

University, Scientific, And Technological Extension As A Means Of Connection For Relationships Within The Brazilian Hinterland's Triple Helix Innovation Model

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Abstract:

Background: This study seeks to analyze how science and technology extension can enhance the connectivity and collaboration between universities, industries, and governmental bodies (UIG) in the rural areas of Brazil. The study employs the IFSC Campus Caçador's extension programs as the focal point.

Materials and Methods Employing a qualitative approach, the case study method, and content analysis as the data analysis technique, the research conducted interviews with key political, academic, and corporate figures. Additionally, 221 extension initiatives from 2016 to 2022 were scrutinized. Key findings reveal that financial, academic, and physical constraints challenge interaction among stakeholders.

Results: However, these constraints do not impede isolated actions, like business-oriented activities, which produce outcomes and innovations resulting in local transformations. Ultimately, the analyzed extension model strengthens ties among stakeholders and amplifies initiatives within the local community. The model cooperates with marginalized communities, public institutions, innovation hubs, and companies.

Conclusion: The resulting interaction generates new prospects and motivations for scientific and technological exploration in the region. This, alongside incentives that cultivate trust for enduring partnerships, contributes to local development. A theoretical contribution of this study lies in highlighting extension as a bridge for fostering relationships within the triple helix innovation model.

Key Word: Innovation. Triple Helix. Extension.

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I. Introduction

Triple Helix promotes collaboration among government, businesses, and universities to drive innovation and address societal issues. In the Brazilian context, the interconnection between education, research, and outreach is vital, strengthening the practical link between academia and the community. (Moita; Andrade, 2009). The Triple Helix model, proposed by Etzkowitz and Leydesdorff, is examined in this study within a Brazilian rural context, aiming to assess its applicability at the Federal Institute of Santa Catarina, Caçador campus. This is relevant due to the limited decentralization of public services, including education, in this region with a history of conflicts and low local development.

Outreach is a response to the pressures and criticisms faced by universities regarding societal demands, enabling the building of bridges and dialogues with diverse social actors. This approach offers new experiences and observations, strengthening the ties between the university and society and meeting the legal requirement for the federal institute to be connected to the community and bridge the gaps between academia and society. (Brazil, 2008).

According to Silva (2000), the proposal emphasizes the importance of outreach as a key element to bring the university closer to the community and foster interaction among the actors of the Triple Helix model, creating an environment conducive to innovation and regional development. The research suggests that the successful application of this model in rural contexts requires a special focus on outreach and its capacity to connect with and address local needs.

In this context, this study seeks to answer the following research question: Can university, scientific, and technological outreach contribute as a means of connection for the relationships within the Triple Helix innovation model? The overall objective is to analyze how scientific and technological outreach can contribute to the connection and interaction among university-industry-government in the Brazilian rural context, using the outreach processes of IFSC Caçador Campus as a case study.

Etzkowitz's studies (2019) bring discussions about the effects of Silicon Valley in the United States, questioning whether this territory can be replicated or if it's merely a unique anomaly. They highlight the

elements that bring together companies, governments, and universities for development, considering a range of local conditions and elements. The study analyzes the declining history of the current Silicon Valley and emphasizes the decentralization of public and private resources, as well as the establishment of an academic tradition that has resulted in the current model of cooperation and development, offering solutions not only for the local context but also for the global present and future (Etzkowitz, 2019).

Hence, establishing the connection between outreach, research, and education as tools capable of fostering dialogues that serve the interests of society in the Triple Helix model is a challenge. This model is interesting and valid for development as well as for addressing the demands of industry, government, and the university. In this regard, it is even more intriguing to investigate why the Federal Institute of Education, Science, and Technology (IF) acts as a hybrid through university, scientific, and technological outreach in rural regions, aiming to promote connection and interaction among university, industry, and government in the community and the context in which the IF is situated.

Triple Helix Innovation Model and University Outreach

The Triple Helix model, proposed by Etzkowitz and Leydesdorff (1995), involves cooperation among government, university, and industry to promote innovation and regional development (Etzkowitz, 2017; Champenois & Etzkowitz, 2018; Etzkowitz, 2019). This model is recognized as an approach to building a regional innovation system (Bencke et al., 2019), filling gaps left by federal, state, and municipal spheres (Bencke et al., 2019).

