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The Constitution Of A Hybrid Organization In The Light Of The Triple Helix: A Framework Proposal

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Abstract:
Background*: The aim of this research is to propose a framework for the constitution of hybrid organizations, in the light of the Triple Helix.*
Materials and Methods*: For this, a qualitative approach was carried out whose method used was the case study (Yin, 2015). Data collection was carried out through interviews, bibliographic data and documentary data. The Content Analysis technique was used for data analysis.*
Results*: The results showed that a hybrid organization is born from the interaction between university, industry and government, as recommended by the Triple Helix model; however, it can also involve secondary actors. The data showed the movement of individuals between the helices, called boundary spanners. These boundary spanners play an important role in managing tensions and building personal and inter-organizational relationships between primary and secondary actors and the hybrid organization.*
Conclusion: *The research showed that, after the implementation phase, the hybrid organization approaches other actors in the innovation ecosystem and starts to act as an innovation intermediary, facilitating knowledge sharing and contributing to the transfer of knowledge between university and industry.*
Key Word*: Innovation. Hybrid Organizations. Triple Helix*.

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I. Introduction

Hybrid organizations are institutions that are born from the dynamics of interaction between university, industry and government, which is the basis of the Triple Helix model of innovation (Leydesdorff & Etzkowitz, 1996). Examples of hybrid organizations are: technology transfer offices, science and technology parks, business and technology incubators, startup accelerators; public and private venture capital firms, angel networks and seed capital funds (Ranga & Etzkowits, 2013).

The Triple Helix model advocates that the interaction between university, industry and government is the key to improving innovation conditions (Etzkowitz, 2004) and developing a successful innovation strategy (Etzkowitz & Zhou, 2017). In addition, the interaction of these three actors makes it possible to create hybrid organizations that will encourage local, regional or national innovation. This interaction dynamic can occur in different ways and adopt different formats, which are difficult to replicate, because some characteristics of this relationship depend on natural and social, local and regional conditions (Cai & Etzkowitz, 2020), which gives hybrid organizations distinct and dependent on regional dynamics.

This model has the potential to be implemented by specific innovation policies, at the local, regional, national, as well as international and transnational levels, which expands the possibilities of different applications (Vlados & Chatzinikolaou, 2019). The model has also been considered ideal for transferring university research to the technology of small and medium-sized companies (Betz, Carayannis, Jetter, Min, Phillips, Shin., 2016).

In Brazil, from the 2000s onwards, policies were created to supporting and strengthening the national industry through innovation (Santos, 2016). However, difficulties in technology transfer between university and industry were still present in the country (Dalmarco, Hulsink, & Zawislak, 2019) which led to the mobilization of the national industry itself to demand specific measures from the government to change this situation. One of these initiatives was developed around 2012, with the support of the Ministry of Science, Technology and Innovation, Ministry of Education, which, together with the National Confederation of Industry (CNI), culminated in the creation of the Program to Support the Competitiveness of Brazilian Industry. CNI was responsible for managing this program that gave rise to the creation of the SENAI Innovation Institutes (Piore & Cardoso, 2020). The SENAI Innovation Institutes (SII) are characterized as a hybrid organization created with the objective of being a bridge between academia and national industry, working with applied research, development of new products and generation of business opportunities (SII, 2020). In view of the process of constituting the SII, which is born from a dynamic of interaction between university, industry and government, this research has the general

objective of proposing a framework for the constitution of hybrid organizations, in the light of the Triple Helix. The specific objectives seek to: know the trajectory of constitution of the Institutes; identify the role of government, industry, university and other actors in the constitution of SIIs and; to analyze the dynamics of constitution and performance of hybrid organizations in the context of the triple helix.

This research is justified by presenting a model of the constitution process of hybrid organizations, which aggregates and explores other elements that were present in the case studied, such as: the role of the boundary spanner, defined as individuals who circulate between the helices and contribute to the interaction among the actors (Cai & Etzkowitz, 2020); the tensions that emerge between the different actors and that can harm or contribute to the process of creating hybrid organizations, as well as addressing the interpersonal and inter-institutional relationships that are formed during this process. Finally, the role of the hybrid organization as an innovation intermediary is explored, which, according to Duan and Jin (2021), strengthen the regional knowledge base, improve regional collaboration in a Triple Helix space, and promote and transfer knowledge among institutions, making the Triple Helix model more balanced.

II. Material And Methods

This study used a qualitative research approach, with a descriptive and exploratory nature. It used the case study method (Yin, 2015), indicated when you want to understand a situation in depth in its real-world context (Klein, Colla & Walter, 2021). Interviews, documents and bibliographic analysis were used as sources of evidence, and the content analysis technique (Bardin, 2016) as a data analysis technique, using mixed categories, that is, a priori and a posterior to the theoretical framework used as a basis.

The object of this study, the SII was found in 2012 in Brazil, and its constitution took place in three waves: the first was the strategic planning of the network that lasted approximately three years; the second resulted in the implementation of the institutes and took four to five years and; the third wave consists of network monitoring and control, which is still in progress.

The interviews with the research subjects were carried out during the period from March to September 2021. The interviews were carried out in two phases, in the first one the objective was to understand the process of constitution of the Institutes. At this stage, 11 interviews were carried out with SII components from different regions of the country, the Brazilian Industrial Research and Innovation Company (EMBRAPII) and a researcher from Paraná State who developed her doctoral thesis on the institutes of that state. The subjects interviewed were indicated by the previous interviewees, using the snowball technique (Godoi & Mattos, 2010).

