universities, and their respective interaction process.

According to the *Oslo Manual* (OECD, 2005, p. 93), the cooperative innovation, which is defined as "active cooperation with other companies or public research institutions for activities of innovation (which may include purchases of knowledge and technology)", allows access to knowledge and technologies by companies that do not have conditions to exploit them alone. In addition, it presents a potential for synergies for cooperation, with mutual learning, representing a relation "win-win".

It should be pointed out that the company, as stated by Stal, Campanário, Andreassi and Sbragia (2006, p. 19), must be inserted into a National System of Innovation (NIS), which is defined as:

> A network of public and private institutions that interact to promote scientific and technological development of the country. It includes companies, of the most varied types, business associations, universities, technical schools, research institutes, government, development agencies and regulatory agencies, in an effort of generation, import, modification, adaptation and dissemination of technological innovations.

According to these authors, Sabato's Triangle is one of the earliest representations of the NIS, whose vertices are (1) the government, (2) the institutions of education and research, and (3) companies, in which each of them assumes a specific role. According to Figueiredo (1993), Sabato's Triangle can be seen as an action strategy to enable the scientific and technological progress of countries, as a result of synergistic action between these three elements, which are interrelated.

Stal et al. (2006) argue that, in the Sabato's Triangle, arose the metaphor of triple helix, which consists of the existence of an intersection between the helices. Each of them represents an independent institutional sphere, however, all of them work in cooperation and interdependence. According to Etzkowitz (2003), the model is more interactive and interdisciplinary, contrasting with the linear form of innovation, approaching the various actors and allowing a process of hybridization between the different spheres.

According to Etzkowitz and Leydesdorff (2000), the relational model between the agents ceases to be bi-directional and it is considered that the three agents are acting simultaneously in a synergic way in triple helix, passing to a model of trilateral relations. As observed by the authors, the thesis of triple helix is based on the idea that the university plays a more important and active role through the process of innovation, to fulfill the function of transfer of knowledge and technologies to society.

2.2 INTERACTION ICT-COMPANY

The relationship with universities is considered one of the most effective means of obtaining technological innovation by the organizations (Rbehold, 1998). Through the knowledge generated in research institutions, companies have the possibility to meet their needs in developing products, services and improving processes, as an alternative to an internal investment research that, in many cases, is unfeasible due to the level of investment required.

According to Plonski (1995), companies realize this cooperation as a means to provide solutions for complex and multidimensional activities, as

occurs in innovation. In this way, the author reported that organizations seek: to train and specialize the human resources; to obtain support from consultancy for the improvement of quality and productivity; adapting itself to the requirements of consumer and environmental preservation law; and develop new products and processes. In addition, they also seek to gain privileged access to recruit and select new talent.

To Plonski (1998), the term "Cooperation university-company" involves several actors. The "company" is usually a legal person, from transactional applications to micro-enterprises, but it can be a natural person (inventor), an informal company or cooperative. On the other hand, the term "university" represents Higher Education Institutions, such as universities, university centers or colleges solely, public or privates. It can also be an entity contracted or associated with them, such as hospitals, research institutes, foundations and junior companies.

Therefore, the two main actors in this respect are the companies and, on the other hand, the universities, which play an important role in this process. Especially because, according to Marcovitch (1999), so that the cooperation takes place in ideal terms, it is necessary that the university contributes effectively in the modernization of the production processes.

In this sense, the author emphasizes the importance of the role of the university with respect to (1) formation of frames (under graduation) for the market, first level of university-company interaction; (2) the importance of the role of the *stricto sensu* graduation to innovation, technological advancement and development, differential to the new century to globalized countries; and (3) the need to demystify that the academic researcher is too theoretical and that the employer usually despises the search. Specifically, with regard to undergraduate studies, Marcovitch (1999, p. 13) says that "being the main support for the development of production, scientific and technological research in our country, the public system of research, fruit of the graduate program, has fulfilled its role, despite of its notorious difficulties".

Conceptually, Plonski (1995) defined the university-company cooperation as an institutional arrangement, made up of organizations from a distinct nature. This arrangement has several formats and purposes,

ranging from subtle interactions, as it occurs in the apprenticeships offering, up to more intense bonds, as in large programs of cooperative research. In addition, Costa et al. (2010, p. 110) defined it as:

> Formal cooperation of companies with universities and research institutes, with the purpose of promoting incremental or radical improvement, in products or processes, transfer technology or provide specialist service, formalized through an agreement, contract or other legal instrument that defines the goal of the research and establishes the responsibilities of the parties, even though in a generic way, and indicates a timeframe for it to be completed.