The entrepreneurial university, according to Etzkowitz's perspective (2020), adopts strategic management that defines the academic structure, objectives, and educational programs, aligning the knowledge generated within the university as added value. This valuation can have economic and social impacts, transforming students into agents capable of entrepreneurship in society (Gomes, Coelho & Gonçalo, 2014).

The role of industry is crucial in connecting the produced knowledge and disseminating it within the community. It manufactures and markets products resulting from university research, promoting the viability and market applicability of the outcomes, aiming at social interest (Mineiro et al., 2019). Etzkowitz (2019) questions whether models like Silicon Valley can be replicated or if they are unique anomalies. The author highlights that local elements, state willingness, company capital gains, and a public offering of innovation resources contribute to connecting the elements of the Triple Helix, driving local development.

Universities are fundamental in connecting the Triple Helix and local development, as seen in Silicon Valley. The role of the university, according to Saviani (1987), is to disseminate knowledge and elevate culture through outreach. After the political opening of the 1980s, there was pressure for universities to support less privileged communities (Nogueira, 2005). In Federal Institutes (IFs), as stated by Da Silva and Ackerman (2014), outreach democratizes and seeks social transformation through knowledge (Tavares, 2001).

In this perspective, it is important to understand the outreach processes as extracted from the document of the National Council of Federal Institutions of Professional, Scientific, and Technological Education Network (CONIF) from 2013, which aims to contribute to society, establishing a link to exchange knowledge, experiences, and other experiences among all societies involved in the context of IF's outreach activities (CONIF, 2013, p. 17).

IFs promote dialogue and collaboration with the community, linking education, research, and outreach for learning and compliance with legal obligations. This partnership goes beyond knowledge transfer, embracing citizenship education and environmental care. Outreach acts as a bridge between IFs and urgent local needs (Da Silva & Ackerman, 2014). This interaction of the outreach model with the community strengthens the Triple Helix, especially in interior contexts, addressing issues such as labor force, academic tradition, and innovation. The figure below illustrates this interaction in the Triple Helix model considering internalization and outreach itself:

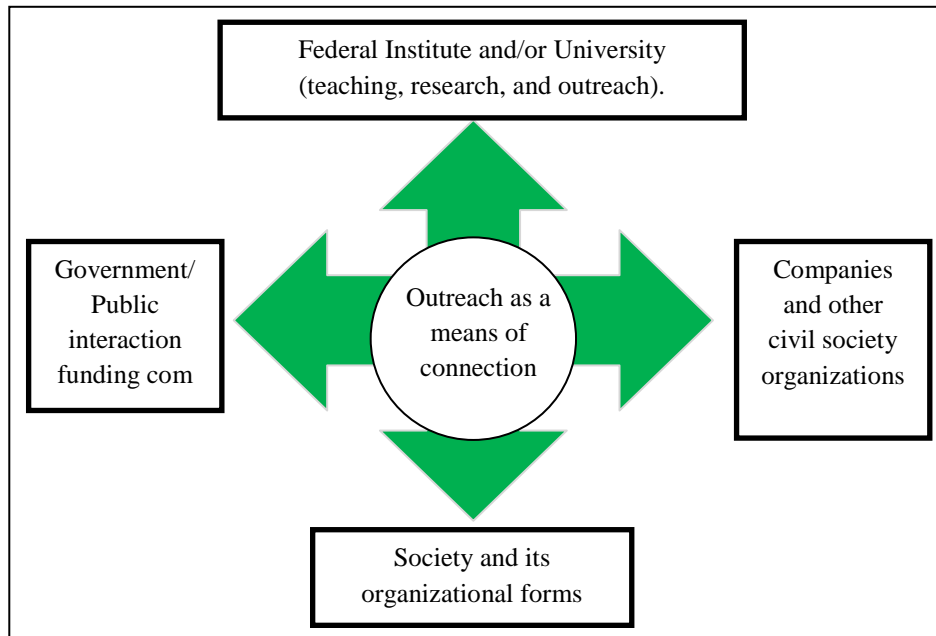


Figure 01: Model of connection among the actors of the Triple Helix through outreach

In light of this theoretical context and other historical experiences in the literature, it's important to emphasize that outreach holds within its tripod the significant power to connect society, recognized by Etzkowitz and Zhou (2017) as the foundation of the ideal Triple Helix, with the university, and this includes the company as a means of approach/connection for innovation and the development of new techniques and practices aimed at local development.