During the interviews, it was found that the brazilian state of Santa Catarina had been cited by the interviewees as a highlight in the creation of a differentiated space for the SII and, as it encompasses projects of national impact, in this way, we sought to explore the structure that was created in that State and the projects mentioned by the interviewees that were being developed.

At this moment, the initial contacts with the informants were restarted for a new phase of interviews in which the interviewees were also selected via snowball (Godoi & Mattos, 2010). The criteria for choosing the interviewees were: one member from each institution that is part of the SII in Florianópolis City, members of the SII Manufacturing Systems in Joinville, which resulted in 7 interviews.

After the data collection stage, the analysis process began, for which the content analysis technique proposed by Bardin (2016) was used and, to assist in this, support from the Nvivo Software was used. It was possible to identify events that stood out in the constitution of the SIIs and to codify them, it was also possible to map evidence of the role of the university, industry and government in the process of constitution of the SIIs and also some characteristics of a hybrid organization, giving the first insights into the evidence for our a priori and a posteriori categories of research.

For this research, a priori categories and subcategories were defined, based on the literature and theoretical propositions, which contributed to the direction of reading and elaboration of the data collection instrument, however, a posteriori categories also emerged, as in Table 1.

Table no 1: Theoretical propositions of the research.

Theoretical construct	**Theoretical proposition**	**Authors**
Triple Helix	A hybrid organization is born at the intersection of the relationship between industry, university and government.	Leydesdorff and Etzkowitz (1996); Etzkowitz and Brisolla (1999); Etzkowitz and Leydesdorff (2000); Shinn (2002); Etzkowitz, (2000, 2002; 2003); Ranga, Miedema and Jorna (2003); Etzkowitz and Mello (2004); Carayannis and Campbell (2009; 2010); Leydesdorff (2012); Ranga and Etzkowitz, (2013); Etzkowitz e Zhou, 2017; Vlados and Chatzinikolaou, (2019);Cai and Etzkowitz (2020); Arranz, Arroyabe and Schumann (2020).

	One actor takes the place of the other and creates an ideal condition for innovation and the emergence of hybrid organizations.	Etzkowitz and Leydesdorff, 2000; Jaroszewski, (2018); Cai and Etzkowitz (2020).
Government role	The government encourages the emergence of hybrid organizations through laws and fostering.	Leydesdorff and Etzkowitz (1996); Etzkowitz and Brisolla, (1999); Etzkowitz and Leydesdorff (2000); Etzkowitz and Klofsten (2005); Cai and Liu (2015); Etzkowitz and Zhou (2017); Jaroszewski, 2018; Ryan, Geoghegan and Hilliard (2018); Bencke et al. (2019).
Industry role	In addition to being a place of production, industries seek universities and research centers to develop joint research, stimulating the university-industry-government relationship.	Leydesdorff and Etzkowitz (1996); Etzkowitz and Brisolla, (1999); Etzkowitz and Leydesdorff (2000); Bonaccorsi and Piccaluga, (1994); Ryan, Geoghegan and Hilliard (2018); Mascarenhas et al. (2019); Bencke et al. (2019).
University role	The University is a fundamental part of developing the space for knowledge and, increasingly, spaces for innovation and consensus, essential for the development of hybrid organizations.	Etzkowitz, (1983, 1993, 2003, 2011); Etzkowitz and Peters (1991); Bonaccorsi e Piccaluga, (1994); Etzkowitz and Leydesdorff, 2000; Meyer, (2003); Etzkowitz, et al. (2008); D'Este and Perkmann (2010); Perkmann et al. (2013); Rajalo and Vadi (2017); Bencke et al. (2019); Etzkowitz e Zhou (2017); Dalmarco, Hulsink and Blois (2018); Dalmarco et al., (2019).
Hybrid organization	The creation of a hybrid organization takes place in three stages: (I) recognition of an existing gap; (II) representatives of the Triple Helix meet and create a consensus and; (III) a project for ad hoc contingent solution is developed.	Etzkowitz and Leydesdorff (2000); Marques, Caraça and Diz (2006); Champenois and Etzkowitz (2017).
	Hybrid organizations are endogenous structures, difficult to replicate in other environments.	Etzkowitz and Leydesdorff (2000); Champenois and Etzkowitz (2017).
Civil society	Civil society is considered the place to create hybrid organizations.	Etzkowitz (2003); Carayannis and Campbell (2009; 2010); Leydesdorff (2012); Carayannis e Grigoroudis (2016); Etzkowitz and Zhou (2017).
Boundary Spanner	Boundary Spanner acts on the boundaries between university, industry and government and is considered important in the process of creating a new hybrid organization.	Williams (2002), Etzkowitz and Dzisah (2008), Lundberg (2013), Nakwa and Zawdie(2016), Haas (2015), Chau, Gilman, and Serbanica (2016), Rosenlund, Rosell and Hogland (2016), Etzkowitz e Zhou (2017), Bencke et al. (2019), Cai and Etzkowitz (2020), Thomasson (2020), Kriz, Nailer, Jansen and Potocnjak-Oxman (2021).
Tensions	Hybrid organizations present recurring tensions from the adoption of different institutional logics.	Mamao (2011); Garcia (2016); Walchhütter (2017); Gillett, et al., (2018); Villar, Rese and Roglio (2019); Park (2019); Piore e Cardoso (2020).
Relationships	Personal and organizational relationships based on trust are necessary to create a dynamic of interaction between the primary actors of the Triple Helix model and secondary actors to create hybrid organizations.	Etzkowitz and Leydesdorff (1995); Levin and Cross (2004); Boschma (2005); Bychkova, Chernysh, and Popova (2015).
Innovation Intermediaries	Hybrid organizations works as innovation intermediaries and contribute to the Triple Helix relationship to last, acting as an axis that keeps it in constant interaction.	Howells (2006); Johnson (2008); Betz, et al, (2016); Kerry and Danson (2016); Figueiredo e Figueiredo (2017); Mineiro (2019); Zylberberg (2020)

III. Result

The role of knowledge transfer, involving universities and companies, as an engine of social and economic development is unquestionable and essential for a broader innovation system (Galán-Muros & Plewa, 2016), however, in Brazil there seems to be a gap between these two actors, the so-called "valley of death". It was necessary to create an interaction dynamic for significant changes to take place. One of the solutions found was the creation of innovation institutes and technology institutes throughout the country. SENAI was defined as the host organization, a hybrid institution, with more than 70 years working in professional education and technological services throughout the country.