The process of cooperation can achieve high complexity, since it offers a variety of formats and purposes and, in addition, it may take variations in degrees of relations between the parties. In this sense, Segatto-Mendes and Sbragia (2002) emphasizes the need to segment the process in stages (Figure 1), so that it is possible to perform a more appropriate analysis, thorough and profound in every aspect considered.

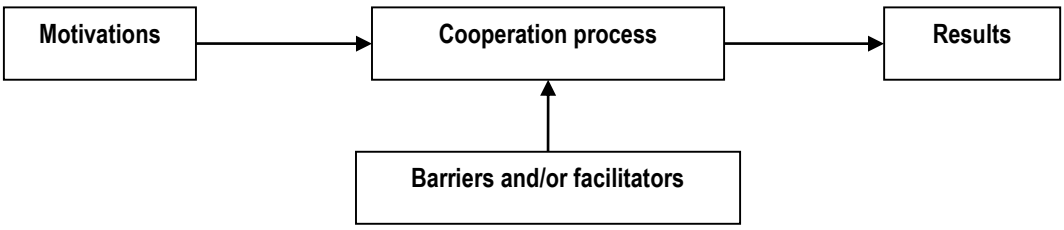


Figure 1: Theoretical model of the process of cooperation university-company

Source: Seggato-Mendes and Sbragia (2002)

This model proposed by the authors, that arises from the theoretical structure of bonaccorsi and Piccaluga (1994), identifies the different stages of the process of interaction that is related to different aspects at different times. The motivations to the process are the initial phase and, during the process of cooperation, there is the influence of facilitators and/or barriers that influence and determine the outcome of this interaction. It is worth noting that, according to the authors, understanding the motivations is essential so that you can compare, in a second moment, the results achieved, which permit a more appropriate and comprehensive analysis of the process. For the purposes of this research, it will be given focus to the

first part of the process, seeking to better understand the issues related to the motivations of the companies to establish partnerships.

In a study conducted by Costa (1998), the reasons why companies seek to establish partnerships were: to enhance investments; improve technological support; organize the production on a global scale; associate the technological dimension to the economic performance, based on scientific knowledge. For this reason, they seek: Qualified Human Resources, technical support of excellence and access to laboratories, to accompany the scientific and technological events. Segatto-Mendes (1996) lists the companies' motivations to establish relations:

- lack of human resources to develop their own research;
- access permission to the scientific frontiers of knowledge;
- access to university resources (laboratories, libraries, instruments, etc.);
- re-education of the time needed for the development of technology;
- license to exploit foreign technology can be an expense far higher than hiring university research;
- existence of previous research by means of cooperation which obtained satisfactory results;
- contact the university environment, which allows you to encourage scientific creativity of P&D employees;
- sharing of the risk;
- improvement of the public image of the company through relationships with universities;
- identification of students for recruitment/selection.

It is worth mentioning, according to Segatto-Mendes (1996), that there is also a concern with regard to the public image of the organizations, a contemporary and distinct look from the traditional reasons why companies seek partnerships. Additionally, Bonaccorsi and Piccaluga (1994) listed the motivations (Table 2), depending on the findings of Costa (1998) and Segatto-Mendes and Sbragia (2002).

Motivations for companies	
Gain access to the scientific frontier	Get early access to the scientific break points; Obtain information about the state of the art; Keep multiple directions of research under conditions of pre-paradigmatic technology; Recruitment of highly qualified human resources already qualified in research activities in technologies in state of the art; Give the internal researcher staff the opportunity to exchanges of high scientific level and stimulate creativity of internal resources of R&D through exposure to academic research; Keep an "open window" on basic pure research (not guided); Benefit from occasional, unexpected discoveries, typical of research activity; Build centers of excellence; Make the access to knowledge more difficult for competitors.
Increase the capacity of prediction of Science	Stimulate the development of mathematical modeling for the activities of creation and troubleshooting solution; Separate and share selected activities with the aim of exchanging technical data; Get training and support to develop internal skills.
Delegate activities of selected development	Share risks; Decreases costs; Solve problems occurring in industrial projects; Avoid investments in heavy equipment that will have low utilization rates; Gain access to large scales of experimentation and testing.
Lack of resources	Gain access to university facilities (laboratories, instrumentation, library); Reach the scale of efficient management of facilities for research; Get quick access to new areas of knowledge; Improve the image of the organization.