II. Material And Methods

The criteria for this research follow a qualitative approach, with a descriptive and exploratory focus. Qualitative research seeks to deeply analyze the complex aspects and processes of human behavior. According to Godoy (1995), the qualitative approach aims to construct descriptive data about facts and events through direct contact between the researcher and the object of study, in order to understand the spaces and nuances and provide insights into the raised problems.

The case study method was employed, which involves observing a set of decisions, how they were made, implemented, and what results were achieved in a specific focus or moment (Yin, 2018). In this study, the choice of extensionist elements applied by the Caçador Campus, which are inseparable from teaching, research, and outreach, indicates potential indications of interactions with society, including relationships with companies, enabling the study of aspects that promote interaction and the formation of new networks in the triple helix.

Thus, we will adopt a qualitative case study approach in response to the elements of interaction, considering the exploratory and descriptive nature of the research. As taught by Yin (2018), the definition of the method is of utmost importance because it outlines how to operationalize the research, allowing for a broad and in-depth description of a social phenomenon. Therefore, contemporary events contribute to this focus.

A total of 221 extension processes submitted within the scope of IFSC Caçador were analyzed, covering various submission phases, including incomplete registrations, with the aim of understanding the extensionist interaction of the Campus and the proposed activities in the community where IFSC Caçador is located. During this analysis, several participating agents in these processes were identified, such as companies, non-governmental organizations, and other third-sector organizations. Subsequently, up to five interviewees were selected to share their experiences, based on documents and records of interactions in the community.

In the interviews, two were conducted virtually and three in person, following all safety guidelines due to the pandemic. Each interview lasted approximately 45 minutes, allowing the interviewees to express their perceptions of the extensionist process, as well as the effects and impacts of interactions on their organizations. The interview details can be observed in the results, through the interviewer's report. Thus, the following analysis categories were identified in the processes.

Table 1 - Analysis Categories

| Categories | Subcategories | Descriptors |
|---|--------------------|---|
| \\University, Scientific, and Technological Outreach as a Means of Connection for Triple Helix Innovation Relationships in the Brazilian Interior Context | Role of Government | Incentivizing and maintaining actions capable of intensifying relationships in TH; Space for preserving, preparing, and popularizing knowledge in society; Space for knowledge construction alongside the company, aiming at social interest and necessity. |
| | Role of University | - IFSC's role in legal facilitation for local interests. |
| | Role of Company | Company's interaction as a space for popularizing knowledge and research, as a means to reach society; Comfort in approaching the institution as a means to address their demands. |

Source: Compiled by the authors (2022)

| Table 01 – Research Protocol | |
|------------------------------|--|
| Structure | Items |
| Schedule | The research was conducted between March 2020 and February 2021. |
| Unit of Analysis | Institute of Education, Science, and Technology of Santa Catarina, Caçador Campus, in the departments of External Relations and Extension. |
| Guiding Questions | What is the role of IFSC in Caçador's society? How is the presence of technological extension perceived as a means of regional interaction towards elements of TH convergence? Do administrators grasp elements of TH in relation to the objectives of interaction proposals? Does the society feel capable of proposing initiatives with the federal public education service? |
| Data Collection | Bibliographic materials, articles, texts, and other available research materials. Interviews with managers of partner institutions in the TH sectors. Secondary documents, publications in magazines, television interviews, institutional videos, references to the extension process, among others. |

The Research Protocol aimed to analyze interactions through documentary analysis of IFSC Caçador's extension programs and projects since 2018. Data collection occurred in three phases. The first phase involved consulting various bibliographic sources to gain insights from previous studies. The second phase included primary data collection through semi-structured interviews and non-participant observation. Interviews were conducted with political, academic, and business leaders connected to IFSC's outreach relations, using the Snowball technique for participant selection. In the final phase, the study was analyzed, and results were developed using the proposed method (Quivy and Campenhoudt, 1995; Gil, 2002; Vinuto, 2016).