The SIIs were born from this movement that involved universities, national industry, the federal government in a Triple Helix dynamic, however, other secondary actors also had effective participation. When it comes to secondary actors in the Triple Helix dynamics, this research corroborates a study carried out in Israel in

which they also distinguished between primary and secondary actors in the implementation of the model (Cai & Etzkowitz, 2020).

In addition to the primary actors (university, industry and government), secondary actors participated in the creation of the SIIs, such as the BNDES, which, along with SENAI itself, financed the SIIs. It was these two institutions that provided financial resources for the creation of the SIIs and for the other actions of the Support Program for the Competitiveness of Brazilian Industry. The Fraunhofer Institutes and the Massachusetts Institute of Technology (MIT) acted as consultants to conduct the implementation of the SIIs, directly influencing their structural and functional model. Brazilian associations from the most diverse areas of science were decSIIve in defining some of the technological areas in which the SIIs work throughout Brazil.

In the process of setting up the SIIs, at first the government (represented by the MCTI and the MEC) and the industry (represented by the MEI and the CNI) interacted in order to seek a solution to solve the situation of scrapping of the national industry. In a second moment, the university also integrates the propeller through the person appointed to lead the process of constitution of the SIIs, who is a professor at the Institute of Aeronautical Technology (ITA) and researchers from other universities who composed the working groups for construction of the business plans of each SII.

In this dynamic, the CNI and the Government acted as spaces of consensus, a space where ideas and strategies were created through the interaction of these actors (Champenois & Etzkowitz, 2017), while the university and SENAI emerged as spaces of knowledge and innovation, strengthening the research and development process and contributing to the transfer of knowledge from the university to industry.

In the trajectory of the constitution of the SIIs, civil society was active in the process of searching for innovation, the demand for innovation arises in society, from a latent need for the development of the national industry, in order to become stronger and, consequently, gain more market and generate more jobs. One of the first initiatives in this direction was the creation of the Entrepreneurial Mobilization for Innovation (MEI), a civil movement, composed of the largest Brazilian businessmen, in search of changes for the national industry. MEI sought to dialogue with different spheres, both in industry and government, in search of a solution to its problem. This dynamic of social interaction, initially between CNI, MEI and the Government, gave rise to what would later become a hybrid organization. This example illustrates the statement by Champenois and Etzkowitz (2017) that civil society is considered the place for the creation of hybrid organizations.

Dynamic category of creation and performance of the hybrid organization in the context of the triple helix

The hybrid organizations addressed in this research combine different institutional logics (Brandsen & Karré, 2011), however, they are those that arise from the interaction of the university, industry and government to generate innovation (Champenois & Etzkowitz, 2017).

For university, business and government relations to take place and result in the constitution of a hybrid organization, it is not enough to have a driving society or a latent demand, but also collective actions catalyzed by a specific type of individual called boundary spanners (Champenois & Etzkowitz, 2017).

In the boundary spanners subcategory, it was possible to identify the role of the Director of Operations at CNI who, together with the President of CNI, established SENAI's strategies for the benefit of Brazilian industry, such as offering education, with basic courses up to postgraduate, meeting the technological demands of the industry, giving rise to the SENAI Institutes of Technology (SITs) and the SENAI Institutes of Innovation (SIIs) (Santos, 2016); the role of a university professor as a tactical person in the constitution of ISTs and SIIs; the role of the Executive Manager of Innovation and Technology at SENAI, responsible for defining the consultancy that would work with his team to set up the SII, also for conducting the training of regional teams with Fraunhoffer for the development of the business plans of each SII, vSIIting several companies to identify innovation gaps, seeking to bring universities closer to the process of defining technologies and locating SIIs throughout Brazil.

The interaction dynamics of the actors in the constitution of a hybrid organization did not occur in a linear and calm way, in this process recurrent tensions emerged from different sources and, it is the function of the boundary spanner to act to minimize the existing tensions and maintain the necessary conditions for the development of the project (Rosenlund, Rosell, and Hogland, 2016).

In the tension subcategory, Piore and Cardoso (2020) found that SENAI's governance structure, decentralized by states, causes tensions in the way the SIIs work, as they depend on SENAI's local infrastructure for administrative and, in some cases, financial support (Piore & Cardoso, 2020). Another tension also identified by the authors was the fact that the SIIs work with specific technologies, while the economy is structured around industries in different technological areas. However, the central tension occurs between technologically advanced industry on the one hand and traditional industries on the other.

Other tensions were identified in the interviews carried out for this research, such as tensions with universities at the beginning of the SII project. One of these tensions was the disbelief that the university treated the new SENAI project, as they understood that the institution did not have the capacity to work with applied

research, in addition, other universities understood that SENAI was wanting to act as its competitors, offering research already carried out by laboratories and university research groups, as interviewee D reports, "there were some universities that also commented and thought that, because these guys want to get involved in our business. (Interviewee D)

Another tension exposed by the interviewees was the feeling of competition in Brazil around R&D, many understood and understand that SENAI does not need money, since it already receives the compulsory deposit from the industry, therefore, it should not offer technological and innovation services through of institutes to compete with existing ICTs.

