

Education, research and practice between higher education institution and business entity

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Abstract

Integration between academy and business may produce mutual benefits, and improves a country's competitiveness. This paper, relating education-research concepts and business practices, has studied - grounded on Regional Strategic Plans and the 2011-2020 Graduate Courses National Plan guidelines – the scientific knowledge integration process existing between business companies and one higher education institution located in the *Greater ABC Paulista* region. An analysis of this relationship has pinpointed the major barriers to optimizing such partnership, such as access to resources, low credibility of the University-Corporation relationship, the acknowledgment of regional constraints, and the mismatch between academic thought and the actual corporate life.

Keywords: Graduate Courses National Plan. Greater ABC Paulista. Higher Education Institution. Corporate Entity. Education. Research. Practice.

Introduction

Brazil appears before the international community in the early 21st Century as a member of the BRICS – a group of countries in a fast development stage, which also includes Russia, India, China, and South Africa as members – being Brazil the sixth largest economy on Earth (PNPG, 2010). Costa and Cunha (2001) noted that the globalization process and the knowledge-based society led social organizations in charge of promoting economic development to shorten products' life-cycle, leading to the programmed obsolescence concept, a feature of the contemporary consumers' society. This fact alone reveals changes in major economic segments, having repercussions in the world geopolitics, and impact on different society sectors, including the educational system, which comprises higher education, as highlighted by the 2011-2020 Graduate Courses National Plan (PNPG, 2010).

According to Dossa (2010), the path to a country's social and economical development includes its ability to develop innovations. According to studies by the Science and Technology Development National Council (CNPq) of the Ministry of Science, Technology, and Innovation (MCTI), in most countries the maturity of the

innovation system is linked to the investment in Research and Development (R&D), and to the volume of Intellectual Property generated (CNPq, 2012). In Brazil, according to CNPq (2012), both the level of innovation achieved in the manufacturing industry and the investment in Research and Development (R&D) are very low, in comparison to the evolution of the Gross National Product (GNP), which measures the Brazilian economy growth, showing that corporations dump the burden of producing innovation applications and patents on universities.

The 2011-2020 National Graduate Courses Plan seeks, through its guidelines, to promote synergy and to nurture the integration of graduate education with the business sector and society. This paper, by connecting the education-research and business practice concepts, shows from the realistic stance of the Greater ABC region, and the 2011-2020 National Graduate Courses Plan, the process of integrating the existing scientific knowledge between the corporate entities (CEs) and universities. In the regional strategic planning scenario, the Greater ABC region highlights new structures and public management, featuring production hubs and development agencies, such as the Economic Development Agencies, the Greater ABC Regional Chamber, and the Greater ABC Intercity Consortium, all of them focusing, as a priority, the sustainable and cooperative regional integration, in a way to optimize the different regional possibilities for the social development and economic growth of this region.

This paper covers the accomplishments by a private higher education institution (HEI) and the business practice of the corporate sector represented by a class association (a corporate entity), analyzing how these players are managing to overcome detected obstacles, such as restrictions to the interaction between them in the process of converting knowledge into social wealth. This paper focuses on the previously mentioned peculiarities in analyzing this subject: (i) the education-research concept and business practice from the reality standpoint in the Greater ABC area; (ii) the education-research concept and business practice seen through the guidelines in the 2011-2020 National Graduate Courses Plan; (iii) the process of integrating the existing scientific knowledge between a Corporate Entity (CE) and a higher education institution (HEI) in that same region. The set of issues proposed and discussed in this paper is broken down and supported by other studies, such as those carried out by the Brazilian Society for the Progress of Science (SBPC) Work Group and by the Coordination for the Improvement of Higher Education Personnel Foundation (CAPES 2012a; 2012b).