III. Result

Observing the extensionist model as a means of approach refers to practical interactions with society, encompassing social and cultural interactions as well as academic and business practices. The historicity of outreach contributes to this interpretation, representing an exercise of connection between the school/university and popular needs. Hence, the Triple Helix model finds comfort when associated with the outreach model for the purpose of convergence.

Etzkowitz et al.'s theory (2000) deals with the elements that bring together company, government, and university for local development. The experience of IFSC is unique, especially in the context of internalization, and the extensionist procedures experienced and encouraged by IFSC's outreach are facilitated. However, until there is a synergistic integration between research and outreach in the same environment, establishing strong interactions will be difficult. So far, it's culturally common to have distinctions among the elements of the triad, as described in the specific outreach chapter of this dissertation.

In the case of IFSC Campus Caçador, the subject of this study, it's observed that the processes implemented between 2017 and 2022 contributed to the continuity of actions and the establishment of trust between agents and institutions, enabling cooperation in other initiatives and functioning as a two-way street. A total of 221 actions were documented, in addition to undocumented and unprocessed outreach actions, considering IFSC's outreach process as an institutional mission. One challenge is to realize that it's through outreach that the institution presents itself to society, and its interaction generates new activities and actions for the benefit of the community where the Campus is located. So far, this doesn't represent an exclusive innovation

to the reality of IFSC Campus Caçador but rather the fulfillment of the legal duty and the reason for the existence of IFs, as established and regulated by law.

Considering the context of the analysis categories, it's evident that for Triple Helix interaction to occur, it's necessary to think about how this bridge of approach and connection is established. In capitals and major centers, the academic and entrepreneurial tradition brings actors and agents around this proposal, requiring incentives and an appropriate structure to promote this type of thinking. Furthermore, the academic tradition is more suited to meeting the demand since historically, these centers produce more professionals and thinkers in various fields. The internalization of the Triple Helix context operates in this direction and is reflected in the diversity of outreach actions detected in this research, as demonstrated in the following table.

Table 02: Outreach projects and the roles of the Triple Helix actors

| Extension Project | Year | Papel dos atores da tríplice hélice |
|--|------|---|
| Women's Yes | 2017 | The extension empowers women in economic and social vulnerability through handicraft and sewing courses, creating opportunities for employment and entrepreneurship.. |
| Workshops on School Management: Enhancing the skills of administrators in public educational institutions. | 2017 | This initiative fostered the exchange of knowledge between teaching administrators from the IF and school managers, aiming to provide qualified training for administrators through intergovernmental cooperation. |
| Information and Communication Technology Junior Enterprise | 2017 | The Junior Enterprise movement is part of national initiatives that bring entrepreneurship closer to schools, enabling the provision of quality services. In 2017, the NEXUS Junior Enterprise was established, facilitating collaboration for consultations in various local community businesses. |
| Proposal for product development and enhancement | 2017 | The students visited local companies to identify needs and contribute their local knowledge. The company provides the infrastructure, the school develops solutions, and the government ensures the appropriate structure for collaborative work. |
| Technical visit to Maxiplast company in Caçador, Santa Catarina. | 2018 | Technical visits are crucial for future professionals to become familiar with the work environment. IFSC maintains relationships with companies, fostering knowledge exchange for local development. |
| Flexography and Extrusion Seminar | 2018 | In this initiative, the school provided academic infrastructure, companies released professionals, and the government facilitated the action. Through collaboration, there was an exchange of knowledge among professionals from different companies on the same topic. |
| "Rebuilding Dreams" Handicraft Fair and Exhibition - Women Yes 2018 / Caçador Campus | 2018 | The fair is the result of an extension course that trains new local entrepreneurs, with a focus on vulnerable women. The initiative includes products from the training, support from companies providing spaces and materials, and government involvement to reduce inequalities. |
| Extension course to encourage income generation through the creation of fabric bags and accessories. | 2018 | Training in a laboratory outside of IFSC, in Martello Neighborhood, Caçador. The course is aimed at vulnerable women in the field of sewing, with the support of industry-related companies and encouragement for new entrepreneurial ventures. |
| Webinar: Art, Games, and Technology - Meeting with Industry Professionals | 2018 | Conexão com a empresa para troca de experiências. Formação em criação de games com profissionais da área, impulsionando o eixo formativo na informática e desenvolvendo saberes e competências no interior. |
| Building Talents: Expanding IFSC's Sewing Courses in the External Community | 2018 | Highly Sought-After Sewing Extension Course at IFSC Caçador. Enables local businesses and employment opportunities in a high-demand field. |
| Nexus Junior: Consolidating the Junior Enterprise of IFSC Caçador Campus | 2018 | Objective: To establish and develop a Junior Enterprise in collaboration with business entities in Caçador (SC). Providing services related to planning, projects, consultancy, and assistance to advance the Campus and enhance students' qualification for the job market (Mendes, 2018). |
| Promoting Entrepreneurship in Caçador, SC | 2018 | The Extension Project promoted entrepreneurial learning through the exchange of knowledge and experiences among IFSC students, entrepreneurs, representatives of productive arrangements, and the community of Caçador (Ferronato, 2018). |
| Combining Business and Academic: IFSC Caçador Junior Enterprise | 2018 | The project established a Junior Enterprise, connecting IFSC and companies in Caçador, offering services in planning, projects, consultancy, and assistance, promoting the development of the city, the campus, and student qualification (Mendes, 2018). |
| "Women Yes" Program 2018 - IFSC Caçador - "Generating Income and Rebuilding Dreams" | 2018 | "Women YES" Program: women over 15 years old in social vulnerability, lacking education, and from specific social groups. Objective: strengthen autonomy and generate income (Ullrich, 2018). |
| Building the Hackathon through the Quadruple Helix | 2019 | "Building the Hackathon" Project: integrates participation, promotion, and the network coordination of Inova Contestado (University, Government, Businesses, and Society). Funding approval to develop technology in Caçador (IFSC and partners). |

