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University-Business-Government Interaction: the case of the Brazil-Singapore Educational Program for Knowledge Transfer

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Abstract

The university-business-government interactions in Brazil reflect the orientation of public policies and models adopted by the National Innovation System, in which the university becomes an important social actor in economic development. When considering the university's role and its relationship with the state and the market, this study analyzes how the configuration of a Triple Helix model occurs in the university-business-government relationship. The qualitative approach uses a case study of an international educational cooperation program for knowledge transfer. Data collection occurred through documents and in-depth interviews that were analyzed using content analysis. The results demonstrate that the configuration of the Triple Helix is laissez-faire. However, it presents an imbalance in the participation of the actors involved. The state government offered support and was limited to regulate and establish the intermediation between the university and the company in an institutional way. The company starred the relationship, taking responsibility for most of the actions that should have been taken by the other actors. The university sought to balance its social and economic purposes by implementing Entrepreneurial University principles in its structure and by managing intercultural obstacles to articulate other partnerships. Among the actions taken are the creation of a research and extension program and a doctoral course focused on the naval industry. This shows that this kind of interaction can promote promote innovation, although incrementally, in the long run.

Keywords: Triple Helix. Entrepreneurial University. University-Business Interaction.

Interação Universidade-Empresa-Governo: o caso do Programa de Cooperação Educacional para Transferência de Conhecimento Brasil-Cingapura

Resumo

As interações universidade-empresa-governo no Brasil refletem a orientação das políticas públicas e modelos adotados pelo Sistema Nacional de Inovação, nos quais a universidade passa a ser um importante ator social no desenvolvimento econômico. Considerando o papel da universidade e, consequentemente, a sua relação com o Estado e o mercado, o objetivo deste estudo foi analisar como ocorre a configuração de um modelo Hélice Tríplice na relação universidade-empresa-governo. O estudo, de natureza qualitativa, faz uso do método de estudo do caso de um programa internacional de cooperação educacional para a transferência de conhecimento. A coleta dos dados foi por meio de documentos, entrevistas em profundidade e analisados com uso da análise de conteúdo. Os resultados demonstram que a configuração da Hélice Tríplice é do tipo *laissez-faire*, no entanto, apresenta um desequilíbrio na participação dos atores envolvidos. O governo estadual teve uma participação coadjuvante e se limitou a regular e estabelecer a intermediação entre a universidade e a empresa de forma institucional, a empresa protagonizou a relação, se responsabilizando por grande parte das ações que deveriam ser assumidas pelos demais atores. A universidade buscou equilibrar suas finalidades sociais e econômicas implementando princípios da Universidade Empreendedora em sua estrutura e administrando obstáculos interculturais para articular outras parcerias. Entre as ações realizadas estão a criação de um programa de pesquisa e extensão e um curso de doutorado voltado à indústria naval. Isso demonstra que esse tipo de interação é capaz de promover, a longo prazo, a inovação, mesmo que de forma incremental.

Palavras-chave: Hélice Tríplice. Universidade empreendedora. Interação Universidade-Empresa.

Interacción universidad-empresa-gobierno: el caso del Programa de Cooperación Educativa para Transferencia de Conocimiento Brasil-Singapur

Resumen

Las interacciones universidad-empresa-gobierno en Brasil reflejan la orientación de las políticas públicas y los modelos adoptados por el Sistema Nacional de Innovación, en los que la universidad se convierte en un importante actor social en el desarrollo económico. Considerando el papel de la universidad y, en consecuencia, su relación con el Estado y el mercado, el objetivo de este estudio fue analizar cómo se produce la configuración de un modelo de triple hélice en la relación universidad-empresa-gobierno. El estudio cualitativo utiliza el método de estudio de caso de un programa internacional de cooperación educativa para la transferencia de conocimiento. La recolección de datos se realizó a través de documentos y entrevistas en profundidad, que se examinaron mediante análisis de contenido. Los resultados demuestran que la configuración de la triple hélice es del tipo *laissez-faire*, sin embargo, presenta un desequilibrio en la participación de los actores involucrados. El Gobierno estatal tuvo una participación secundaria y se limitó a regular y establecer la intermediación entre la universidad y la empresa de una manera institucional. La empresa protagonizó la relación al responsabilizarse de la mayoría de las acciones que deberían asumir los otros actores. La universidad buscó equilibrar sus propósitos sociales y económicos implementando los principios de la universidad empresarial en su estructura y manejando los obstáculos interculturales para articular otras asociaciones. Entre las acciones tomadas están la creación de un programa de investigación y extensión y un curso de doctorado enfocado en la industria naval. Esto muestra que este tipo de interacción es capaz de promover la innovación, aunque de forma incremental, a largo plazo.

Palabras clave: Triple hélice. Universidad empreendedora. Interacción universidad-empresa.

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INTRODUCTION

Beginning with the world economic crises of the '70s and '80s, the principles of *New Public Management* (NPM) arose from managerial reform in the United Kingdom and managerialist precepts designed to combat the politicization of American public administration stimulated this movement to redefine the role of the State. In this manner, an agenda of reforms in response to public debt and the size of the State was elaborated (ABRUCIO, 1997).

Within this context, it was observed that some of the NPM principles could be extended to the domain of scientific policy in some countries along with market logic related to efficiency, results-based management, entrepreneurship and partnerships, and this began to be incorporated in the academic discourse in terms of science and technology policies (ELZINGA, 2010). In other words, the global transformations associated with manifestations of NPM extended to the institutional context of the production of knowledge, which became capitalized (ETZKOWITZ and LEYDESDORFF, 2000) or merchandized – as other authors preferred to define it (ARMBRUSTER, 2008; ELZINGA, 2010), creating a debate full of antagonistic positions in the scientific realm.

Within this context, the assumptions of the *Triple Helix thesis emerged, created by* Etzkowitz and Leydesdorff (1998), which visualizes the university as an inducer of relations with the government and the market. This perspective assumes that the intersection between these institutional spheres makes an environment favorable to innovation possible intermediated by the formation of trilateral networks and hybrid organizations. Thus, science became a strategic area for nations (VELHO, 2011) and the Triple Helix thesis, because it promotes greater closeness among the involved actors, ended up inspiring some national systems of innovation around the world. Its principles were accepted in many countries, including Brazil, influencing public policies directed towards a national system of innovation and altering institutional arrangements between universities, the market and government (DAGNINO, 2003).

In parallel, innovation systems were created as a source of national strategy to face global competition, and beginning in 2004 some initiatives were introduced to spur the resumption of economic growth, through acceleration programs designed to attract external investment in an attempt to revitalize sectors. Added to this were local content policies designed to guarantee that a portion of production would be destined to Brazilian industries (MACHADO NETO, 2012). The naval industry was one of these federal government initiatives, sustained in part by the implementation of public policy through a political-institutional arrangement "marked by the involvement of a group of actors and a lesser concentration of attributes among them" (CAMPOS NETO and POMPERMAYER, 2014, p. 101).

An example of this was the Program for Educational Cooperation for the transfer of technological knowledge of naval construction between the Federal Education Institute (IFE), a shipyard – a subsidiary of a multinational group which operates in the naval sector and off-shore areas headquartered in Singapore with both being located in southeastern Brazil, and the state government. This is an international exchange partnership based on private initiative and the shared use of public resources in which, on one hand, the company seeks to develop its capacities in naval construction and the transfer of knowledge from its headquarters in Singapore to the local subsidiary in Brazil, and on the other, the IFE seeks to educate professors to make the introduction of naval technology viable in the state, incorporating the innovative techniques developed outside of the country.

This partnership became singular due to the fact that the knowledge was imported by the university and not just by the company, given that the benefits were provided to the Brazilian subsidiary as well as the IFE. This diverges from the tendencies of late industrialization in emerging economies in which generally the companies appropriate technology from innovative countries and exploit the external knowledge which is strongly dependent on learning (TORRES, DUTRÉNIT, BECERRA et al., 2011). Another point that differentiates this cooperation agreement is its private financing, because the role of the government was restricted to articulation between the social actors, regulation and institutional support.

Considering the relevance of discussions that involve the role of the university in economic and social development, and as a result, its relationship with the State and the market, the objective of this study is to analyze the configuration of the Triple Helix model in regard to the university-business-government relationship in this cooperation program. To achieve this objective, we intend to answer the following questions: How does the university-business-government relationship occur within the context of the Triple Helix and the Entrepreneurial University? What are the roles played by the university, the company, and the government?

Recent analyses of this phenomenon have been for the most part oriented by the Triple Helix Theory, which, as a result, introduces the university in the context of the Entrepreneurial University. This approach has recently been complemented by the intermediary framework proposed by Todeva (2013), which adds the concepts of governance and regulation to structural aspects and the systemic relations between these parties. With the intent of complementing the Triple Helix innovation model, other researchers have proposed a Quadruple (CARAYANNIS and CAMPBELL, 2009) and Quintuple Helix models (CARAYANNIS, BARTH and CAMPBELL, 2012). However, the Triple Helix approach continues to be one of the main models of theoretical and empirical analysis of the university-business-government relationship, in developed economies (CHINTA and SUSSAN, 2018), as well as emerging economies (GUERRERO and URBANO, 2017), which has also been demonstrated by the systematic review of the literature by Schmitz, Urbano, Dandolini et al. (2017).

The Influence of New Public Management on the Entrepreneurial University Paradigm

The unfolding of the social, economic and administrative dimensions of the crises during the '70s and '80s had a worldwide impact and motivated many countries to move in the direction of the reforms proposed by New Public Management (NPM). During this period, the role of the State as the provider of well-being and economic projection, as occurred in the United Kingdom, came to be questioned in many countries because of ungovernability, scarcity of resources, and the retraction of macroeconomic policies in the face of the advance of the power of multinational corporations (due to the effects of globalization and technological evolution), due to the supposed inefficiency of the Weberian model, etc. (GRUENING, 2001).