The key question is: What is the current mutual and two-way integration strategy for scientific knowledge development existing between a HEI and a CE in place within the Greater ABC region? As a general goal, the intent is to determine its likely existence, and then to qualify the current mutual and two-way strategy for scientific development, existing between a HEI and a CE in the Greater ABC region. The specific objectives of this work are: a) to understand what are, and how are formulated, the strategies proposed by a higher education institution and the corporate practice, b) to analyze how these focused players are overcoming the barriers identified as constraints to the interaction between them in the process of converting knowledge into social wealth.

Technical Basis

Proposals in the 2011-2010 National Graduates Courses Plan

This part of the study considers the proposals made by the 2011-2020 NGCP (PNPG, 2010) and confront them with the views introduced in recent studies about the relationship between Science, Technology, and Innovation (ST&I), and the consequent contribution the

2011-2020 NGCP proposes for the university-business (U-B) relationship, aiming to develop knowledge and deploy it as social wealth for Brazil. The Plan, published by CAPES, had as its objectives to set guidelines, strategies, and goals to keep progressing with the proposals for a graduate studies and research policy in Brazil (PNPG, 2010, p. 2). This work was supplemented by others within the scope of the Ministry of Education and Culture (MEC) and other government bodies developing a new National Education Plan (PNE), which shall indeed integrate, for the first time, the proposals presented in the NGCP, requiring substantial coordination of such proposals and activities in these plans, together with the strategies proposed by universities and the Brazilian business sector practices, in the process of converting knowledge into social wealth. The 2011-2020 NGCP (PNPG, 2010) was to include a strong continuity component, compared to the previous plans, in managing and conducting academic activities in relation to the scientific community participating as one of the central players in the conversion of knowledge into social wealth..

Therefore it becomes important to establish the U-C relationship in a way to improve the academy action in its education and research proposal, while benefitting companies in their search for innovation, so supported by the universities, thus establishing a true partnership in the U-C relationship. This topic in the present paper is completed by presenting what are, at the kernel of the 2011-2020 NGCP, the proposals for, upon facing the scenarios hitherto introduced, ensuring the articulation, depth, improvement, and optimization of the U-C relationship, from the academic standpoint: (i) develop strategies to improve the quality of education at all levels; (ii) create new forms to insert in the marketplace youngsters with technical secondary or non-degree college education; (iii) stimulate and promote the intake of Masters and Doctors by companies; (iv) significantly expand Brazilian graduate courses with emphasis in engineering and technology areas; (v) stimulate, during graduate courses, an agenda to develop talents focused on global competitiveness; (vi) support initiatives in graduate courses including an enhanced U-B integration.

The Greater ABC Paulista region

The terms “ABC Paulista”, “Greater ABC Paulista region”, or simply ABCD, are commonly used to designate a territory comprising seven towns located in the Southwest part of the São Paulo Metropolitan Region: Santo André (A), São Bernardo do Campo (B), São Caetano do Sul (C), Diadema (D), Mauá, Ribeirão Pires, and Rio Grande da Serra.

The towns that currently make up the Greater ABC area have undergone, over time, several changes in their geographic boundaries (KLINK, 2001, p. 87). Presently the region has approximately 2.6 million inhabitants, with a population density index of 4,000 habitants per sw.m², the towns of São Bernardo do Campo and Santo André having the largest populations, respectively 774,000 and 680,000 habitants (IBGE, 2012).

Two other data sets that may be observed are: Population growth in age brackets above 30 years, and population decline below this age, within the time periods considered, which indicates an increase in the average population age. It is further observed that in the age range prone to opening a business, the factors above are noticeable, which may guide in setting U-C relationship goals based on reaching a larger and more mature population, which will require education and training of manpower within the regional enterprise. Characteristics like life expectancy, percentage of households served by public water & sewage utility, illiteracy rate, and years of schooling of inhabitants in that region, if compared to nationwide figures between 1991 and 2000 are at least the same, or higher than

the regional ones, those for the São Paulo State, and well above the Brazilian nationwide averages, showing educational and life quality level above the national average, which may favor the mid- and long-range return on social, educational, and business investments in that region.