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| Extension Course: Income Generation, Technology, and Empowerment of Women's Work - "Women YES" 2019 - Caçador Campus | 2019 | The course arises from the demand of the "Women YES" Program to build upon the knowledge acquired in previous courses, with a focus on technological skills to enhance product value and increase income (Ullrich, 2019). |
| Promoting Entrepreneurship in Caçador, SC - 2nd Edition | 2019 | The 2018 initiative was successful and motivated its continuation in the following years. The project facilitated entrepreneurship learning through knowledge exchange among students, entrepreneurs, representatives of productive arrangements, and the Caçador community (Ferronato, 2019). |
| Proposal for Product Development and Enhancement | 2019 | Objective: Integrate teaching, research, and extension through Product Engineering to enhance products in Caçador's companies. The project structured as a scientific work for events. Groups proposed conceptual solutions to selected companies. Presented to the company and colleagues (Rodrigues, 2019). |
| Alumni Follow-up Project - "Women YES" 2019 - Caçador Campus | 2019 | Assess the impact of "Women YES" on the students through: (a) socio-economic profile; (b) post-course events; (c) qualitative research; (d) connection to entrepreneurial ventures; (e) alumni meetings (Ullrich, 2019). |
| Extension Course: Income Generation through Creative Sewing - "Women YES" - Caçador - 2020 | 2020 | The course extends creative sewing to women above 15 years old, vulnerable, from Caçador, SC, preferably without formal education, with a focus on CRAS Norte/Martello. Martello is a deprived neighborhood with a population of 12,696, where 49.27% are women (Ferronato, 2020). |
| Expansion and Development of the Junior Enterprise at IFSC Caçador Campus | 2020 | Until March 2021, the project "Nexus Junior: Growth and Development of IFSC Caçador Junior Enterprise" aims to enhance internal processes, student training, and the connection between the market and the community. Through training, tools, and community interaction, the company's activities are expanded (Córdova, 2021). |
| Entrepreneurship Week 2021 - IFSC Caçador Campus | 2021 | The Entrepreneurship Week at Caçador Campus is part of the project "Entrepreneurial Stimulus in Caçador," promoting Entrepreneurial Education for the community and students. In 2021, it focused on topics such as digital businesses, formalization, financial management, encouraging local entrepreneurship. |
| IFSC-Industry Interaction and Technological Transfer through Service Provision. | 2021 | Project Objectives: Strengthen the relationship between companies and IFSC; identify potential clients for services from the Materials Characterization Laboratory (LCM) in Caçador; showcase laboratory services; involve students in the project; drive innovation through partnerships. |
| Promoting Entrepreneurship in Caçador/SC - 4th Edition | 2021 | The "Entrepreneurial Stimulus in Caçador-SC - 4th Edition" Project promotes entrepreneurship learning through the exchange of experiences among IFSC professors, students, entrepreneurs, productive sectors, and the community. |
| Sewing Courses 2022 - IFSC Caçador Campus | 2021/2022 | Sewing Course for the Community, with a focus on women for skill-building and income generation. Covers manual skills and products using sewing machines. |
| Application of Lean Manufacturing Methodology in a Woodworking Industry | 2021 | Objective: Analyze production in a Woodworking Industry in Caçador, SC to identify wastage. Approach: case study, lean manufacturing tools, propose production improvements. |
| Promoting Entrepreneurship in Caçador/SC - 3rd Edition | 2021 | The project "Entrepreneurial Stimulus in Caçador-SC - 3rd Edition" aims to promote entrepreneurial learning through the exchange of knowledge among IFSC professors, students, entrepreneurs, productive sectors, and the community. |
| Extension Course: Income Generation through Creative Sewing - "Women Yes" - Caçador | 2022 | Extension course for income generation through creative sewing with fabric, targeting women over 15 years old in social vulnerability in the municipality of Caçador, SC. Priority for those assisted by the Department of Social Assistance through CRAS Norte and Martello, a deprived neighborhood with 12,696 inhabitants in the 2010 Census, of which 6,255 are women (49.27%). |
| Junior Consulting at Tigre Academy - Caçador, Santa Catarina | 2022 | This project aims to provide students of the Integrated Administration course at the Federal Institute of Santa Catarina, Caçador campus, with practical experience in junior consulting. |
| Hand in Hand in Caçador: Crafts and Entrepreneurship in Contestado Catarinense | 2022 | In the quest to combat inequalities, local partnerships are crucial. Disparities in the Contestado region demand attention. Local institutions such as IFSC, Municipal Department of Economic Development, SESI, SENAI, and FIESC collaborate to address challenges in the textile sector. They aim to maintain shared spaces for project #PJ297-2021, offering courses and training for the community and students. |
| Material Reutilization in a Metalworking Company in the City of Caçador - Integrative Project II - 2022.1 Caçador | 2022 | The metalworking company in Caçador adapts forestry equipment for more intensive use, such as wooden logs. The project aims to address the excess of "cut-offs" resulting from steel cuts (round, hexagonal, tubes, iron, angles) of 6 meters. To optimize the process, the project categorizes "cut-offs" by material (steel 1020, 1045, 4340, 8620) and diameter. It selects high-consumption components like pins, bushings, shafts, etc., directing them for specific cutting. This reuses pieces for stock or individual sales, addressing high monthly demand. |