Among the managerial percepts developed by the private sector, we can cite some of those adopted by NPM which facilitate the understanding of this movement: results-based management with explicit performance indicators; downsizing and decentralization applied to the division of public organizations into smaller units and a reduction in the number of employees; marketization with the introduction of administrative competition or the control of quasi-markets in the providing of services; an emphasis on the control of results; the introduction of new instruments of control and transparency, to achieve accountability (manager responsibility) and empowerment (reducing the political role and increasing the power and autonomy of intermediate managers); the introduction of the concept of entrepreneurship in the political sphere, delegating to managers the role of articulators; and hiring following agent-principal logic (HOOD, 1991; OSBORNE and GAEBLER, 1992; PETERS and PIERRE, 1998).

In Brazil, managerial reform occurred staring in 1995 through the Overall Plan for the Reform of the State Apparatus. This reform centered on the modernization of the State apparatus, with emphasis on efficiency and control. Even though the plan made use of some managerial instruments from the private sector, it was not totally oriented towards NPM. In fact, a governance model was adopted based in part on processes of privatization and the resulting greater proximity of the State with the market and civil society (PECI, PIERANTI and RODRIGUES, 2014), based in part on a reform based on a strengthening of the Social State contrary to the neoliberal view of the minimalist State (BRESSER PEREIRA, 2010).

According to Gibbons, Limoges, Nowotny et al. (1994), these transformations affect the institutional context of the production of knowledge, creating some transitions in the type of knowledge produced, proceeding from Mode 1 to Mode 2. The authors define Mode 1 of scientific production as traditional knowledge generated in an academic context, or in other words, basic impartial disciplinary scientific research. Mode 2 refers to the production of interdisciplinary research within a broader economic and social context; it is based on applied research and spans academic frontiers through the interaction between university and society, between companies and governmental agencies. To Etzkowitz and Leydesdorff (1998), a common interest in the world arose concerning the "third mission of the university", that is expanding the role of economic and social development beyond the traditional functions of teaching and research. The term "new social contract" was incorporated to redefine the university's social functions with society: teaching, research, and economic development.

According to this logic, the concept of the Entrepreneurial University emerged, which introduced the entrepreneurial *ethos* to academia (ETZKOWITZ and LEYDESDORFF, 1998; GUERRERO and URBANO, 2012). The Entrepreneurial University consists of the idea that it is capable of executing entrepreneurial activities with the intent of improving economic development and contributing to the commercialization and generation of revenues from technological innovations produced by academic research (ETZKOWITZ and LEYDESDORFF, 2000; ETZKOWITZ, 2013).

To facilitate the understanding of the university orientation in terms of the entrepreneurial paradigm, Philpott, Dooley, O'Reilly et al. (2011) present a series of entrepreneurial activities that a university can develop within a spectrum of hard and soft

initiatives, which bring universities closer or further away from entrepreneurship, such as: the creation of a technological park; the formation of spin-off companies; patenting and licensing; hired research; educational courses for industry; consulting; subsidies; results from academic publications; and the production of high quality graduates.

In the entrepreneurial paradigm, using knowledge produced for economic purposes signifies capitalizing knowledge. To Etzkowitz (2003), the capitalization of knowledge is the process through which knowledge is transformed into capital through the creation of patents, incubators, corporate research or in the form of consortiums, technology transfer offices, and public and private risk capital investments, etc.

Even though studies about entrepreneurial universities are preeminent (ARMBRUSTER, 2008; GIBB, HASKINS and ROBERTSON, 2013; AUDRETSCH, 2014), the literature presents antagonistic positions (MATHIEU, MEYER and POTTERIE, 2008; STYHRE and LIND, 2010; HANNON, 2013). These authors note that there is a tendency for the academic field to be driven by external pressures, such as a reduction of financing from universities, the legitimization of economic development as one of its functions, and changes in legislation regarding intellectual property rights (PHILPOTT, DOOLEY, O'REILLY et al., 2011).

In Brazil, the legitimization of some actions related to academic entrepreneurship materialized with the Law of Innovation (Law nº. 10,973 of 2004, updated by Law nº. 13,243 of 2016), which addresses incentives for innovation in scientific research. The quantity of company incubators and technological parks created in Brazil after the law's implementation crowned the efforts of the government to insert new actors and share responsibilities (CASTRO, 2011). The effect was that "our universities inhabit a new environment today, surrounded by large incubators and technological parks, which is the case with USP, Unicamp, UFRJ, UFRGS, UFSC and UFPE, to cite a few public universities, as well as PUC-Rio, PUC-RS and Univap, to cite a few private ones" (CASTRO, 2011, p. 564). It should be noted that Latin American countries have a history of relationships between public science and technology policies and university research, by virtue of the incipient level of investment in research and development by the private sector (DAGNINO, 2007).

However, to follow the example of the Washington Consensus, Geuna and Muscio (2009) observe that one of the determining factors in affirming the institutionalization of university knowledge transfer activities was the redefinition of the role of the State and its consequent role in the economy, which ended up resulting in restricting budgets which affected the sources of university financing. In some countries, universities suffered strong political pressures to raise funds from industry for research to actively contribute to economic development (LEISNER, 2006; HARRISON and LEITCH, 2010). This connects this movement to the managerial reforms, in which it is possible to identify in a systematic form, traces of NPM in Mode 2 theoretical perspectives of the production of knowledge and the entrepreneurial university (TOLOFARI, 2005; LORENZ, 2012). One recurring method used to broaden access to financial resources was the adoption of partnerships between universities, companies and governments.

Triple Helix: A Theoretical and Empirical Model of University-Business-Government (U-B-G) Interactions

Considered to be the dominant model, the Triple Helix model was proposed for the first time in 1996 by Henry Etzkowitz and Loet Leydesdorff, who argued in favor of growing systematic collaboration between these three institutional spheres, in the formation of networks in which each institutional sphere in university-business-government relations should act in a harmonious manner with the others (ETZKOWITZ and LEYDESDORFF, 1998; ETZKOWITZ, 2011). Thus, the theory presents the three existing configurations of the models of university-business-government (U-B-G) interaction in accordance with the evolution of innovation systems. These configurations made these into applicable models which make it possible to understand the stages of the innovation process, and the forms that the relationships between the three institutional spheres can take, the dynamics of each institutional sphere in using science and technology for innovation, as well as potential conflicts that can exist within these relationships (SARPONG, ABDRAZAK, ALEXANDER et al., 2017).

This evolution of the Triple Helix models is represented by three configurations. Triple Helix I is a configuration in which the interaction model is statist, in which the State includes industry and academia, and directs the relationships between both of them. This top-down model, centered on the State, is considered flawed because it does not stimulate innovation, because it does not provide much space for bottom-up interactions, and thus limits the capacity of other actors to innovate. The statist configuration has a broader normative and institutional nature than other models, based on policies and norms which govern

the innovation system, without concerning itself with university-business interaction (ETZKOWITZ and LEYDESDORFF, 2000; ETZKOWITZ, 2003; RANGA and ETZKOWITZ, 2013).

Triple Helix II is defined as the laissez-faire model, in which institutional spheres have well-defined separated boundaries between the actors. In other words, the interaction between actors is still modest and represents a reduction of the role of the State in the economy. Industry is the driving force in this configuration, where the government tends to act in the regulation of economic and social mechanisms, and the university acts as a provider of knowledge through research and the formation of human capital. In this way, the government and university become support structures, exercising limited roles in innovation. It is important to point out that the laissez-faire model makes interactions possible between these institutional spheres, but since the boundaries are well defined, this interaction generally occurs through the actions of an intermediary (ETZKOWITZ and LEYDESDORFF, 2000; ETZKOWITZ, 2003; RANGA and ETZKOWITZ, 2013).

Triple Helix III is a balanced model which introduces the notion of overlapping exchange relationships between the institutional spheres, with the intent of generating a new form of knowledge infrastructure through interrelationships between the various social actors involved. The intersection between these institutional spheres is recursive and is designed to provide a favorable environment for innovation through the formation of trilateral networks and hybrid organizations. The hybridism refers to new organizational formats which emerge from U-B-G interactions as academic spin-offs, incubators, technological parks, startups, risk capital companies, etc. In addition to these new formats, strategic alliances between companies and academic and government research laboratories work together to form trilateral initiative networks for the production of knowledge based on economic development (ETZKOWITZ and LEYDESDORFF, 2000; ETZKOWITZ, 2003; RANGA and ETZKOWITZ, 2013).

This configuration is considered more balanced, because the institutions are more autonomous and can assume the role of others, making the relationships more symmetrical, reciprocal and cooperative. Cooperation increases U-B-G interactions, which leads to new development strategies and innovation practices. The government assumes the role of articulator, guiding the social rules of the game to stimulate the formation of partnerships and making risk capital available for supporting ventures related to the production of new technologies (ETZKOWITZ and LEYDESDORFF, 2000; ETZKOWITZ, 2003; LEYDESDORFF, 2013). On the other hand, universities and other knowledge institutions can assume leadership in joint initiatives with the government providing support (ETZKOWITZ and LEYDESDORFF, 2000; RANGA and ETZKOWITZ, 2013).