Chart 2: Motivations for companies

Source: Bonaccorsi and Piccaluga (1994, mentioned by Reis, 1998)

According to Bonnacorsi and Piccaluga (1994), the block of motivations "Get access to scientific frontier " represents the most relevant under conditions of reliance on technology and scientific state of the art, representing the increased importance and the number of multidisciplinary research. Thus, they report that the maintenance of close relationships with universities must be part of a strategy of technology and research and development of companies.

3 METHODOLOGICAL ASPECTS

According to Vergara (2009), the research is classified as to the ends and the means. As for the ends, it is a quantitative-descriptive study that, according to Marconi and Lakatos (1996, p. 86), "it consists of investigations of empirical research whose end is the design or analysis of the characteristics of facts or phenomena". Gil (1998) adds that the descriptive research also exposes the characteristics of a population. As to the means, the research is characterized by being: literature, by having a consultation phase to books, journals, proceedings, theses and dissertations; *desk research*, with the consultation of other sources of information; and field, by carrying out a survey of primary data with the respondents.

The research universe corresponds to the companies comprising the National Association for Research and Development of Innovative Companies (Anpei), which currently has 151 member companies. They are medium and high technological intensity companies, belonging mainly to the sectors of technological services (19%), chemicals (13%), machines and equipment (12%), Electronics (7%) and auto parts (7%); more than half (55%) is large companies (over 500 employees); the majority (26.5%) is national capital origin and, together, totaled R$ 10 billion in investment in r,D&I in Brazil (Anpei, 2015).

The sample was of the not probabilistic type, by accessibility to *e-mails* of representatives from such organizations. As a criterion for qualification, companies should have, or already have maintained,

partnerships with ISTs and universities. The amount of affirmative answers obtained was 38 companies, totaling 25.2% of the universe.

Issues with closed-ended questions were elaborated, with the following parts: characterization of the respondent and the company, with 23 questions; motivating factors, with 26 questions. This last part of collection instrument was built based on the classification of the four motivating factors for businesses proposed in the thesis of Porto (2000, p. 74-75), namely: Research and development; technology; product/market; social contribution. These were adapted to the objectives of the present study, being presented in the form of Likert scale of four points. The respondents were exposed to 23 affirmative sentences.

Since this is a *survey* (*levantamento*), the method of primary data collection occurs through the application of self-answered questionnaires (Hair Jr et al., 2007). According to Martins and Theóphilo (2009, p. 60), the survey is appropriate for the "cases in which the researcher wishes to answer questions about the distribution of a variable or relations between people's characteristics or groups, as it occurs in natural situations". Thus, this research strategy is appropriate for the purposes of this research.

For data collection, it was prepared an electronic questionnaire (*e-survey*), whose access was sent to respondents by email, with the availability of the *link* to the respondents. For treatment and analysis of the data, we used the tools in Microsoft Excel (dynamic table, graphics), seeking to analyze the frequency of responses and highlighting possible associations among the variables studied.

4 PRESENTATION AND DATA ANALYSIS

4.1 RESPONDENTS:

It was obtained a total of 38 questionnaires, whose majority of respondents belong to the male gender (84%). With regard to age, eight respondents have age below 30 years; eight, between 31 and 40 years; 13 between 41 and 50 years; nine above 51 years, indicating a degree of seniority of professionals.

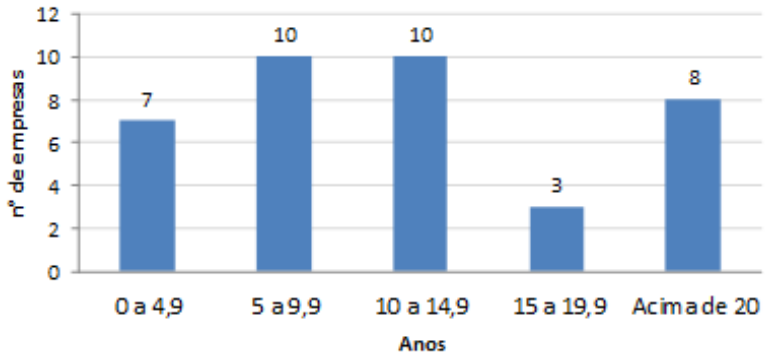
The prevailing major area is the Engineering (32 respondents). With respect to professional experience, eight are in the range of 0-10 years; 12, between 11-20; 15, between 11-20; and three above 30 years. It is noteworthy that 15 respondents said to have specific experience in the relation between universities/ISTs and companies, whose average time is 11.3 years in this type of activity.