The SIIs, by giving so much weight to financial sustainability, end up prioritizing larger projects, therefore serving, for the most part, large companies and may end up leaving aside medium and small companies whose projects are cheaper, therefore, not helping effectively in the economic development of the country.

Other tensions were observed when developing innovation projects. The projects carried out by the SIIs can be funded by resources invested directly by the contracting company; through the Notice of Innovation for Industry; by regional and national funding sources, such as EMBRAPII (Content, 2019). The model guided by the Fraunhofer consultancy is that the SIIs operate based on the divSIIon of innovation risks into three parts, in which 1/3 of the budget value is funded by the company, 1/3 by the SII itself and 1/3 by some source of funding, development, however, as evidenced by interviewee H, this division only occurs in the units of the SIIs that are EMBRAPII, in the others it is necessary to seek promotion in other ways.

As can be seen, tensions are inherent to hybrid organizations, regardless of their form of constitution. Another factor that emerged from this research and proved to be relevant were the personal and interorganizational relationships necessary for a university-industry-government (UIG) relationship. Regarding the relationships subcategory, according to interviewee C, the inventive capacity itself is composed of two principles: extremely high capacity and depth of knowledge about a given sector and the ability to associate and set up networks. For interviewee C, only the UIG relationship is not enough to explain the innovation process, but the synergistic relationships between people and institutions are more relevant.

According to interviewee C, relationships are part of the innovation process, therefore, it is part of the constitution and operation of SIIs. During the study of the history of the creation of the SII, it was possible to show that many decisions were made based on personal and institutional relationships. In the 1940s, when Brazil was going through a labor crSIIs to compose the national industry, the government created the S System and again it sought the S System, now to help it leverage the national industry. When the government proposes that the CNI conduct the process of setting up the institutes, and the latter, in turn, assigns the implementation process to SENAI, it represents a relationship of trust between the government and the CNI.

The choice of a German institution as a model international institution to be followed by the SIIs, in addition to being considered adequate due to its structure, was also based on a long-standing history of the relationship between Brazil and Germany. The way chosen for the constitution of the SIIs, in which each institute has a different expertise, demonstrates the idea of complementarity of its constitution, the SIIs were created to act in a network, the initial idea was always of cooperation between the institutes. This relationship dynamic between actors and individuals has permeated most of the network's projects.

The SIIs of Santa Catarina, for example, understood that the relationship with different actors and geographic proximity are important to enhance the development of innovation projects when they created the Industry Institute, in Sapiens Park in Florianópolis. There they added the main players needed for the development of an innovation project as long as it is classified on the technological maturity scale (TRL) would go from TRL 2 (when the concept or technology formulated in practice is applied) to TRL 9 (when it is possible to develop and approve the new technology through successful operations) (Valtente, 2021), thus expanding its business opportunities.

At SENAI's National Board, relational bonds and trust need to be constantly being built and reinforced. The circulation of people between different institutions allows for continuity in relationships and, consequently, in the development of research, as reported by interviewee E.

I'm talking all the time with the government, with the university, with Brazilian associations (Abimaq, Abine, Sindipeças, Sindicalçados), MIT, I go to the Ministry of Economy, I go to the MCTI, I have a partnership with ICTs, with Eldorado, with Silvio Meira, Porto Digital. We are all the time exchanging stickers with each other. It's a very dynamic business, isn't it… We don't have a guide saying how to do it. (Interviewee E)

Santos (2016, p. 218) identified that "the most important tool for doing business with the industry is the trust it has with those who do business", therefore, documents that offer secrecy, such as, for example, confidentiality terms are fundamental for interaction with this type of organization and are present in the practices adopted by the SIIs.

Although relationships have already been explored in the literature on the Triple Helix, the difference is that in this research it was possible to analyze the different ways in which these relationships manifest themselves in practice and showed that trust and geographical and cognitive proximity effectively contribute to relationships,

also, that hybrid organizations depend heavily on institutional and personal relationships to exist and remain in operation, these relationships are created by ties between people who circulate between partner institutions. From the interaction analysis of the actors who participated in the constitution of the SIIs and the operationalization of the SIIs projects in Santa Catarina, the innovation intermediaries subcategory emerged. Zylberberg (2020, p. 159) characterizes SIIs as innovation intermediaries and explains that in developing economies, such as Brazil, innovation intermediaries play various roles in innovation systems, such as: "disseminating information about standards, best practices and technology trends; coordinate stakeholders to discuss and resolve common issues; connecting different nodes in disjointed innovation systems".

Our findings are in line with the study by Faria and Ribeiro (2020) who, when analyzing the dynamics of a technology park in the United States as an intermediary organization, found that the technology park represents an engine that makes the Triple Helix rotate. If one considers the way in which the SIIs operate and the way the Institute of Industry in Santa Catarina has been structured, for example, it can also be seen that there is a process of intermediation, in which the SII is the institution that brings the actors together primary actors of the Triple Helix and various secondary actors for the development of innovation.

At the Institute of Industry, which was built in Florianópolis and which houses SII Sistemas Embarcados, the CERTI Foundation, a factory laboratory (LabFaber), an industry (Produza) and an accelerator (Hards), there was a dynamic interaction in innovation, often driven by projects developed by SII. Kerry and Danson, (2016) also understand that hybrid organizations strongly influence the UIG relationship because they synthesize elements from each sphere in their institutional project. Just like Barrie, Zawdie and João (2019) found that intermediary organizations, based on the Triple Helix relationship, positively impact the cohesion and centralization of innovation networks, in addition, they understand that these organizations carry out the main activities to promote network construction, the that facilitates shared learning. The authors also reinforce that these intermediary organizations have demonstrated a unique ability to promote knowledge exchange and collaboration between triple helix institutions, in addition to being able to be used as an effective policy tool to nurture early-stage innovation networks (Barrie, Zawdie & John, 2019).