Even though Etzkowitz (2003) argues that the Triple Helix thesis encompasses historical, analytic and normative dimensions, contributing to the understanding of the context and the resulting adaptation of innovation systems to the function of the transformation of science, in accordance with the interpretation of the local reality, there is some dissension in the literature. Amir and Nugroho (2013) raise some critiques and limitations, including the mechanistic approach of the model, because it has been transformed into a reference or even a policy guideline in some countries. Cai (2014) points out the lack of empirical evidence in the applicability of the Triple Helix to non-western contexts. Cooke (2005, p. 1129) argues that the Triple Helix can be criticized "[...] for emphasizing consensus aspects in the relationships between distinct epistemic communities and a somewhat cybernetic vision of innovation in conformity."

Despite these limitations, Amir and Nugroho (2013) admit that the ample diffusion of the Triple Helix assumptions through conferences, workshops, and research events have transformed it into a reference in development policies and the elaboration of public policies regarding science, technology and innovation in various developed and developing countries.

Even though two new models have since been proposed, adding more "helices" relative to society and the environment, the Triple Helix model still is reaffirmed by the mainstream of the literature and science and technology in countries, and specifically emerging economies. These other models are the Quadruple Helix (CARAYANNIS and CAMPBELL, 2009) which adds a public helix based on media and culture and the Quintuple Helix (CARAYANNIS, BARTH and CAMPBELL, 2012), which increases the number of relationship networks as well as adding the fifth helix – that of the natural environment – in a multidisciplinary analysis perspective. Put in a different way, the Triple Helix model centers on university-industry-government relations, and does not consider the social sphere in a broader context, and is predominant in the interaction between innovation and public policy development environments, mainly in countries with emerging economies (GUERRERO and URBANO, 2017; WONGLIMPIYARAT and KHAEMASUNUN, 2015).

Dagnino (2003) emphasizes the ample questioning that the Triple Helix theory has received in terms of the relationship between the effectiveness of institutional arrangements that link universities and companies and the increase of competitiveness in Brazil. Despite recent legal changes which favor a closer relationship between universities and other sectors (BRASIL, 2016; MACULAN and MELLO, 2011) and some experiences analyzed within the Brazilian context which demonstrate this closer proximity through the Triple Helix model (e.g. ALMEIDA, TERRA and MONTSERRAT, 2011; AMARAL, FERREIRA and TEODORO, 2011; ARMANDO, BOAVENTURA, TODEVA et al., 2017; PARANHOS and HASENCLEVER, 2011; ZAWISLAK and DALMARCO, 2011; ZOUAIN and PLONSKI, 2015), studies find that the country is still behind the most advanced and emerging Asian nations, or in other words, the institutional arrangements and the behavior of actors in the university-business relationship are still not as significant as in other countries (YE, YU and LEYDESDORFF, 2013; CHOI, YANG and PARK, 2015).

In the case of Singapore, the indicators which measure the relationships in the Triple Helix show that since 2002 the country has been ahead of Brazil and among the best positioned of the Asian countries (PARK, HONG and LEYDESDORFF, 2005). Part of Singapore's advantage comes from the country's development process, which opted early on to open up the market, inviting in foreign multinational firms which possess the technology and the knowledge that the State needs (HUFF, 1995), and this was followed by the broad structuring of higher education to adopt the model of the entrepreneurial university (WONG, HO and SINGH, 2007; MOK, 2015). This permits the reconfiguration of U-B-G relationships and the development of guidelines envisioned by the country's National Innovation System (NIS) with the clear objective of promoting technological capacity through the improvement of process innovation during the initial stages of product innovation (PARAYIL, 2005).

For the reasons presented, the present study focuses on the Triple Helix Theory (ETZKOWITZ and LEYDESDORFF, 2000) and the adjustments proposed by Todeva (2013), in the sense of encompassing other institutions and public bodies which also participate in the formation of helices and governance. This is above all because Ranga and Etzkowitz (2013) consider the Brazilian teaching institutions to be of a hybrid nature according to the Innovation Law of 2004, which associates teaching and research institutions and extends to public and private laboratories and even academic foundations.

RESEARCH METHODOLOGY

The current article is the fruit of a wider study of a qualitative, exploratory and descriptive nature, which uses a cross-section of a single ex-post-facto case study. The case study is widely used in empirical studies to understand specific complex political and social phenomena, which deduces a deeper analysis of the real context through various sources of data (YIN, 2005). This methodological option is also frequently adopted to investigate university-business-government relationships (RAPINI, 2007). The unit of analysis was the experience of the partnership used in the conception and execution of the Educational Cooperation Program for the transfer of knowledge of naval technology (YIN, 2005).

Data collection consisted of interviews and documental research. Initially in-depth unstructured interviews were conducted with the partnership managers (the company and IFE managers). The intent of these interviews was to offer greater liberty to subjects to discourse about the context that involved the formation of the partnership (GODOI and MATTOS, 2010). These occasions were also opportune moments to obtain permissions to conduct field research and gain access to documents to facilitate the documental research (CRESWELL and CLARCK, 2013).

The other interviewees were selected based on their direct or indirect participation in the Cooperation Program and their functions performed in the respective institutions. After initial unstructured interviews, new subjects were indicated by the interviewees, creating a "snowball" effect (GODOI and MATTOS, 2010). This second group consisted of 24 semi-structured interviews totaling – with the two initial interviews – 26 interviews (represented in this work as *I* 1, *I* 2... *I* n) which were recorded and later transcribed.

In the IFE, ten interviews were conducted in the dean's office and in four campuses, two of which were with advisors in the implementation of the innovation poles (partnership managers), and three-unit directors, two course coordinators and three professors who participated in the Educational Cooperation Program. In the company, out of a total of fourteen interviews, two were conducted with the manager of human resources, one with the exchange coordinator, two with the coordinators of the areas responsible for welcoming annual trainee teams, as well as eight current and past IFE students. In the state

government two interviews were conducted with the undersecretary of development responsible for international partnerships and stimulating local industry.

Documental research was an important resource used to compose and enrich the analysis of the object under investigation, and it made it possible to situate the Educational Cooperation Program in a chronology of events and identify convergences and divergences in the overlapping data (GIBBS, 2008). This secondary data was obtained from various sources, such as: official documents made available by the company; official public domain documents available on the internet; official electronic websites; newspapers; decrees and reports that, in some way, possessed content related to the context of the Educational Cooperation Program. It should be noted that this study covers the period between 2008 and 2017, due to the fact that the initial contacts between the company, the state government and the university took place in 2008.

Since this study is based on the Triple Helix Theory and the Entrepreneurial University paradigm in analyzing the U-B-G relationships, some categories were defined *a priori* (BARDIN, 2006). However, during the content analysis, other themes emerged in the systematic process of rereading the data. In other words, some codes revealed other subcategories which were defined *a posteriori* (BARDIN, 2006). These categories and subcategories were interpreted and compared with the theoretical perspectives covered in accordance with the proposed objective.

The Case Study of the Educational Cooperation Program for Brazilian-Singaporean Knowledge Transfer

The case study refers to the Educational Cooperation Program involving three organizations: (1) the IFE, (2) the International Polytechnic Institute (3) and the shipyard located in the southeastern Brazil – a company which is a subsidiary of an multinational group in the naval construction market, headquartered in Singapore; as well as the participation of the Brazilian state government. This Cooperation Program is in reality an international professional exchange program between the City-State, which instructs students, graduates and professors in the transfer of knowledge in naval technology.

The consolidation of the Educational Cooperation Program was made effective in April 2012. The protocol of intentions was signed by the Assistant Extension Rector of the IFE, the state Governor, the President of the shipyard subsidiary in Brazil, the Director of Human Resources of the multinational group and the Director of the Mechanical Engineering division of the International Polytechnic Institute. Participating also in this act were the State Secretariat of Development, State Secretariat of Science, Technology, Innovation, Professional Education and Work, State Secretariat of Education, and the Mayor of the municipality where this company is located.

The negotiations of the formation of this cooperation partnership began in 2008, when the Governor of the state, through the State Secretariat of Development acted as an intermediary between the representatives of the group and the representatives of the teaching institution which was disposed to embark on the initiative of professional training proposed by the shipyard. The actions of the state government in this partnership were institutional and political in articulating the social actors for the design and implementation of this Educational Cooperative Program, with this initiative being made in return for the group's implementation of a shipyard in the state.

The Educational Cooperation Program seeks to train students and graduates of the IFE to form the local workforce, meeting the international standards of naval technology required by the shipyard, and training professors to develop and provide a new naval and oceanic technology course in the state, or in other words, technology is directly transferred from Singapore, one of the world leaders in naval construction, through international reference training in naval and oceanic technology at the International Polytechnic Institute, followed by the on the job training at the group's headquarters.

The objective of the shipyard in the implementation of this Program was to train and improve the level of the local workforce in the operation of the subsidiary, placing students and graduates of the IFE, who were already hired after going through a selection process as trainees in the group's culture. The training of professors, in turn, arose due to the intention of the IFE to educator multipliers who would be responsible for developing the new curriculum for a course in naval and oceanic technology (to be created) in the state where the shipyard is located in such a manner that after the five years of the Program, the Institute would be able to minister courses to transfer knowledge to the shipyard employees and to society.

The Program counted on an investment of roughly US$ 4 million by the shipyard to subsidize the selection process, logistics, infrastructure and training for all of the foreign exchange participants. The IFE provided the installations for the selection process

and put it into operation through its foundation which offered grants to professors participating in the foreign exchange. The Program lasted five years – beginning in April 2012 – with an annual expectation of 25 to 30 students and three professors. The training schedule for the students was divided into three stages which involved staying in Singapore for an average of 14 months, while the professors were expected to stay for a period of five months.