With respect to schooling, 75% has graduation and only 5% have incomplete university degree, indicating, in this way, a high level of qualification of respondents. This indicator can be explained by the position they occupy in organizations - more than 60% of respondents occupy managerial levels or above.

With respect to the functional area, 15 respondents belong to the area of research and development; seven, to sales and exports; four, the production area; three, the supply of services. In addition, the following areas were also mentioned: corporate governance, corporate projects, marketing, information technology, instrumentation and innovation management.

4.2 COMPANIES

The organizations represented have been operating in Brazil for a long time: Ten for at least 50 years; 13 between 40 and 50 years; ten, between 10 and 20 years; and five, for fewer than 10 years. With respect to the interaction time between universities and ISTs, more than half of the sample (55%) maintains this type of cooperation for more than ten years (Chart 1).



Graph 1: Duration of partnerships with ISTs

The main operation sector of the companies surveyed is the automotive (12 companies), followed by the telecommunications, media and technology (four companies), representing two sectors whose products have a high added value due to the innovation and technologies

Table 1: Interaction time by sector

Sector (number of companies)	**Years** (average)	**Sector** (number of companies)	**Years**
Automotive (12)	12,5	Aviation (1)	42
Technology, media and telecommunications (4)	8.5	Civil Construction (1)	1
Cosmetics (3)	9	Education (1)	3
Services (3)	11.7	Internet (1)	5
Food (2)	4.5	Mineration (1)	15
Energy (2)	30.0	Petrochemical (1)	10
Others (3)	7.0	Machine and equipment (1)	6
		Chemical (1)	5
		Siderurgy (1)	15

With regard to the size of the companies, ten have up to 500 employees; 11, 501 to 2,000; and 17 have more than 2.000 employees. These data demonstrate that large companies predominate, a fact that can be seen in the annual billing: 25 earns more than 60 million reais of gross operating revenues. In their majority, they are private companies (34), whose capital controller is practically equivalent between the national capital (17) and foreigner (16).

With respect to the legal personality of the universities and ISTs with which the companies keep relationship, 19 is open to the public and 16 is mixed (public/private). We notice that it is low the incidence of institutions of entirely private nature (3).

Almost half of the company's exports products or have already implanted innovations originated from partnerships in the country with

universities/ISTs in subsidiaries abroad and, in addition, five intend to perform this type of transfer.

The majority of companies (25) says to keep some kind of formalized structure to deal with the partnership, while 12 do not do it. With regard to the purposes of the partnership, the researched companies seek primarily to create innovation in products and/or process (28 and 29 respectively), being the search for innovation in services less often.

Out of the 21 companies that adopt partnerships for at least 10 years, 17 (81%) has formal structures to deal with this type of partnership, such as departments or normative instructions. Out of the 17 companies that adopt partnerships for less than 10 years, eight (48%) keeps these structures.

4.3 MOTIVATING FACTORS

To meet the objective of the research, which is to prioritize the reasons that lead companies to the decision to establish partnerships with ISTs, the results are presented according to the following categories: Research and development, technology, product/market and social contribution.

4.3.1 Research and Development

According to the results of the study (Table 2), the main reasons that made the companies surveyed to establish relations with ISTs were: the search for new sources of creativity, access to skilled labor and training of human resources. It should be noted that these three factors had the greatest results, both in sorting by the number of answers "I agree totally" (CT), as the sum of the answers "I agree totally and partially agree " (CP). In addition, they showed a low number of disagreement, representing, in this way, the three main reasons for this category.