This category demonstrates that hybrid organizations act by bringing together the three actors of the helix, but also other actors to create innovation projects, maintaining this dynamic of more perennial and long-lasting interaction. Table 2 presents the main results of the research carried out.

Table no 2: Descriptors resulting from the search results for each category.

Category	Subcategory	Descriptors
Triple Helix	Role of the University	- Train qualified human resources to work in hybrid organizations. - Develop projects in partnership with hybrid organizations; - Provides scholarship holders to work on projects developed by hybrid organizations; - Influence the definition of the location and areas of action of hybrid organizations.
	Industry Role	- Responsible for the demand for innovation; - Provide financial resources for the development of innovation projects. - They are necessary for building a network with hybrid organizations for the development of new projects; - Provides human resources with practical experience to work in hybrid organizations; - User of innovation.
	Government Role	- They support the constitution of hybrid organizations through influence in the search for resources with financial institutions; - Invest public resources in innovation projects through notices or public calls; - Create laws to encourage innovation.
	Society as a basis for UIG interactions	- They are the basis for the interaction between the three actors of the triple helix for the constitution of hybrid organizations; - Bring to light society's demands for innovation; - They create conditions for the constitution of hybrid organizations through social or business movements.
Dynamics of creation and performance of hybrid organizations in the context of the triple helix	Boundary Spanner(s)	- Individual or group of individuals who define strategies for the development of innovation in the national industry and for the creation of hybrid organizations; - Approach university, industry, government and other secondary actors that are necessary for the creation of hybrid organizations; - Lead the process of setting up hybrid organizations; - Approach international institutions (consultants) to assist in conducting the process of setting up hybrid organizations; - They help to manage and minimize recurrent tensions in the process of creating a hybrid organization.
	Tensions in hybrid organizations	- In the process of creating hybrid organizations, different types of tensions arise: i. Tensions between the host institution and the hybrid organizations, such as defining marketing strategies, ways of communicating with clients, researchers' salaries and career plans, divSIIon of responsibilities, etc.

		ii. Tensions between the different levels in the technological advancement of the country's industries; iii. Tension related to its institutional model, which may prioritize financial and economic aspects more than fulfilling its mission; iv. Tensions with universities, as they may understand the hybrid organization as a competitor and not a partner; v. Universities can treat hybrid organizations with disrepute for focusing only on applied and not basic research (which is seen as the role of the university).
	Personal and interorganizational relationships	- Personal relationships precede interorganizational relationships in the creation and operation of hybrid organizations; - Personal relationships are essential for the creation and transfer of knowledge among the actors of the triple helix, therefore, they are necessary in the constitution of hybrid organizations; - Personal relationships are taken into account when forming the team that will lead the process of setting up hybrid organizations; - Institutional trust relationships are taken into account when defining the host institution of the hybrid organization; - Personal and institutional relationships are considered when choosing an international partner institution to conduct the creation of a hybrid organization; - The definition of partner institutions for conducting innovation projects by the hybrid organization is influenced by personal and institutional relationships. - The geographical and cognitive proximity between the hybrid organization and its partners influences the development of joint innovation projects.
	Hybrid Organizations as Innovation Intermediaries	- Hybrid organizations act as innovation intermediaries, assisting in the transfer of knowledge from the university to the industry through the development of innovation projects; - Hybrid organizations bring together universities, industry, government, and other institutions such as startups, accelerators for the development of new technologies; - Hybrid organizations act as innovation intermediaries, helping to maintain the perennial and long-lasting UIG relationship through their projects, acting as the axis of this relationship.

IV. Discussion

This research proposes a framework that illustrates how the constitution process of a hybrid organization occurs. In this, elements already identified by Champenois and Etzkowitz (2017) and other elements that emerged from this research are contemplated.

Step 1: A demand arises

The first step in the formation of a hybrid organization is the existence of a demand for innovation, which can be born in society, industry, universities or government. Champenois and Etzkowitz (2017) call this first step "identifying an innovation gap", that is, a latent demand for innovation.

This demand may be related to the low rate of innovation and loss of competitiveness of the national or regional industry, resulting both from unsuccessful innovation incentive policies and the difficulty of transferring technology from universities to industry. Also the need to encourage entrepreneurship and even the distance between the academic environment and the productive sector, which makes it difficult to transfer knowledge from the university to the industry. Differences regarding the temporality of project development was one of the main arguments of both actors (universities and industry) for the relationship difficulty (Oliveira & Guimarães, 2020).

The existence of "death valley" is another reason for latent demand. Using the technological maturity scale to identify the "valley of death" Bezerra (2021) analyzed 11 technologies and found that:
It occurs when the developer spends all of his initial resources (which may be personal, family or government funds) and successfully demonstrates the effectiveness of the technology, however, he is unable to evolve, as he cannot get funding to produce the prototype final product on a commercial scale (Bezerra, 2021, p. 50).

To eliminate or minimize this gap, the literature shows that, around the world, solutions such as ETTs have been created by universities, as well as experience-based teaching programs, such as the one reported by Barr, Baker and Kingon (2009) in which students University students are trained in technology commercialization, increasing students' skills in technology entrepreneurship. Investments with venture capital are also listed (Bezerra, 2021) with a view to creating bridges over the valley of death. That is, the creation of hybrid organizations has been the solution usually used for the development of innovation and approximation of the actors of the Triple Helix.