For the first year of the exchange in 2013 there were 23 students and 2 professors. For the first class eight students were approved from Unit A (the municipality of the shipyard subsidiary), five students from Unit B, and 9 students from Unit C (the capital of the state). For the second year in 2014 there were 27 students and 2 professors. Since the six units of the IFE participated in the selection, the second class was made up of three students from Unit A, eight students from Unit B, ten students from Unit C, three students from Unit D, one student from Unit E and two students from Unit F. In the third year in 2015, the six units participated again in the selective process, with the third class consisting of 30 students and 3 professors, with seven students from Unit A, seven from Unit B, ten from Unit C, three from Unit D, three from Unit E and none from Unit F.

In the fourth year of 2016, seven units of the IFE participated in the selective process because the shipyard demand involved technical courses in Industrial Automation, Electromechanics, Electric Engineering, Mechanics and Metallurgy. 18 students were selected for the fourth class. The fifth year was made up of 11 students selected at the end of 2017 who began their training in Singapore in January 2018. The exchange was extended beyond the agreed upon period and the scope was also widened to include shipyard engineers, together with the students and professors. This was due to the importance of the technical and intercultural results obtained during the partnership by the subsidiary as well as the interest in the head office in preserving its relations with the International Polytechnic Institute, independent of the economic scenario and Brazilian politics.

The U-B-G Relationship and the Conditions for the Configuration of the Laissez-Faire Model

This case study arose within the context of attempting to expand and modernize the productive capacity of the Brazilian naval sector to meet demands due to the growth of offshore petroleum activities and the discovery of large volumes of oil in the so-called pre-salt layer, and an attempt to recover technologically in relation to world leaders in the manufacture of ships, improving Brazil's low level of productivity.

To stimulate the naval construction sector, the federal government in conjunction with the navy, Petrobrás and its subsidiary Transpetro developed a series of actions, fiscal incentives and programs to create a new industrial policy for the sector. Among these programs, one of the most talked about was Transpetro's Program for the Modernization and Expansion of the Fleet (Promef), which ratified these stimuli for the sector, based on the following assumptions: the construction of ships in Brazil with initial national content of at least 65% (local content production), and seeking international competitiveness (BRASIL, 2015a). The Program was divided into two phases denominated Promef I and Promef II, with the second being adjusted by Petrobras in 2010, due to the discoveries of the pre-salt layer.

To meet the demand for new orders, 10 new shipyards went into operation in Brazil beginning in 2013. Of these, five were implemented just to meet orders for pre-salt drilling equipment. Eight states were contemplated with these investments of R$ 10 billion in total, with three of these shipyards being in the southeastern region of the country, which has the largest number of shipyards due to its favorable logistics (MORAIS, 2013). The analyzed case study became part of this group in 2007, which was when there was a succession of new discoveries in the pre-salt layer, due to the technological limitations of oil prospecting in deep waters (MORAIS, 2013). Faced with the recent discoveries, organizations in the oil and gas sector in Singapore began to contact the state in search of opportunities.

In May 2008, the state government, represented by the Governor and the State Secretariat of Development visited Singapore and held prospecting meetings with two large corporations, two of the largest constructors of platforms in the world which have operated in Brazil since 2000 as partners in joint ventures. During the visit, the Governor has the opportunity to see Brazilian professionals taking a course in platform operations and having access to cutting edge technology through training conducted through the academic cooperation of world-renowned polytechnical schools. According to *I* 24, "he [the Governor]

returned from his experience [...] and emphasized that we should bring projects that include the [state]. We thought how are we going to include the [state] in a chain in which Brazil is so deficient?".

The result of these visits was the Educational Cooperation Program which involved the IFE, the shipyard and the state government. Each one of these actors played specific roles which will be explored below with a synthesis of the cooperation program in which the roles of each actor will be considered in light of the assumptions of the Triple Helix Theory (ETZKOWITZ and LEYDESDORFF, 1998, 2000).

The State: a reduced role in the relationship?

According to the model instituted by the federal government, one of the forms of legitimization of the state role in the construction of the naval sector was the process of environmental licensing for the implementation of the project. In this type of licensing, a profound evaluation had to be made of the socio-environmental conditions as well as the definition and deliberation of the requirements for the liberation of temporary licenses for the installation and execution of the work, which were not restricted to federal or state environmental bodies.

Bilateral accords signed in the academic sphere and other incursions of Singaporean groups in the state, culminated in August 2008 with the signature of a protocol of intentions with the Singaporean multinational group. By virtue of the lack of qualified professionals for the naval industry, which up to this point was practically non-existent in the state, this protocol of intensions already stated the commitment of the company to the training of the local workforce which would be absorbed by the shipyard.

In terms of the responsibility for this training, even though the federal government had announced a naval plan that contemplated some municipalities with resources to train the local labor force, this plan did not extend to the state's naval construction sector. According to *I* 4, "the federal naval plan did not help because the [state] was not included in this package [...], it was a question of the company strategy coming here." Thus, it was up to the company to provide this training, a responsibility imputed by the state government in the environmental licensing process, as one of the requirements of the process.

This was the instrument used by the government to combine the interests of the social actors involved in the implementation of the venture with a significant socio-environmental impact in the sense of maximizing potential positive impacts to promote the best possible sustainable development for this territory and mitigating negative impacts. To understand the prioritization and the training of local labor, the shipyard formulated the labor mobilization, selection and training program as part of its Environmental Impact Statement / Report in December 2009.

In November 2010, the installation license was emitted in which the government presented 93 conditions to be monitored periodically by the State and by the monitoring commission. Among the conditions, number 16 refers to the execution of a program to mobilize, select and train the labor force. To meet this condition the shipyard subsidiary presented the mobilization program with integrated strategies of mutual cooperation, seeking to give priority to local workers and young candidates with mitigating measures being developing actions to hire local workers and stimulate their training and retraining.

This chronology is a brief summary of the facts that preceded the establishment of the partnership for the Educational Cooperation Program for the transfer of technology, as the environmental license shows itself to be an instrument of political, bureaucratic and legal control, used by the state to stimulate actions oriented towards the development and resurrection of the naval construction sector. The state government made use of its legitimacy to ensure that the environmental license included social issues and the inclusion of the local citizens as qualified workers in this venture. This is emphasized by *I* 24:

> The licensing played a fundamental role, [...] the fact that made the [shipyard] come to Brazil was local content. The way that it is related to society which isn't perfect, but has improved, was through licensing. What we tried to do during this decade of influence was to make this territory part of the company's plans.

However, there was a difference of opinion on the part of the shipyard subsidiary and the IFE in terms of what was postulated by the state, in terms of the association between the environmental licensing and the creation of the Educational Cooperation Program. To both there was no direct relationship between condition number 16 of the environmental license and the Program, because this is linked to the multinational group's strategy of selecting the workforce for its ventures. In other

words, this condition did not encompass the formation of professionals of an intermediate level, and the demands imposed by environmental licensing could only be met through the training modalities offered by the Professional Education Program for the operational phase of the shipyard subsidiary. To *I* 4, the Program:

> ...is not a part of a condition, it's a company strategy, and this strategy is related to what? The company's need to have a more advanced work force, with groups capable of producing drilling ships. Drilling ships that can perforate the ocean floor are very complex ships.

To tell the truth, the scope of the program was determined by international practices already familiar to the group through other subsidiaries spread throughout the world. It is considered "one of the pillars of its venture work force strategy" (*I* 12), delineated by the President of the multinational group, who also presides over the Consultative Committee of the Marine and Offshore Technology Innovation Center of the International Polytechnic Institute of Singapore.

Therefore, after the details of the environmental licensing, the role that the state exercised in the partnership was limited to the following of the schedule of actions for the execution of environmental requirements and, above all, the intermediation of the State Secretariat of Development with teaching institutions and the monitoring of the actions that resulted in the program's consolidation. The supporting role of the state government in the partnership was justified by *I* 24, because direct acting would imply a delay in the process of formalizing the Memorandum of Understanding, due to the bureaucratic details necessary. In this way, the signature of the Memorandum of Understanding by the state government's Chief of Staff's office was a symbolic act to *I* 4, in which the Governor played the political-institutional role articulated by the Secretariat of Development and the IFE in signing protocol of intentions as witnesses.

From this point on, the relationship basically became university-business. The state Secretariat of Development emphasized the importance of exiting the stage at an opportune moment, and to *I* 4, the non-active participation in the partnership "is the price paid by the high cost of bureaucracy in involving the government. It's better to maintain one's distance than scare off partnerships."

The Company: A Private or Public Strategy of Acting in Brazil?

The subsidiary of the shipyard installed in the state is part of a Singaporean group that is over 50 years old, which currently is the global leader in integrated solutions for naval and oceanic engineering and possesses approximately 30% of the capital of the State Sovereign Fund. The group, as a consequence, possesses a global network made up of subsidiaries and other business units in China, India, Indonesia, the United Kingdom, and the United States. With the implementation of the subsidiary in Brazil in 2010, the group's purpose was to broaden its participation in the Americas, and become a reference for the construction of petroleum exploration vessels and structures.

According to Ordoñez (2014, p. 2), Singapore's interest in the oil and gas sector, especially in the exploration of the pre-salt layer is not restricted to naval construction, but also includes increasing sales of equipment and materials to the sector and "promote the entrance of engineering companies in the country to meet the growth in demand expected for the pre-salt layer." Even in the face of the direct effects of the crisis in the petroleum sector, specifically the cuts in pre-salt drilling vessels, the shipyard was one of the few to continue operating and expanding its portfolio of services and clients beyond the construction of ships and drilling vessels.