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| Ergonomic Analysis of Public Service in Public Offices in the City of Caçador/SC - Integrative Project II - 2022.1 Caçador | 2022 | All work demands effort, and long hours can lead to long-term problems, both physical and mental. Burnout syndrome, becoming increasingly relevant, stems from excessive work, stress, and pressure. It affects productivity and leads to damages. In public offices, employees often face stress, often stemming from clients who don't respect processes or delays. This article explores the challenges of customer service in public offices in Caçador/SC, aiming for improvements for both employees and clients. Despite the stress inherent in these settings, employees persist in resolving issues to achieve customer satisfaction and encourage their return. |
| Application of Lean Manufacturing Methodology through Overall Equipment Effectiveness analysis to enhance productivity in the labeling sector of a winery - Integrative Project II - 2022.1 Caçador | 2022 | Upon analyzing the production of a winery, a critical bottleneck was identified in the labeling process. Finished products in stock face delays in labeling, leading to order cancellations. A project is planned to address efficiency and timelines. The study will begin with the Overall Equipment Effectiveness (OEE) index, analyzing availability, performance, and quality. Then, the Lean Manufacturing methodology will be applied using the PDCA cycle to identify and implement improvements. Trello via Kanban will be used for inter-departmental communication and order management, while the ABC curve will determine the next demand. The goal is to optimize the entire production process of the winery. |
| Application of Lean Approach in a Health Clinic in the municipality of Calmon, SC - Integrative Project II - 2022.1 Caçador | 2022 | In 1988, with the Brazilian Constitution, the Unified Health System (SUS) was established, providing free healthcare for all citizens. Despite advancements, SUS is often criticized for its slowness and inefficiency. In this context, our study focuses on the Basic Health Unit (UBS) in Calmon, SC. This unit offers various healthcare services and uses the "e-SUS" software for patient information management. However, the UBS faces challenges such as movement waste due to layout, overcrowding, and lack of support for Covid-19 cases due to the pandemic. Based on this, our goal is to enhance UBS service delivery by applying Lean Healthcare concepts, utilizing tools such as QFD and VSM for significant improvements. |
| Community Sewing Laboratory in Caçador, SC | 2022 | In the quest to combat inequalities, local partnerships are essential. Disparities in the Contestado region demand attention, and local institutions can contribute to development through connections and collaborations focused on local production and development axes. IFSC, the Municipal Department of Economic Development, SESI, SENAI, and the regional branch of FIESC join forces to address a potential bottleneck: the textile industry. The goal is to establish a joint laboratory with training and extension courses for this sector. Involving the community and student leadership, the project aims to provide an appropriate space for textile courses. Administration and production engineering students will experience connections and partnerships that complement their education, addressing external demands and valuing the connection between skilled work and the community. This aligns with the curricular extension in IFSC. |