Table 2: Category Research and Development sorted by CT

Category	Results						Item
	CT	CP	CT + CP	DP	DT	DT + DP	
Research and Development	25	10	35	2	1	3	Search for new creativity sources
	21	16	37	1	0	1	Access to qualified labor
	21	15	36	1	1	2	Qualification of your human resources
	19	11	30	8	0	8	Reduction of development time production/ process/service
	12	16	28	7	3	10	Access to the University facilities
	10	13	23	6	9	15	Access to the government financial resources
	7	15	22	10	6	16	Decrease of internal expenses with R&D
	5	25	30	4	4	8	Decrease of the risks involved in R&D
	4	18	22	12	4	16	Sharing of the R&D installations

Legend: CT - Totally agree; CP - Partially Agree; DP - Partially disagree ; DT - I totally disagree

It should be emphasized that the factors "reduce the internal expenses with R&D" and "share their installations of R&D' had the lowest values with respect to the sum of the responses of agreement, and larger in relation to the sum of the responses of dissent, " I totally disagree " (DT) and "I disagree partially" (DP), which indicates that not all surveyed organizations seek cost reduction or structures sharing.

4.3.2 Technology

With regard to the technology category, the two main reasons are the strengthening of its technology and the acquisition of new technologies that, according to the Table 3, were the items with the highest levels of agreement, total sum of TC + CP and lower values of dissent.

Table 3: Technology category, sorted by CT

Category	Results						Item
	CT	CP	CT + CP	DP	DT	DT + DP	
Technology	26	8	34	4	0	4	Technology Enhancement
	24	12	36	2	0	2	Acquisition of new technologies
	18	12	30	6	2	8	Access to technical support of excellence
	13	17	30	7	1	8	Obtaining specific information
	11	18	29	8	1	9	Resolution of a specific problem

Legend: CT - Totally agree; CP - Partially Agree; DP - Partially disagree ; DT - I totally disagree

It should be emphasized that, to analyze the set of responses of TC + CP, all of them found a high level of agreement (at least 29 or 74%), which means that the technology category is an important reason for companies to establish partnerships with ISTs. It should also be noted that, among the items analyzed, to obtain information or to resolve specific problems were the reasons which showed lower frequency (CT).

4.3.3 Product/Market

In this category (Table 4), the factors that presented greater number of responses CT were "obtain *expertise* in technologies to the market" and "Develop new products", which also had the highest levels of agreement (CT + CP) and, consequently, the lower rates of disagreement.

Table 4: Category Product/Market, ordered by CT

Category	Results						Item
	CT	CP	CT + CP	DP	DT	DT + DP	
Product Market	24	13	37	1	0	1	Obtaining technologies for the market
	20	12	32	5	1	6	Development of new products
	11	16	27	9	2	11	Optimization of your processes/products/services
Product Market	10	18	28	7	3	10	Increase of market participation
	5	18	23	10	5	15	Obtaining access to new markets
	6	12	18	12	8	20	Improvement of client attendance
	2	15	17	12	9	21	Obtaining standardization of products/processes/services

Legend: CT - Totally agree; CP - Partially Agree; DP - Partially disagree; DT - I totally disagree

On the other hand, the factors with the lowest levels of agreement were "Improve your customer service " and "Get standardization of your products, processes and services".

4.3.4 Contribution Social

In this category (Table 5), the factors that obtained the highest levels of agreement were "obtain prestige and improve the image" and "contribute to the good community relations ".

Table 5: Social contribution category, sorted by CT

Category	Results						Item
	CT	CP	CT + CP	DP	DT	DT + DP	
Social Contribution	11	13	24	10	4	14	Obtaining prestige and image improvement
	10	12	22	12	4	16	Contribution for the good community relationships
	6	19	25	9	4	13	Improvement of image for large audiences
	5	11	16	15	7	22	Resolution of environmental problems
	4	12	16	11	11	22	International transfer of technologies

Legend: CT - Totally agree; CP - Partially Agree; DP - Partially disagree; DT - I totally disagree

It is observed that there was a high rate of disagreement (DT+DP) with respect to the resolution of environmental problems and with respect to the international transference of technologies, compared to the concordances (CT+CP), indicating, in this way, there is greater interest on the image, reputation and relationships with the community in comparison to environmental issues and technology.

4.4 DISCUSSION

From the results obtained by the questionnaire, it was possible to list the main factors that lead companies to seek partnerships with ISTs and university.

For data analysis and interpretation, it was used the study of the frequencies, based on the percentage of responses indicated. For that, the responses I agree totally (CT) and I totally disagree (DT), were considered as a criterion. The largest results obtained of concordance (CT) are presented in percentages in the table 6.