In this sense, the interest in acting in Brazil is not that of the multinational group, but rather the government of Singapore. This can be seen by the fact that in addition to the implementation of a subsidiary, there has been an expansion of Brazilian-Singaporean relations. Even though diplomatic relations began in 1967, it was only in 2000 that the bilateral agenda, which was previously restricted to the commercial field, expanded to "new areas, such as naval construction, science and technology, academic cooperation and port and airport logistics" (BRASIL, 2015a, p. 6). The strategy of broader bilateral relations with Brazil is in line with a long-range vision of past and future investments in Brazil by the Singaporean government through companies in which it holds shares.

According to the Minister of Foreign Relations, "Singapore is today the fourth largest Asian investor in Brazil, behind Japan, China, and South Korea. At the moment, there are 60 Singaporean companies operating in Brazil" (BRASIL, 2015a). The country has one of the most advanced technologies in petroleum prospecting in deep waters. In addition to the subsidiaries

and business units in Brazil, the government of Singapore has two sovereign funds and two business prospecting agencies with offices in São Paulo.

Therefore, this seems to be a public investment strategy, that is, the government of Singapore has a long-term action plan in Brazil. In truth, the implementation of a shipyard subsidiary in Brazil is one of the fronts of the Singaporean government. The Educational Cooperation Program, in turn, is a way to populate the subsidiary with trained professionals who have been introduced to Asiatic business culture.

> We brought foreigners who worked with them [*trainees*], managers, but they're there talking about this transfer, about what they learned and what they're continuing to learn, because it's a learning process. In 14 months, they cannot learn all that they have to. The *trainees* who become managers are here, they're continuing. In the future, we want to see these managers [Singaporeans] return there because their visas are work visas for the two years in which the *[trainees*] are growing within the company (*I* 12).

> They had the knowledge which was missing in Brazil, this know-how in the technological sense. So, it was a vision of the company to transfer this know-how from Singapore to Brazil, because they know that it would be very expensive to relearn this here. The learning curve has a time and a cost, so it was much quicker to bring this know-how through trained people to Brazil, training in the polytechnics that train this profile of theirs there, and with the internships of people from here in the shipyards there (*I* 4).

The subsidiary of the shipyard already operating in this state has maintained its commitment with a portfolio of orders, despite the great depression in the price of petroleum and the Petrobras crisis. According to *I* 4, in the conversations with the President of the subsidiary, the position of the Singaporean government in relation to its investment strategy in Brazil became clear, or in other words,

> They have a lot of strategies; it's not simply doing what the government here induces or wants. On the contrary, they try to keep as far as possible from the government. My vision is that they want a lot of independence. In relation to any decision of the government here, any attempt at influence or any appearance of it, it appears that they have a good idea of what they're doing.

Nonetheless, the subsidiary counts on the direct investment of the group to finance two of its seven orders and does not possess financing from the FMM. Through the beginning of 2016, even though the naval industry lost more than 12,000 jobs, the subsidiary presented the lowest number of layoffs in the Southeast. They have maintained the same production rhythm and delivery schedule for the drilling vessels despite this crisis, and also have preserved the investment and actions envisioned by the Educational Cooperation Program. In addition, they have developed other projects with the IFE – the Cooperation Network for Studies, Extension and Research on Coastal and Marine Environments (RECEPAC) and the research project for the development of an iron plating that is suitable for the construction of ships.

The University: Entrepreneurship as an Institutional Model?

As has been pointed out above, it is up to the State Secretariat of Development to intermediate the contacts between the multinational group and the state universities. Even though universities have been called to action by the Secretariat of Development, the institution which made itself available for the establishment of the partnership to train the work force was the IFE. According to *I* 24:

> The federal university received us well, but it was very bureaucratic. SENAI prepared us, but within that gamut of courses that they have. When we visited the [IFE], they had already designed more or less what the partnership would be like because this institute already has experience of technical cooperation agreements for the transfer of national and international knowledge.

This experience of the IFE is related to its long trajectory of cooperation with the market, with relations established with industry since the 1970s (*I* 4). This context has to do with the decentralization of Brazilian development, which occurred during the same decade. At the time, large companies installed in the country, increased their demand for the manufacture of pieces, accessories and the providing of services of dismantling and industrial maintenance in the metal-mechanical segment (VILLASCHI and LIMA, 2000).

To *I* 2, this was the "vocation" of the Institute, having an "extension essence". According to *I* 4, the mission of the Institute is permeated by "a vision of connectivity, of integration with the world of organizations, with the world of work [...]. This leads us to search for companies who want us to train their employees" and this transformed it into a vector for local development.

This extension is an important via for transporting "the walls of the university to understand the world of work" (*I* 2). In addition, the interiorization of what happened over the past three decades enabled the institute to know and understand distinct contexts and needs, in accordance with the locales within the state. The fact that the Institute is organized into a multi-campus structure oriented towards interiorization, makes its boundaries more open than those observed in a traditional university. As *I* 2 affirms, there is "a greater permeability in our boundaries and this makes us begin to understand the world of work out there better, the needs of companies, and the needs of communities." This change in the paradigm, according to *I* 4:

> Occurred within management itself, the entrepreneurial vision of management. What now is a vision of innovation, begins with this entrepreneurial configuration. Innovation doesn't exist without entrepreneurship. And the institution itself, the model of the [Institute] today, if we are to characterize the institutional model is that of an entrepreneurial university.

These actions can be considered an effort to institutionalize the paradigm of the entrepreneurial university in the IFE (ETZKOWITZ, 2013; RANGA and ETZKOWITZ, 2013). To act on the fronts oriented towards entrepreneurship, there is an extension rectory, composed of a directorate of business relations and community extension, responsible for institutional relationships with the government and the market and a directory of technology extension, which is linked to the Institute's Innovation Agency.

Note that this institutional model was designed by relations with the market, however, it still is deficient because it acts only in the institutional sphere and not in terms of managerial actions and the monitoring of entrepreneurial activity. According to *I* 2, 4, 5 and 6, there is no organizational structure in the IFE, an operational team, to support the entrepreneurial activity and the management of partnerships, agreements and accords. *I* 4 admits:

> We have the directory of business relations, why do we have this thing of not knowing whom to talk to, which door to knock on, and whom to talk with? I'm not going to say that it is very good and functions, that it's a marvel, because it isn't. We have various deficiencies, but it is easier for industry to be closer to us because of our history. In our model, this is extension, this is very clear to us.

The actions are concentrated in the Extension pro-rectory which occurs in a top-down manner on the institutional level which, in turn, does not possess a rear guard with a structure and a technical corps, which permits not just the management of entrepreneurial activities. Above all there is a great reach and decentralization of other actions. This approach within a top-down context, observed in Brazil and Latin America, is due to the efforts of institutionalizing the National System of Innovation, which in part is influenced by the assumptions of the Triple Helix Theory (DAGNINO, 2003; SUTZ, 2000).

The Formation of the Partnership: Eliminating the Boundaries for Collaboration

In analyzing the role of each actor in the Educational Cooperation Program, it was possible to follow the steps that led to the conception of the U-B-G relationship according to the Triple Helix Theory. In other words, the case study is similar to the configuration of Triple Helix II (ETZKOWITZ and LEYDESDORFF, 2000), also known as the laissez-faire model in which the boundaries between the University, the Company and the Government are well defined and generally there's a need for other social actors to perform an intermediary role in the interactions among them. The rigidity of these boundaries tends to moderate the interaction between the IFE, the shipyard and the state government, which implies: (1) a limited role of the government consisting of basically regulation and intermediation; (2) the limited participation of the university in the production of innovation; and (3) the leading role of the company in the coordination of the actions of the Program without expecting support from the other parties (ETZKOWITZ and LEYDESDORFF, 1998, 2000; RANGA and ETZKOWITZ, 2013).