Before this demand emerged, the Triple Helix model evidenced in this research was laissez-faire, in which university, industry and government interact only modestly (Ranga, Miedema & Jorna, 2008). In this model, government and university action is limited, while industry acts as the driving force (Ranga & Etzkowitz, 2013). When, however, the demand for innovation emerges, interaction begins between the actors of the Triple Helix model, which does not necessarily take place between the three actors at the same time. A double helix

dynamic can precede the triple helix dynamic, which corroborates a study by Liu and Cai (2017), and later adds the third actor.

It is at this point that personal and organizational interactions begin to intensify, largely based on trust between individuals. These relationships are motivated by the actions of individuals called boundary spanners (Rosenlund, et al., 2016). These boundary spanners act on the boundaries between the helices, circulating between them and bringing them closer together (Champenois & Etzkowitz, 2017).

From the moment that these relationships of trust are established, a space for consensus is created and the second stage of the process of constitution of the hybrid organization begins.

Step II: Creating a consensus space

In the second stage, a space for consensus is created in which the actors interact to find solutions to the latent demand. The existence of this consensus space is a condition for the interaction of the actors and for the constitution of the hybrid organization (Etzkowitz, 2002, 2008; Ranga & Etzkowitz, 2013; Etzkowitz & Zhou, 2017; Champenois & Etzkowitz, 2017; Jaroszewski, 2018). The creation of this consensus space can take place through the government (Etzkowitz & Zhou, 2017) or by institutions representing the industry, as was the case of the CNI.

In the consensus space, actors interested in creating favorable conditions for the development of a solution to latent demand are brought together. Champenois and Etzkowitz (2017) state that the person responsible for creating conditions for these actors to come together is the boundary spanner and add:

This process includes creating a commonly accepted formulation of the problem, convincing other relevant members of the existence of a gap, and agreeing on a solution – a set of activities belonging to the "consensus space" (Etzkowitz, 2008). This can occur at different times, including shortly after the identification of a gap by some individuals, or much later in the process (Champenois & Etzkowitz, 2017, p. 6).

In the case of this research, the consensus consisted in the creation of the Program to Support the Competitiveness of Brazilian Industry, which would be conducted by industry representatives (SENAI). The fact that industry coordinates, in a way, the process corroborates the innovation movement that took place in Silicon Valley in the 1990s, in which industry took the lead in creating a triple helix dynamic (Cai & Etzkowitz, 2020) . At this moment, the first tensions may arise, more directed to the type of solution for the demand and the role of each actor in the process. Based on consensus, a triple helix dynamic is effectively created, which brings together secondary actors in the process of creating the hybrid organization.

Step III: A triple helix dynamic for hybrid organization planning is born

The planning stage of the hybrid organization definitely brings university, industry and government closer together, creating a Triple Helix dynamic, as suggested by the model proposed by Etzkowitz and Leydesdorff (2000). From this phase on, the main actors of the model interact in a dynamic movement of individuals from each helix (Cai & Etzkowitz, 2020), one occupying the place of the other (Etzkowitz & Leydesdorff, 2000).

At this stage, the government usually assumes the role of financing the hybrid organization, either by seeking financial resources or by creating legal, regulatory, and fiscal stimuli for the process to take place (Bencke, Dorion, Prodanov, & Olea, 2019). It is the government's objective to encourage and support this process, stimulating interaction between university and industry, with a view to economic growth in the region or country (Ryan, Geoghegan & Hilliard, 2018).

The industry can also assume the function of financing, in the case studied, SENAI invested the same amount of financial resources invested by the government through BNDES. The industry also has the role of specifying the base technologies necessary for the hybrid organization to act, in addition to being configured as an innovation space (Ranga & Etzkowitz, 2013). The university, in turn, contributes with its highly qualified team of researchers to define the areas of technological activity and location of the hybrid organization. The university is the ideal actor to develop the knowledge space (Etzkowitz & Zhou, 2017).

At this stage, secondary actors can also be added (Cai & Etzkowitz, 2020). Secondary actors can be: banks, unions, associations, international organizations, in short, it will depend on the local and regional dynamics that are built. These secondary actors can assume the role of partners in conducting the process, serving as a benchmark for the new organization. In the case studied, the Fraunhofer institutes and MIT acted as consultants in the process, and the hybrid organization created was very much based on the model adopted by these two institutions.

Also, during this step, the individuals who will lead the process of planning and implementing the hybrid organization are designated. These individuals need to be recognized by those involved and, usually, it will be a boundary spanner who will lead the work group, because of their ease of movement between the helices.

The planning phase will not necessarily last a short time. As in the case studied, it lasted three years. This is because it is at this stage that strategic decisions are made, that the hybrid organization's business plan(s) is

built, the necessary resources are sought for its implementation, both financial and personnel, it is defined the strategic positioning, the business model and the viability of the organization are studied.

It is also at this time that relationships are strengthened and, at the same time, more tensions arise between the actors involved in the process. These tensions can be between the actors of the helix, or even between the host institution and the hybrid organization that is constituted. The boundary spanner, in addition to having a strategic role in bringing the different actors together (Lundberg, 2013; Nakwa & Zawdie, 2016), at this stage, starts to act as a manager of these tensions.

The constituted hybrid organization model can be "ad hoc", since it will respond to specific local restrictions and resources (Champenois & Etzkowitz, 2017). When the planning process is finished, the implementation process begins.