The local Gross Domestic Product GDP corresponds to 2.43% of Brazil's GNP, and 7.21% of the São Paulo State's GDP. The regional illiteracy level is around 8%, while the national index is close to 17%. On top of all these, it is worth mentioning that the regional *per capita* income is twice the nationwide average, ranking this region as the third consumer market in the entire country (Alves, 2012).

This brief appraisal of the region fits within historical, economical, and social metrics, demonstrating the great regional momentum, characterized by the fact that three of the seven towns that make it up are among the best in Brazil, thanks to direct management by various sectors of society (Alves, 2012). Therefore, this regional analysis must consider the existence of both universities and entrepreneurs interested in the development of such hubs. Barbieri (1994) reminds us that the essential condition to develop technology centers is the existence of high level universities that provide specific scientific know-how applicable to the regional state of affairs, such as the vicinity of access ways, consumers, infrastructure, and political goodwill from the different regional players.

Methodology

This research is exploratory by nature, as it proposes to investigate the U-C relationship. The constructs explored by Betts and Santoro (2011) were used, i.e. intellectual property, management, communication and trust between the players in this process. Analysis included the understanding of a HEI in the Greater ABC region, as well as of a Corporate Entity (CE) that focused and had impact on the regional development, however not necessarily having facilities within the Greater ABC region. This research, according to Lee (1999) is characterized by allowing the use of the in-depth individual interviews techniques, with liberty in leading. One interpretation of this may be found in Yin (2010), showing that the case study, albeit a linear process, is interactive.

This research is focused on the U-C relationship through the case study of a partnership involving a HEI in the region, viz. FEI (Faculdade de Engenharia Industrial), one CE, and the FIESP (São Paulo State Federation of Industries). Using the case study methodology, it will be possible to confront the strategies proposed by universities and the practice in the corporate sector to analyze how they are managing to overcome the barriers identified as constraints to mutual interaction in the U-C, in the regional social and economic development. The targets chosen were the people in charge of the research and development fostering area at FEI, who had attempted to develop both academic activities and relationships with corporate entities in the Greater ABC region. FEI was chosen on account of its recent R&D initiative, used to add new ideas to human knowledge, being strongly engaged in the process of institutionalizing and consolidating strategic research lines, which may support the social, economic, and environmental development of the region where they are located and, ultimately, of the entire country. Regarding the CE, the choice was to survey the people in charge of R&D Foster Groups at FIESP, an overarching entity that pools together and represents countless companies in the region, and that has been working hard to establish U-C links within the Greater ABC. The DEMPI (Micro, Small, and Mid-sized Manufacturing Industries Department) of FIESP (2012) developed agreements with 25 higher education institutions, associations, and research institutes, with the intent of connecting and promoting the integration of partnered institutions with the

small and mid-sized companies, named University-Company Interaction Program.

Two types of data collection questionnaires were prepared, based on technical benchmarks. The first questionnaire is focused on the academic scenario, and aims to understand the U-C relationship from the standpoint of the selected HEI managers. This questionnaire tries to understand the paradigms surrounding the E-C relationship which, according to Betts and Santoro (2011), fall into four analysis code: Intellectual Property, Management, Communication, and Credibility in this same research unit. Likewise, another questionnaire is focused on everyday corporate life, having been developed to capture the stance of companies regarding the U-C relationship, relative to the same four levels of study to be surveyed at educational institutions, and hence understand the cross-views of the players in this process. The two types of questionnaires mentioned above were used as interviewing script, and asked to the person in charge of the management and technology development unit.

Results Presentation and Analysis

Presentation of the Units Researched

According to Bardin (1977), at this stage it is necessary to know the reason why an analysis is to be done, and say it explicitly in order to determine how the analysis will be done. This is why accurate hypotheses are required, as well as framing the technique within a theoretical framework. Next, according to Bardin (1977), the analysis procedures should be analyzed around a categorization process. The set of categories that should have our attention comprises: (i) mutual exclusion – to prevent ambiguities; (ii) homogeneity – of the different categories to be established; (iii) pertinence – adaptability between the material for analysis and the theoretical framework established; (iv) objectivity and truthfulness – related to the material gathered; (v) productivity – obtaining fertile results from inferences, hypotheses, and data. Based on the analysis of the responses it will then be possible to prepare the final report, with the shall inferences data interpretation, may indicate.