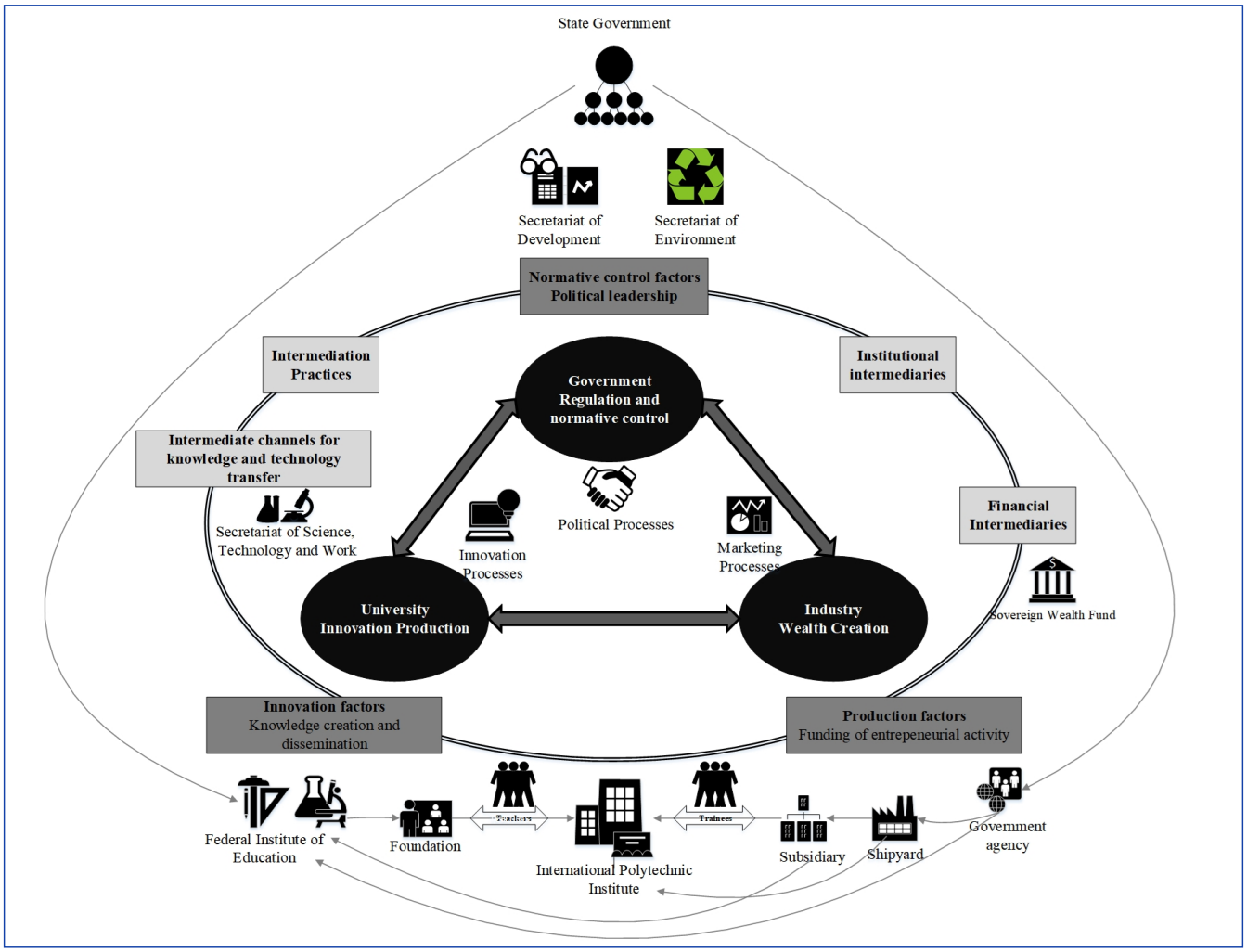
At first, the role of the IFE was to provide highly qualified students and professors to participate in the Educational Cooperation Program, and later to promote the transfer of knowledge of naval technology acquired in Singapore. However, in addition to training highly qualified students (which would be a first phase of entrepreneurial activities), in offering industrial courses with an emphasis on the naval area, the Institute also directs its actions to the entrepreneurial paradigm, in accordance with the range of entrepreneurial activities defined by Philpott, Dooley, O'Reilly et al. (2011), positioning itself between hard and soft activities.

According to Philpott, Dooley, O'Reilly et al. (2011), the adoption of the entrepreneurial university model may be ideal for universities which operate in specific technological contexts. This corroborates the context of the IFE which, even though it is distributed in 21 units within the state, possesses a technological orientation focused on the metal mechanics sector, which facilitates the management of knowledge in the direction of the implementation of more hard activities, such as the production of patents. These activities demonstrate that the IFE, in addition to training professionals, is performing activities that contribute to the social, economic and technological development of the country (IPIRANGA, FREITAS and PAIVA, 2010).

Given this, after situating the partnership in its historical and social context as envisioned by Etzykowitz (2003), presenting the respective roles of the institutions involved in the university-business-government relationship, it was possible to delineate in Figure 1 the configuration of the Triple Helix that the Educational Cooperation Program for the transfer of technology represents. Using as a reference the model proposed by Todeva (2013), the diagram below represents the configuration of Triple Helix II for the studied partnership, or in other words, the laissez-faire model (ETZKOWITZ and LEYDESDORFF, 2000). Todeva (2013) expands the Triple Helix model to explore the connection between the production of innovation in universities with the creation of wealth in the market, and the normative and political leadership of the government. The author postulates that integration of the factors of production, innovation and normative control is made viable by intermediators instituted by the government or by the market.

Figure 1

Diagram of Triple Helix II – the U-B-G *Laissez-Faire* Model



Source: Elaborated by the authors based on Etzkowitz and Leydesdorff (2000) and Todeva (2013, p. 266).

The intermediaries can act in a direct or indirect manner in the distribution of resources, support or control of innovation processes (TODEVA, 2013). In the Educational Cooperation Program, the intermediary practices were initially performed by the Secretariats of Development and the Environment, which were responsible for the regulation of the licensing. The Secretariat of Technology, Innovation and Work acted only in an institutional manner by participating in the signing of the Memorandum of Understanding.

For the IFE part, the foundation was responsible for intermediating the transfer of the financial resources to pay for the logistics and the grants paid to the professors, paid by the shipyard. According to *I* 4, "the company sends this money to the foundation and we create a grant with the foundation. The professors receive these grants. The money comes from the company, but it is used as a grant to meet legal requirements." The Singaporean Government Agency was responsible for intermediating the contact between the multinational group, the state government and the IFE. It is also important to know that the multinational group possesses 30% of the Singaporean Sovereign Fund. It should be noted that the International Polytechnic Institute, even though it signed the Memorandum of Understanding as part of the Educational Cooperation Program, is a private institution contracted by the shipyard to provide services to test the level of English, immersion in technical English and other training related to naval construction.

As can be seen in Figure 1, the government uses political leadership to exercise the roles of regulation and normative control (ETZKOWITZ, 2003; ETZKOWITZ and LEYDESDORFF, 2000), while other government bodies and agencies act as intermediary and/or financial institutions, together with the market in practices of intermediation and as channels of intermediation for the transfer of knowledge and technology together with the university (TODEVA, 2013). In this way, the identification of the other social actors which facilitated the creation and execution of the Program, elucidated a reading of the intermediary role played by the government in this relationship, even though, in this case, it apparently is reduced.

The state government opted for indirect participation in the Program and focused on governmental regulation, which according to the literature that postulates the Triple Helix, should be the "last resort" (ETZKOWITZ, 2003, p. 306). However, to Etzkowitz (2003), the laissez-faire model is not liberal to the point of discouraging university-business-government interactions, but since the boundaries are strong, this interrelation generally occurs through the actions of an intermediary. Regulation, to some extent, influenced the development of the skills of the local work force on a basic level, through training oriented towards naval construction, which is an important step in the competitiveness of the nation's industry and contributes to economic development (PHILPOTT, DOOLEY, O'REILLY et al., 2011).

It may be inferred, by the case studied, that there is a long path left to the ideal overlapping of the interactions between institutional spheres, so that there are recursive actions that are conducive to a favorable environment for innovation in naval construction. The government also acted as an articulator through the official mission of the Government of Singapore and the accompanying of the representatives of the Secretariat of Development in all the initial contacts, stimulating the formation of the partnership for the Educational Cooperation Program. However, the program was limited to the transfer of naval technology knowledge, and did not deal with the production of new technologies, which can occur only during the long term. This means the case does not reflect the techno-scientific evolution assumed by the Triple Helix. Even though it is possible to identify a series of Triple Helix elements intrinsic in the regulation and institutionalization of the government, the university and even the initiatives of the shipyard in the formation of the partnership, the approach does not seem to reach the specificities and dimensions of local historical, social and economic issues (AMIR and NUGROHO, 2013; COOKE, 2005).

If the IFE comes to offer the transfer of knowledge to the shipyard, the financial resources obtained by the payment for the training could, for example, be reverted to education and could also make new entrepreneurial activities possible (PHILPOTT, DOOLEY, O'REILLY et al., 2011). These new work fronts could drive, even if timidly, the IFE to introduce possible incremental innovations in the naval industry (CASTRO, 2011). With this fertile ground, the IFE believes that the relationship over the long term will make incremental innovation possible. *I* 4 argues that "the approach to technological innovation is encompassed by this process, but this is a long-term perspective of acquiring some dynamic skills in the development of the project and technological innovation with time." In fact, this incremental innovation seems possible to achieve through these new partnerships such as the continuity of the foreign exchange program, the RECEPAC, and the doctoral project whose research objective is the development of iron plating specifically designed for naval construction.

Even though the Triple Helix literature defends the incorporation of the historical and normative context (ETZKOWITZ, 2000; RANGA and ETZKOWITZ, 2013), the analysis of these dimensions is superficial and tends not to examine in-depth how the university-business-government relationships are socially constructed, as well as how "the content of the knowledge is socially, culturally, and politically formed and conditioned" (AMIR and NUGROHO, 2013, p. 123). In Brazil, specifically, studies usually focus on the barriers and facilitators of this relationship (FERREIRA, AMARAL and LEOPOLDI, 2013; IPIRANGA, FREITAS and PAIVA, 2010; NOVELI and SEGATTO, 2012), but do not pay attention to the kernel of divergences that exist within universities and among the social actors to understand the obstacles that afflict the interactions with the state, the market, and civil society in the promotion of innovation and economic and social development.

FINAL CONSIDERATIONS

The current study is designed to analyze the Triple Helix model in terms of the university-business-government relationship in the Educational Cooperation Program delineated and executed through a partnership between the IFE, a shipyard subsidiary of a multinational headquartered in Singapore, and the state government. To achieve the proposed objective, it was necessary to initially situate this relationship within its historical-social context not just for the Educational Cooperation Program, but also for the institutions involved in the university-business-government relations. In this manner, it was possible to follow the path that led to the formation of the partnership to identify the Triple Helix configuration which represents the studied program. It was determined that the university-business-government interaction may be represented by the Triple Helix II configuration known as the laissez-faire model, in which the boundaries between the university, company and government are well defined and the relationship tends to be oriented by the market.

It was verified that the role of the state was solely to regulate and mediate, which was performed by other government bodies which acted as intermediaries in the relationship. In contrast, the IFE demonstrated that it was oriented by the assumptions of the Triple Helix to the extent that the Entrepreneurial University paradigm was institutionalized by management and a number of entrepreneurial activities were developed by the IFE, as well as those identified in the analyzed case study. The shipyard, as a consequence, was the protagonist in acting as the financer of the Program and an intermediary in the relationship between the IFE and the International Polytechnic Institute (in Singapore) in their international cooperation agreement.