Step IV: Implementation of the hybrid organization

The implementation stage, like the planning stage, is not fast. In the case studied, it took four to five years to happen, however, there were two institutes that took nine years for their physical structure to be completed. This delay does not necessarily affect the performance of the hybrid organization, since the implementation can occur organically, that is, even before assembling the work team and the physical structure, the first clients are sought for the development of innovation projects. This can be a good strategy to help define the skills needed to hire a team of researchers.

In this period tensions intensify, there may be tensions regarding the people management model adopted, regarding the marketing strategies used, regarding the very mission for which the hybrid organization was created. Often these management decisions are based on the market positioning of the host institution, and the hybrid organization ends up adopting it, without necessarily agreeing, as there is a difficulty for the host organization to recognize the hybrid organization as an independent institution (Meyer et al., 2018)

These tensions cannot be ignored, because, according to Jay (2013), they must be recognized, minimized, even if systemic organizational changes are necessary for this, therefore, the role of the boundary spanner as a mediator becomes even more important (Champenois & Etzkowitz, 2017).

The pressure for the development of new projects and for the payment of debts contracted, for investment in the structure of the hybrid organization, also intensified. Care must be taken at this point, so that the hybrid organization does not focus too much on financial sustainability and forget the real reason why it was created (Mamao, 2011), which is usually the approximation of university and industry, the in order to transfer knowledge and generate innovation, consequently contributing to regional or national development.

In the hybrid organization constitution model resulting from this research, a step that goes beyond implementation was included - the operationalization process - because, after operating the hybrid organization, it makes adjustments to its original institutional model.

Step V: Operationalization of the hybrid organization

In the operationalization stage, the hybrid organization starts to adopt its own characteristics that distinguish it from both the host organization and the model organization used for its conception. In the case studied, this process was called by the interviewees "tropicalization of the model", since the conceptual model was based on the German culture, which is more rigid and methodical, while in Brazil the culture is more flexible and friendly.

Also, when in operation, the hybrid organization starts to interact effectively in an innovation ecosystem, which then, through innovation projects, ends up getting involved with other hybrid organizations, with startups, with accelerators, with R&D of companies, among others. Likewise, it begins to interact even more with the university, mediating the transfer of knowledge from the latter to the industry. This interaction makes the hybrid organization assume an innovation intermediary function, that is, as a supporter of the interaction of the actors, both from the triple helix and from other institutions that are part of this ecosystem (Howells, 2006; Johnson, 2008), improving collaboration between them (Mineiro, 2019).

Using the propeller analogy, one can think of the hybrid organization as the axis that keeps this propeller in motion. What motivates this constant movement is the need to share knowledge so that the innovation projects demanded by the industry and carried out by the hybrid organization and its partners can be developed. Society, in turn, remains the basis of this interaction

From this research it was possible to verify that hybrid organizations are built in five stages. These steps, however, do not happen linearly, one or more steps can occur simultaneously, because the dynamics between the actors of the helices and the action of the boundary spanners creates multiple personal and interorganizational interactions in different directions. In addition, the Triple Helix model is not sufficient per se to explain this process, as it is influenced by society, which means that in each regional/national scenario the dynamics of interaction between the actors are configured in a different way and, add diverse secondary actors.

The Figure 1 summarizes the five steps described in this research, and represents the framework from this research

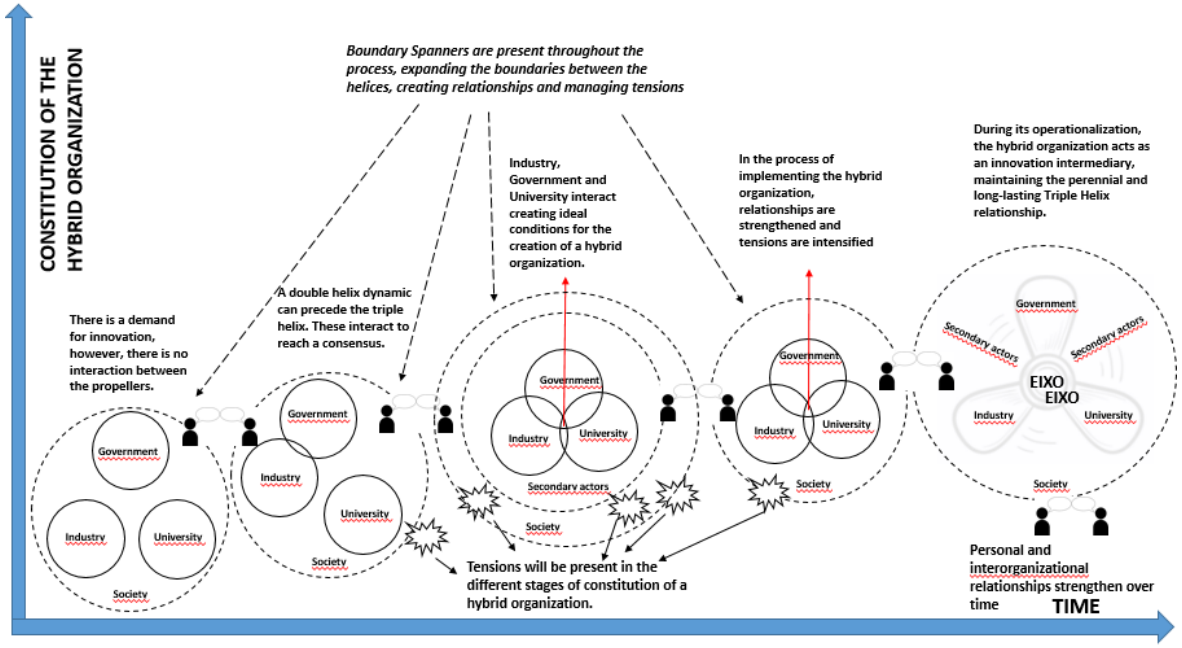

Figure 1: A framework proposal from the constitution of a Hybrid Organization in the light of the tripe helix

V. Conclusion

This research initially sought to understand the formation trajectory of the SIIs in order, from this case, to identify important events or elements that could theoretically contribute to the Triple Helix model and to the community of practice. From this description it was possible to identify the role of the government, industry, university and other actors in the constitution of the SIIs.