FEI-SBC (Faculdade de Engenharia Industrial – São Bernardo do Campo)

As previously explained FEI (Faculdade de Engenharia Industrial) was chosen for its recent R&D activities development work, also connected to regional issues, developing the U-C relationship to support the social, economical, and environmental development mostly in the Greater ABC Paulista region, where it is located, and ultimately to the entire country.

This higher education institution therefore undertakes the important role of producing knowledge in an unbiased fashion, disconnected from any private interest, aiming at the fair and sustainable development of society. At FEI, the interviewee was the Deputy Dean for Outreach and Community Activities, hereon DD-FEI. The interview took place at the Dean's Office building in São Bernardo do Campo – SP, on October 19th, 2012, and the full transcript of this interview provided inferences on what was shown by the interpretation of data.

FIESP (Federação das Indústrias do Estado de São Paulo)

For the Corporate Entity, the choice was to survey with the people in charge of the R&D Foster Groups at FIESP, an overarching entity that pools together and represents countless companies in the region, and which has been working hard to establish U-C links within the Greater ABC, having established partnerships with many HEIs in the region. At FIESP, the interview was done with the Companies Support Coordinator and Head of Agreements with Universities, and his Assistant, hereon referred to, respectively, as COORD-FIESP and ASST-FIESP. The interviews took place at the FIESP headquarters building in São Paulo –

SP on September 26th, 2012, and the full transcript of this interview provided inferences on what was shown by the interpretation of data.

Data description and analysis

Based on the analysis of the responses it was possible to prepare the final report, which provided inferences on what data interpretation may indicate. Exploration of the documental material followed the analysis of the existing bibliography on the subject, based on the following analysis fronts: education, science and technology infrastructure, and Brazilian strategic sectors, confronted with the 2012-2020 National Graduate Courses Plan; the education-academic research integration with corporate practice in the actual regional scenario, confronted with the Strategic Regional Plan for the Greater ABC Paulista; the technical concepts; the drivers and decision-makers of the strategy process in organization.

On its turn, the exploration of the interviews followed the focused analysis of the U-C relationship from the study of the partnership between one HEI, in this case, FEI, and one CE, in this case, FIESP. The issues covered in the interview tried to approach each of the major aspects highlighted in the documental material analyzed. The set of questions in both questionnaires was focused on the proposals in the 2011-2020 NGCP and the Regional Strategic Plan around the regional scenario found in the geographic area drawn, as well as in the strategic issues in the U-C relationship. From there, it was possible to compare the documental material obtained in the three analysis fronts with the answers to the questions posed, in order to gather factual evidence on the processes related to the generation of intellectual property, management of the U-C relationship process between the parties, and mutual credibility and trust.

Content, context, process, and strategic alignment of the surveyed entities

This work proposes that the survey made at the chosen University and CE chosen will clarify the search for individualized answers by sector, within the fronts stated by such survey, specifically:

- The definition of the strategic process of establishing, acknowledging, and controlling patents and intellectual property in the U-C relationship.
- The strategic definition of the two-way U-C relationship managers or leaders.
- The strategic definition of the E-C communication process.
- The value of credibility and trust between academic and corporate managers.

One interpretation covering all these four fronts may be found in Plonski (1999), who further adds that this strategic communication positioning starts from understanding the scope of both university and corporation concepts under the criteria of interaction, bond, relationship, and, ultimately cooperation between U-C.

Actual scenarios analyzed in the U-C relationship

The report below lists the major findings from the interviews with HEI and VE representatives, in response to the core questions, and will possibly lead to understanding the peculiar features in the U-C relationship, as testimonies regarding each of the aspects considered, and appearing in the technical reference.