It is inferred in this case study that there is a long road ahead before the ideal of overlapping interrelationships between the institutional spheres is achieved through recursive actions which are favorable to innovation in naval construction. In other words, the case analyzed still does not reflect the techno-scientific evolution assumed by the Triple Helix. However, it was verified that the assumptions of NPM and the Triple Helix influenced Science and Technology policies related to innovation, the opening of markets, competitiveness, and the reduction of university budgets.

These pressures drove the IFE to institutionalize some actions oriented towards the Entrepreneurial University paradigm. The change in the paradigm, as a result, revealed the paradoxical coexistence of the so-called "marketization" of teaching and the entrepreneurial posture – however, to a certain extent social and humanized – of the teachers and the managers, preoccupied with the transformation of the subjects and their surroundings, and the conflicts inherent in the contradictory positions of academics and managers in relation to the entrepreneurial model. The management of the IFE seems to have adjusted to these paradoxes to some extent, because the results throw light on a balanced combination of their social functions. The IFE, currently, is a national reference in the education and formation of partnerships, national and international cooperation agreements, and the development of entrepreneurial activities. An example of this is the continuity of the foreign exchange even after the termination of the RECEPAC cooperation, and the doctoral project whose research objective is innovation in iron plating for naval construction. Other examples oriented towards the management of technological innovation are actions directed towards the management of the state innovation center in partnership with the Brazilian Industrial Research and Innovation Company – EMBRAPII, and the development of continual training projects, involving technology transfer and the development of products and services in partnership with local and multinational industries.

Finally, considering the contribution of thematic pertinence and in light of the possibilities that interaction between a university, a company and government can offer in terms of alternatives for research and development, it is beneficial to

promote this discussion during times of scarce resources and social, economic and environmental issues that are more and more complex. Moreover, in the face of the adversities imposed on the current Brazilian university environment, due in part to the pressures of neoliberalism in terms of the reigning economic paradigm, some issues should be reflected on, discussed and proposed in future studies: to not only examine whether there is institutionalization of the national Innovation Systems model, but whether the implementation of cooperation agreements has expanded in territorial terms for the promotion of development reaching countries in the Southern Axis; whether the academic community has concentrated its efforts in the pursuit of broader objectives to resolve problems in the world of development, rather than just studying the production of financial profits by means of applied studies and the production of patents (AMIR and NUGROHO, 2013); whether the inclusion of new social actors, such as those proposed by the Quadruple and Quintuple Helices offer the implementation of a more horizontal and democratic top-down model for nations, extending beyond the limited boundaries of institutionalization, as has occurred in many countries in Latin America including Brazil (DAGNINO, 2003, 2007; SUTZ, 2000). Finally, at what point can we begin a debate about “Mode 3” in terms of Latin American and Brazilian production, considering that there is a movement of concentrating research on development in the headquarters of multinational corporations, while universities are still positioned between “Mode 1” and “Mode 2” in the production of their epistemic islands of teaching, research and scope?

REFERENCES

ABRUCIO, F. L. **O impacto do modelo gerencial na administração pública**. Um breve estudo sobre a experiência internacional recente. Brasília, DF: Fundação Escola Nacional de Administração Pública, 1997. (Cadernos ENAP, n. 10).

ALMEIDA, M.; TERRA, B.; MONTSERRAT, M. The incubator movement: A comparative analysis of Brazil and Mexico. In: SAAD, M.; ZAWDIE, G. (Eds.). **Theory and Practice of the Triple Helix Model in Developing Countries**: Issues and challenges. London: Routledge, 2011. p. 192-205.

AMARAL, M.; FERREIRA, A.; TEODORO, P. Building an Entrepreneurial University in Brazil: the role and potential of university–industry linkages in promoting regional economic development. **Industry and Higher Education**, v. 25, n. 5, p. 383-395, 2011.

AMIR, S.; NUGROHO, Y. Beyond the triple helix: framing STS in the developmental context. **Bulletin of Science, Technology & Society**, v. 33, n. 3-4, p. 115-126, 2013.

ARMANDO, E. et al. Triple Helix influence on competitiveness factors: Comparison between wine clusters in Brazil and Chile, **Review of International Business**, v. 12, n. 3, p. 43-60, 2017.

ARMBRUSTER, C. Research universities: autonomy and self-reliance after the Entrepreneurial University**. Policy Futures in Education**, v. 6, n. 4, p. 372-389, 2008.

AUDRETSCH, D. From the entrepreneurial university to the university for the entrepreneurial society. **The Journal of Technology Transfer**, v. 39, n.3, p. 313-321, 2014.

BARDIN, L. **Análise de conteúdo**. Lisboa: Edições 70, 2006.

BRASIL. **Lei n. 10.973, de 02 de dezembro de 2004**. Brasília, DF: Diário da União, 2004. Available at: <http://www.planalto.gov.br/ccivil_03/_ato2004-2006/2004/lei/l10.973.htm>. Accessed on: Nov. 20, 2014.

BRASIL. Presidência da República. **Reconstruir a indústria naval foi uma decisão estratégica do governo, afirma presidenta**. Brasília, DF: Diário da União, 2015a. Available at: <http://blog.planalto.gov.br/assunto/promef/>. Accessed on: Dec. 17, 2015.

BRASIL. Ministério das Relações Exteriores. **República de Cingapura**: informações ostensivas. Brasília, DF: Senado Federal, 2015b. Available at: <http://www.senado.gov.br/atividade/materia/getPDF.asp?t=181487&tp=1>. Accessed on: Nov. 28, 2015.

BRASIL. Lei n. 13.243, de 11 de janeiro de 2016. **Marco Legal de Ciência, Tecnologia e Inovação**. Brasília, DF: Diário da União, 2016. Available at: <http://www.planalto.gov.br/ccivil_03/_Ato2015-2018/2016/Lei/L13243.htm#art2>. Accessed on: Feb. 20, 2018.

BRESSER PEREIRA, L. C. Democracy, social state and managerial reform. **RAE**, v. 50, n. 1, p. 112-116, 2010.

CAI, Y. Implementing the Triple Helix model in a non-Western context: an institutional logics perspective**. Triple Helix**, v. 1, n. 1, p. 1-20, 2014.

CAMPOS NETO, C. A. S.; POMPERMAYER, F. M. **Ressurgimento da indústria naval no Brasil (2000-2013)**. Brasília, DF: Ipea, 2014.

CARAYANNIS, E. G.; BARTH, T. D.; CAMPBELL, D. F. The Quintuple Helix innovation model: global warming as a challenge and driver for innovation. **Journal of Innovation and Entrepreneurship**, v. 1, n. 1, p. 2, 2012.

CARAYANNIS, E. G.; CAMPBELL, D. F. J. "Mode 3" and "Quadruple Helix": toward a 21st century fractal innovation ecosystem. **International Journal of Technology Management**, v. 46, n. 3/4, p. 201-234, 2009.

CASTRO, M. H. M. Universidade e inovação: configurações institucionais e terceira missão. **Caderno CRH**, v. 24, n. 63, p. 555-573, 2011.

CHINTA, R.; SUSSAN F. A Triple-Helix Ecosystem for Entrepreneurship: A Case Review. In: O'CONNOR et. al. (Orgs). **Entrepreneurial Ecosystems**: International Studies in Entrepreneurship. New York: Springer, 2018. p. 67-80.

CHOI, S., YANG, J., & PARK, H. The triple helix and international collaboration in science. **Journal of the Association for Information Science and Technology**, v. 66, n. 1, p. 201-212, 2015.

COOKE, P. Regionally asymmetric knowledge capabilities and open innovation: exploring "globalisation 2" - a new model of industry organisation. **Research Policy**, v. 34, n. 8, p. 1128-1149, 2005.

CRESWELL, J. W.; CLARCK, D. **Projeto de pesquisa**: Métodos mistos. Porto Alegre: Artmed, 2013.

DAGNINO, R. A relação universidade-empresa no Brasil e o argumento da hélice tripla. **Revista Brasileira de Inovação**, v. 2, n. 2, p. 267-307, 2003.

DAGNINO, R. **Ciência e Tecnologia no Brasil**: O processo decisório e a comunidade de pesquisa. Campinas: Editora Unicamp, 2007.

ELZINGA, A. New public management, science policy and the orchestration of university research: academic science the loser. **The Journal for Transdisciplinary Research in Southern Africa**, v. 6, p. 307-332, 2010.

ETZKOWITZ, H. Studies of science etudes sur la science innovation in innovation : the triple helix of university ± industry ± government relations. **Social Science Information**, v. 42, n. 3, p. 293–337, 2003.

ETZKOWITZ, H. (2011). The triple helix model. **Innovation**, v. 1, n. 4, p. 5-10, 2011.

ETZKOWITZ, H. Anatomy of the entrepeneurial university. **Social Science Information**, v. 52, n. 3, p. 486–511, 2013.

ETZKOWITZ, H.; LEYDESDORFF, L. The endless transition: a "triple helix" of university–industry–government relations. **Minerva**, v. 36, n. 3, p. 203-208, 1998.

ETZKOWITZ, H.; LEYDESDORFF, L. The dynamics of innovation: from national systems and "mode 2" to a triple helix of university–industry–government relations. **Research Policy**, v. 29, n. 2, p. 109-123, 2000.