At the top of the hierarchy of the reasons is, within the category Technology, the adoption of partnerships to search for the strengthening of

technology from the company itself, with a concordance of 68% of the respondents. Of all the sample surveyed, no company replied that disagreed completely with this statement. This fact corroborates the statement of Reis (1998) that this type of partnership is an important source of access to technology and innovation.

Secondly, it is the search for new sources of creativity, within the Research and Development category. With respect to the first motivational variable presented, there is a discrepancy of 3%.

Following, it is found at the same level of acceptance the variables that contain the search for new technologies, both in terms of the obtaining of the technology itself (Technology category) as well as the *expertise* to deal with this new technology (category product/market) It should be noted that again there was no rejection on the part of any company to these variables (DT = 0%), reinforcing, again, the statement of Reis (1998).

In fifth place, the access to skilled labor appears with an index of concordance of 55% among the respondents. With these same percentage is the training of human resources of the company itself. The difference to classify one as a fifth position and the other as 6th is the percentile of rejection of 3% of the latter variable. Both variables are within the Research and Development category. This fact corroborates the claims of authors such as Bonaccorsi and Piccaluga (1994), Segatto-Mendes (1996), Costa (1998) and Porto (2000), that this type of relationship is an important means of training, recruitment and access to qualified human resources.

Finally, and in seventh position, is seeking partnerships with the purpose of developing new products within the product category /Market. This variable, as well as all the first ones, presents an index of agreement of more than 50%.

Table 6: Main motivating factors

Position	Variable	Category that it belongs	Percentage of answers	
			CT	DT
1st	Strengthen your technology	Technology	68%	0%
2nd	New sources of creativity	Research and Development	66%	3%
3rd/ 4th	Obtaining *expertise* in technologies for the market	Product/market	63%	0%
	Acquire new technologies	Technology	63%	0%
5º	Access to qualified labor	Research and Development	55%	0%
6º	Qualification of your human resources	Research and Development	55%	3%
7º	Developing new products	Product/market	53%	3%

The results presented in Table 6 allow you to observe that all these motivations concentrate more than 50% (20 respondents or more, in absolute terms) of the responses of total agreement.

The data show that the factors presented had a high level of acceptance among the interviewees. This result is corroborated by the fact that, among all the first seven reasons for the adoption of partnerships, at most 3% of respondents replied that they disagreed completely.

Through these findings, it is possible to observe that organizations have characteristics of open innovation, where the center for research and development is not restricted solely to the internal department of organizations, but also count on external R&D, which is able to generate value to organizations through the involvement of partnerships and cooperation agreements.

It should be noted that, although authors such as Bonaccorsi and Piccaluga (1994), Segatto-Mendes (1996) and Porto (2000) indicate that the social reasons are also considered in the search for partnerships with ISTs, the findings of this research pointed that this is, among all categories, the one with lesser importance in the respondents' opinion.

This fact can be proved, because for no questions in this category, the percentage of "I totally agree" got a percentage of responses to reach at least 30% of responses. On the other hand, it was possible to verify an index greater than "I partially disagree" and "I totally disagree" in relation to other categories, which indicates a strong evidence that organizations still do not have as a main reason for establishing partnerships that fall in this category. In this way, this finding deserves a detailed study to understand the reasons and characteristics of this phenomenon, since issues such as social and environmental responsibility are current and widely discussed and spread in society.

5 FINAL CONSIDERATIONS

In the present study, the objective was to classify the main factors that lead companies to adopt partnerships with Institutes of Science and Technologies (ISTs) and universities. Among a number of variables collected from literature review, you can identify seven as being the most relevant: strengthening the company's technology, seeking new sources of creativity, obtaining *expertise* in technologies to the market, the acquisition of new technologies, access to skilled labor, human resources training and development of new products.

In general, the results indicate that companies that adopt partnerships with ISTs and universities seek strongly to establish such relationships aiming at the opportunities and technological improvements. On the other hand, it is the discovery that motivations aiming at social contribution are proved to be little relevant.

As limitations to the study, it must be highlighted the little representative sample of companies that keep partnerships with ISTs, fact which does not allow generalizations. In addition, depending on the size of the sample, the responses were all analyzed aggregately, not allowing the achievement of specific analyzes for subgroups, as an example, ranking the motivational factors for certain sectors of the economy.

For future research, we suggest that the study with companies from specific sectors to describe the specific profile of their needs/motives.

Another point which can be further investigated concerns the category Social Contributions, since the companies pointed as being the item of lesser importance compared to the other categories analyzed.

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