As advocated by the Triple Helix model, university, industry and government were present and active in the constitution of the hybrid organization studied, each one assuming specific functions emerged from the national industry, and in the definition of the first actions. The university, in turn, is part of the process and can contribute to the definition of areas of activity, location, supply of qualified labor and carrying out joint projects.

These findings reinforce that in the Triple Helix dynamics, not necessarily all actors will be involved at the same time, as identified by Liu and Cai (2017) when studying the development of a Triple Helix dynamics in Shenzhen, where they found that at the beginning, university and industry got involved and the government got involved later. Therefore, it can be concluded that a Double Helix dynamic can precede a Triple Helix dynamic for innovation development.

The performance of the three main actors in the model, however, may not be enough, secondary actors such as banks, associations, unions and international institutions may be present supporting the process, which corroborates the findings of Cai and Etzkowitz (2020) who, in a study held in Israel, also found the incorporation of secondary actors to the Triple Helix dynamics. The fact of recognizing the existence of secondary actors corroborates the idea of maintaining the model with three helices, without adding a fourth or fifth helix as suggested in the literature (Carayannis & Campbell, 2009, 2010, Villareal & Calvo, 2015; Arranz, Arroyabe and Schumann, 2020) and accepts other actors acting alongside the three main propellers, giving them a secondary role in the process.

When analyzing the dynamics of constitution and performance of hybrid organizations in the context of the triple helix, other elements stood out as the significant role of the boundary spanner which, in addition to acting on the borders between the helices, bringing the actors together and leading the process of constitution of a Hybrid organization (Champenois & Etzkowitz, 2017) also helps to strengthen personal and interorganizational relationships between the actors, acts by managing and seeking to minimize the tensions that emerge from the process, in addition, they need to be recognized by all those involved to be accepted as If such and his actions are effective (Cai & Etzkowitz, 2020) in this way he transcends spaces and brings secondary actors closer to the process.

The recurrent tensions of the institutional model of the hybrid organization was also an element evidenced in the research. Although tensions in hybrid organizations are further explored in social enterprises (Battilana &

Lee, 2014;), Meyer et al. (2018) had already identified tensions in Norwegian UIG hybrid organizations recurrent from their relationship with the host institution.

This research confirmed the existence of tensions between the hybrid organization and its host institution, but also highlighted tensions between the actors of the Triple Helix model. This finding reinforces that the interaction process of the three helices to generate a hybrid organization is not linear and generates tensions that need to be managed and further explored in the literature.

Another element that emerged was the way in which the hybrid organization operated in the innovation environment. The research showed that, when in operation, the hybrid organization contributes to the process of transferring knowledge and technology from the university to the industry, and to maintaining a more perennial and long-lasting triple helix relationship, acting as an intermediary for innovation. They also bring together other actors in the innovation ecosystem to contribute to the exchange of knowledge and the development of projects in partnership.

This research showed, however, that although the hybrid organization studied here has the mission of being a bridge between university and industry, in practice it is much more driven by the pursuit of financial sustainability than by the mission itself. The projects developed by her need to be sustainable, so most of the innovation projects developed are for large companies that have mandatory funds for investment in R&D. So that they can contribute to the development of the national industry, it is necessary to create strategies to serve medium, small, micro-companies and startups.

The framework resulting from the research consists of a process consisting of five steps, in which the relationship between the actors of the Triple Helix model and other secondary actors for the constitution of the hybrid organization were demonstrated. This hybrid organization, in turn, has an important role for the model since, after being in operation, it contributes to the perennial and long-lasting relationship between the actors, demonstrating its effective contribution to the model.

This research had limitations, one of which was the fact that it was based on a single case study, making it impossible to generalize. Also, the respondent selection technique (snowball) limited the number of respondents to a select group based on proximity. Also, the fact that many interviewees have a connection or have had a connection with the State of Santa Catarina, and the researcher herself is from this state, may have directed the examples of projects developed for SC.

Another limiting factor was the fact that most SII managers, due to the Covid 19 pandemic of 2020 and 2021, were at home office, making it impossible for this researcher to see the SIIs. This situation made it impossible to collect data by observation, which hindered a deeper analysis of the data. The qualitative approach adopted in the study itself, which requires a lot of the author's vSIIon to define categories of analysis, may have subjective biases, although a content analysis methodology with methodological rigidity was followed and with the use of the NVivo software, even so, there may have been researcher biases.

This research does not exhaust the subject on the constitution of hybrid organizations, therefore, further studies are suggested. Cai and Etzkowitz (2020) suggest that tensions in hybrid organizations should be addressed more strongly in theoretical development studies of the Triple Helix model, thus suggesting multicase studies that emphasize types and ways of minimizing existing tensions, both in the constitution and in the operationalization of hybrid organizations. Characteristics and function of a boundary spanner also lack studies in the literature, therefore, better understanding the characteristics and function of this(these) individual(s) could contribute to the innovation process.

This research does not adopt society as a fourth helix, but as a basis for the creation of hybrid organizations. Studies that focus on the role of society as a basis for the emergence of these organizations are recommended, as well as new studies that explore the role of hybrid organizations as innovation intermediaries.

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