FERREIRA, A.; AMARAL, M.; LEOPOLDI, M. A. Análise da interação universidade-empresa sob a perspectiva do corpo docente: um estudo de caso em uma universidade pública. **RACE Unoeste** v. 12, n. 2, p. 677-708, 2013.

GEUNA, A.; MUSCIO, A. The governance of university knowledge transfer: a critical review of the literature. **Minerva**, v. 47, n. 1, p. 93-114, 2009.

GIBB, A.; HASKINS, G.; & ROBERTSON, I. Leading the entrepreneurial university: Meeting the entrepreneurial development needs of higher education institutions. In: ALTMAN, A.; EBERSBERGER, B. (Eds.). **Universities in Change**: Managing higher education institutions in the age of globalization. New York: Springer, 2013. p. 9-45.

GIBBONS, M., et al. **The new production of knowledge**: the dynamics of science and research in contemporary societies. London: SAGE, 1994.

GIBBS, G. **Análise de dados qualitativos**. Porto Alegre: Artmed, 2008.

GODOI, C. K.; MATTOS, P. L. C. L. Entrevista qualitativa: instrumento de pesquisa e evento dialógico. In: SILVA, A. B.; GODOI, C. K.; MELO, R. B. (Orgs.). **Pesquisa qualitativa em estudos organizacionais**: paradigmas, estratégias e métodos. 2. ed. São Paulo, 2010. p. 301-323.

GRUENING, G. Origin and theoretical basis of New Public Management. **International Public Management Journal**, v. 4, n. 1, p. 1-25, 2001.

GUERRERO, M.; URBANO, D. The development of an entrepreneurial university. **The Journal of Technology Transfer**, v. 37, n. 1, p. 43-74, 2012.

GUERRERO, M.; URBANO, D. The impact of Triple Helix agents on entrepreneurial innovations' performance: An inside look at enterprises located in an emerging economy. **Technological Forecasting and Social Change**, v. 119, p. 294-309, 2017.

HANNON, P. Why is the entrepreneurial university important? **Journal of Innovation Management**, v. 1, n. 2, p. 10-17, 2013.

HARRISON, R; LEITCH, C. Voodoo institution or entrepreneurial university? Spin-off companies, the entrepreneurial system and regional development in the UK. **Regional Studies**, v. 44, n. 9, p. 1241-1262, 2010.

HOOD, C. A Public management for all seasons? **Public Administration**, v. 69, n. 1, p. 3-19, 1991.

HUFF, W. What is the Singapore model of economic development? **Cambridge Journal of Economics**, v. 19, n. 6, p. 735-759, 1995.

IPIRANGA, A. S. R.; FREITAS, A. A. F.; PAIVA, T. A. O empreendedorismo acadêmico no contexto da interação universidade - empresa - governo. **Cadernos EBAPE.BR**, v. 8, n. 4, p. 676-693, 2010.

LEYDESDORFF, L. (2013). The Triple Helix of University-Industry-Government Relations In: CARAYANNIS, E. (Ed.). **Encyclopedia of Creativity, Innovation, and Entrepreneurship**. New York: Springer, 2013. p. 1844-18516.

LIESNER, A. Education or service? Remarks on teaching and learning in the entrepreneurial university. **Educational Philosophy and Theory**, v. 38, n. 4, p. 483-495, 2006.

LORENZ, C. If you're so smart, why are you under surveillance? Universities, neoliberalism, and new public management. **Critical Inquiry**, v. 38, n. 3, p. 599-629, 2012.

MACHADO NETO, A. A evolução do conteúdo local. **Sinaval**, Rio de Janeiro, Jan. 29, 2013. Seção Notícias da Semana.

MACULAN, A.; MELLO, J. A new regulatory framework for the relationship between university and industry: the Brazilian experience. In: SAAD, M.; ZAWDIE, G. (Eds.). **Theory and Practice of the Triple Helix Model in Developing Countries**: Issues and challenges. London: Routledge, 2011. p. 68-82.

MATHIEU, A.; MEYER, M.; POTTERIE, B. Turning science into business: a case study of a major European research university. **Science and Public Policy**, v. 35, p. 669-679, 2008.

MOK, K. The quest for global competitiveness: promotion of innovation and entrepreneurial universities in Singapore. **Higher Education Policy**, v. 28, n. 1, p. 91-106, 2015.

MORAIS, J. M. **Petróleo em águas profundas**: uma história tecnológica da Petrobras na exploração e produção offshore. Brasília, DF: Ipea: Petrobras, 2013.

NOVELI, M.; SEGATTO, A. P. Processo de cooperação universidade empresa para a inovação tecnológica em um parque tecnológico: evidências empíricas e proposição de um modelo conceitual. **Review of Administration and Innovation (RAI)**, v. 9, n. 1, p. 81-105, 2012.

ORDOÑES, R. Após estaleiros, Cingapura quer investir em engenharia no Brasil. **Jornal O Globo**, Rio de Janeiro, Sept. 06, 2014. Available at: <http://oglobo.globo.com/economia/negocios/aposestaleiroscingapuraquerinvestiremengenharianobrasil13851316>. Accessed on: Nov. 23, 2015.

OSBORNE, S. P.; GAEBLER, T. **Reinventing government**: how the entrepreneurial spirit is transforming the public service. Reading: Addison-Welsey, 1992.

PARANHOS, J.; HASENCLEVER, L. Is Industry–University Interaction Promoting Innovation in the Brazilian Pharmaceutical Industry? **Industry and Higher Education**, v. 25, n. 5, p. 397-407, 2011.

PARAYIL, G. From "Silicon Island" to "Biopolis of Asia": innovation policy and shifting competitive strategy in Singapore. **California Management Review**, v. 47, n. 2, p. 50-73, 2005.

PARK, H.; HONG; LEYDESDORFF, L. A comparison of the knowledge-based innovation systems in the economies of South Korea and the Netherlands using Triple Helix indicators. **Scientometrics**, v. 65, n. 1, p. 3-27, 2005.

PECI, A.; PIERANTI, O.; RODRIGUES, S. Governança e new public management: convergências e contradições no contexto brasileiro. **Organizações e Sociedade**, v. 15, p. 39-55, 2014.

PETERS, B. G.; PIERRE, J. Governance without government? Rethinking public administration. **Journal of public administration research and theory**, v. 8, n. 2, p. 223-243, 1998.

PHILPOTT, K. et al. The entrepreneurial university: examining the underlying academic tensions. **Technovation**, v. 31, n. 4, p. 161-170, 2011.

RANGA, M.; ETZKOWITZ, H. Triple Helix systems: an analytical framework for innovation policy and practice in the knowledge society. **Industry and Higher Education**, v. 27, n. 4, p. 237-262, 2013.

RAPINI, M. S. O diretório dos grupos de pesquisa do CNPq e a interação universidade-empresa no Brasil: uma proposta metodológica de investigação. **Revista de Economia Contemporânea**, v. 11, n. 1, p. 99-117, 2007.

SARPONG, D. et al. Organizing practices of university, industry and government that facilitate (or impede) the transition to a hybrid triple helix model of innovation. **Technological Forecasting and Social Change**, v. 123, p. 142-152, 2017.

SCHMITZ, A. et al. Innovation and entrepreneurship in the academic setting: a systematic literature review. **International Entrepreneurship and Management Journal**, v. 13, n. 2, p. 369-395, 2017.

STYHRE, A.; LIND, F. The softening bureaucracy: Accommodating new research opportunities in the entrepreneurial university. **Scandinavian Journal of Management**, v. 26, n. 2, p. 107-120, 2010.

SUTZ, J. The university – industry – government relations in Latin America. **Research Policy**, v. 29, p. 279-290, 2000.

TODEVA, E. Governance of innovation and intermediation in triple helix interactions. **Industry and higher education**, v. 27, n. 4, p. 263-278, 2013.

TOLOFARI, S. New public management and education. **Policy Futures in Education**, v. 3, n. 1, p. 75-89, 2005.

TORRES, A. et al. What are the factors driving university – industry linkages in latecomer firms: evidence from Mexico. **Science and Public Policy**, v. 38, n. 1, p. 31-42, 2011.

VILLASCHI, A. F.; FELIPE, E. S. Políticas estaduais para arranjos produtivos locais no Espírito Santo: evolução e perspectivas. In: CAMPO, R. R. et al. (Orgs.). **Políticas estaduais para arranjos produtivos locais no sul, sudeste e centro-oeste do Brasil**. Rio de Janeiro: E-Papers, 2010. p. 257-288.

YE, F; YU, S.; LEYDESDORFF, L. The Triple Helix of university-industry-government relations at the country level and its dynamic evolution under the pressures of globalization. **Journal of the American Society for Information Science and Technology**, v. 64, n. 11, p. 2317-2325, 2013.

YIN, R. K. **Estudo de caso**: planejamento e métodos. Porto Alegre: Bookman, 2005.

WONG, P.; HO, Y.; SINGH, A. Towards an "entrepreneurial university" model to support knowledge-based economic development: the case of the National University of Singapore. **World Development**, v. 35, n. 6, p. 941-958, 2007.

WONGLIMPIYARAT, J.; KHAEMASUNUN, P. China ' s innovation financing system : Triple Helix policy perspectives. **Triple Helix**, v. 2, n. 5, p. 1-18, 2015.

ZAWISLAK, P.; DALMARCO, G. The Silent Run: New Issues and Outcomes for University-Industry Relations in Brazil. **Journal of Technology Management & Innovation**, Santiago, v. 6, n. 2, p. 66-82, 2011.

ZOUAIN, D.; PLONSKI, G. Science and Technology Parks: laboratories of innovation for urban development-an approach from Brazil. **Triple Helix**, v. 2, n. 1, p. 1-22, 2015.

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