- How complex is the managerial challenge in the U-C cooperation?

In this question, the answers were positioned at the formal level of the U-C relationship, and a visible mismatch can be noticed between academic thought and corporate life, as shown below. To this matter, the VR-FEI observed that, at FEI, the existing Research Institute is the entity in charge of this formal dialog, having project models through a

contract for providing services. On its turn, the COORD-FIESP stated that, for FIESP, the relationship with universities occurs as long as it is possible to establish agreements for information and training for company employees.

- How does modern university cooperation work with the corporate sector?

Here, there is a noticeable concern, by both FEI and FIESP, to build connection bridges between their respective realms, however still within a bureaucratic and formal environment.

- How can a mutually beneficial relationship be established between university and corporation?

Answers here were quite objective, focusing on research, innovation, and the development of technology parks by HEIs, while companies are mostly concerned with very-short-term issues in the qualification of manpower for their immediate needs.

- What is the academic/corporate view on the cooperation with universities?

Here both views converged to point that the U-C relationship should reflect an intense and converging mutual cooperation to ensure global competitiveness to both our science and corporate endeavors.

- What are the existing communication channels in the U-C relationship?

Here again the answers converged, and signaled, in the words of the VR-FEI that FEI keeps a good relationship and dialog with companies, which however does not mean that it has achieved the ideal relationship, though some accomplishment has been made. Meanwhile the COORD-FIESP stated, to the same effect, that communication channels between universities and corporations must be based on the current market scenario, however clarifying that there is still a long way to be covered here.

- Who are the relationship leaders on each side of the U-C relationship?

On this count, the aspects covered on the previous question were confirmed and reiterated by both interviewees. VR-FEI stated that this leadership is a business matter. Meanwhile the COORD-FIESP confirmed what had been stated before.

- What legal regulations apply to the research activities carried out by U-C?

On this topic, it became clear that there is an awareness of the problems involving intellectual property issues; however it was observed that legal issues should not be the only consideration here. VR-FEI stated that there is a concern about structuring the university for that, progressing on the existing agreement models with the corporate sector. Meanwhile the COORD-FIESP reminded that industrial property rights still behoove considerable development.

- Is there any lack of credibility in the technology proposal generated in the U-C environment?

Positions here were somewhat nebulous, which could point to the credibility issue in the U-C relationship not being fully understood by the parties, on top of not being a high priority in their agendas.

- What is the academic recognition stimulus for the corporations' technology work and vice-versa?

This topic brought vague responses from both interviewees. Both HEI and CE were unspecific in defining stimuli and recognition for work of each other in generating knowledge.

For reference or further detail, authors are willing to provide the full transcript of the interviews.

Differences in the U-C relationship, as seen by players in the interaction process

Considering that one of the objectives of this research is to analyze how each of these focal players are managing to overcome the barriers identified as restrictive to their interaction in the process of transforming knowledge into social wealth, it is important to highlight some points raised during the interviews, which were not unanimously identified between HEI and CE: need for stronger incentives to research; lack of systematic R&D information exchange in the U-C relationship; wider and better communication of the need for the joint development of scientific activity, to improve competitiveness; identification and investment in multitasking human resources, both in the industry and in the educational institution, by means of formally organized training programs to fulfill this process stakeholders' needs; incentive to cooperation in the U-C relationship, as a way to ensure competitiveness and economic growth; joint efforts to develop regional technology centers matching each location, town, or region's local peculiarities; development and employ of qualified manpower at the different educational levels (technical, undergraduate, graduate, master's, and doctoral), both in the higher education institution and in companies, as a way to conquer and maintain a competitive edge.

Final Considerations

To cap this work, the possible constraints to the research method used are introduced and, considering these very constraints, the major conclusions are presented, as well as their possible developments from this analysis. Considering the specific features of the U-C relationship and the variable of governmental intervention in the sector, on its own this poses constraints to this controversial field of study, based on diverging concepts by their nature and shape, fraught with diversified ideological, social, political, economical and structural standpoints. Another finding that limits the outcomes from this research is related to the fact that the data collected, the analyses done on them, as well as the conclusions taken will be restricted to the cross-section established at the outset, which should not be extrapolated to other situations or either regional or functional relationships. The very methodology used for gathering data, based on descriptive-exploratory research has limitations of its own.

The first among the specific objectives in this study was to understand what are, and how they are formulated, the strategies proposed by higher education institutions and the corporate practice, as well as to analyze how these focal players are managing to overcome the barriers identified as constraints to the interaction between them, in the process of converting knowledge into social wealth. Our study focused the analysis of the relationship between a HES and a CE and, as an answer to the questions posed, it may be considered that: (i) the access to resources, knowledge, and all aspects that complement the U-C relationship may optimize it, minimizing uncertainty in the innovation environment; (ii) the cooperation among different elements of the system contribute to the onset of an environment that favors innovation; (iii) the cooperative generation of science and technology promotes increased credibility in the U-C relationship, thus spreading knowledge and performing its social role in converting knowledge into social wealth; (iv) it is necessary to maintain and increment technology updating, both via research as well as through corporate practices, to preserve and increase competitiveness; (v) the regional features, the upcoming of great urban conglomerates, such as those identified by Klink (2000) as city-regions, should consider integrates regional strategic planning to optimize all

available resources to nurture the U-C relationship, aiming to promote the distribution of benefits to the entire society in that urban space; (vi) regarding strategy, it highlights the influence on regional strategic planning, of all segments of society joining in, with emphasis on those two that make up the U-C relationship, since the generation of knowledge and its transfer to corporate endeavors ensure the stabilizing social factors in society; (vii) a mismatch was noticed between academic thought and the corporate everyday life, producing inefficiencies that have their impact on lost productivity; (viii) the U-C relationship must mirror an intense mutual and converging collaboration to ensure global competitiveness for our science and our corporate endeavors and, furthermore, there are signs to a certain awareness on the importance of improving such relationship; (ix) there is an awareness of the problems involving the issues related to intellectual property, however it was ascertained that legal considerations should not be the only taken into account upon approaching such matters; (x) the credibility issue in the U-C relationship is not well understood by the parties, on top of not ranking high in their priorities.

The other specific objective was to assess the bibliographic production on the issue proposed by academic and corporate entities, that could be used to promote the development in the Greater ABC Paulista, which allowed to identify promotional motivators for the U-C relationship, types of bonds, and outcomes that the literature displayed as typical in such cooperation, having all actors named by literature on the U-C theme being identified, and the academic and corporate proposals were analyzed, serving as a base for understanding the facts dealt with in the previous item on this work's conclusions. One finding on this matter was the interviewees' unawareness of, and even the lack of mention to sector, region, and nationwide documents that regulate, clarify, and provide strategic bases for developing the U-C relationship. Such is the case of the 2011-2020 NGCP and the 2nd NEP, which were practically overlooked in the analyses provided by both HEI and CE.

As a consequence of the possible results from this work, it is supposed that there will be a chance to do additional research and studies with the creation of systematic models for the exchange of information between the E-C relationship managers, under the light of the proposals in the 2011-2020 NGCP, facing the actual academic and corporate situations in the Greater ABC region. Therefore, academic research themes and proposed pathways to solutions may be suggested as they relate to: (i) studying the implications of sector and regional plans in both academic and corporate communities to ensure the accomplishment of innovation and competitiveness goals, according to predicted strategies; (ii) study of the implications of housekeeping management processes in the U-C relationship; (iii) a study determining social needs that may be jointly supplied by academic and corporate sectors; (iv) study of the implementation of public policies that favor the search for and the deployment of knowledge.

In spite of the constraints mentioned, this work attempted to contribute to the understanding of alliances for technology innovation between organizations that differ in their nature, and also tried to better understand the U-C interaction process, to ensure the deployment of knowledge, the distribution of income, and the fair allocation of social wealth in our country.

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