Source: Compiled by the authors (2022)

This table encompasses the role of knowledge connected to societal organizations, including businesses. The actions help understand the extensionist process connected to demand. Extension provides academic and educational structure for interaction without a specific intermediary, unveiling the bureaucratic needs within the Triple Helix. As for the role of the university, it's associated with the mission of the federal EPCT network.

In this context, IFSC's role of approach is consistent with the Triple Helix model, as outreach projects favor an entrepreneurial federal institute, providing essential elements for business development. It's inevitable to understand the company as a space for popularizing knowledge. It was possible to connect the company with the IF and government, interacting in a Triple Helix context in this research. The company can play a positive role in connecting knowledge with the federal institute, providing comfort in seeking the public institution for addressing demands. Ultimately, the approach is more effective in the interior context, where IF's presentation to the community reaches all forms of organization, including companies connected with the state and IF for regional development.

The Triple Helix model needs to be popularized through the establishment of trust among actors (Cai & Etzkowitz, 2020). The university plays an important role in this approach due to its widespread activities and being a mirror of success for students. In the interior context, this role is even more relevant in reducing asymmetries. Development requires cooperation among business, government, and university, providing conditions for people to undertake and innovate, with equal rights for all. The university is crucial in this process, establishing connections, conditions, and popularization to envision the Triple Helix model.

The theoretical contribution is to establish effective contacts and interweavings among actors. The extensionist model with the inseparability of teaching and research brings the community closer to the university, creating bonds and trust in local development. It's necessary to consider history, the absence of the state, and other dynamics that limit interaction in the Santa Catarina interior, as in the case of Contestado

Catarinense. Thinking about the Triple Helix in the interior context requires demonstrating the potentialities of the involved actors, including cooperation for local development.

Meyer et al. (2018) point out dimensions to think about Triple Helix environments: the space of knowledge focused on collaboration among actors for local improvements, innovation, and Research and Development activities. The second is the space of consensus, creating ideas and strategies with reciprocity among institutional sectors. The Triple Helix allows for proximity according to the level of interaction, theoretically translating the institutionalized network environment in the local context.

The Triple Helix model seeks connected, strong, and intertwined relationships to naturally promote innovation (Etzkowitz, 2017). In the Brazilian interior context, implementation is challenging due to its distinct culture. The inseparability of teaching, research, and extension facilitates interaction, with extension being the simplest and least bureaucratic way to seek this approach. The model adopted by IFSC allows for interactions with various elements of the triad, as long as they offer free and quality public access.

To be an entrepreneurial university, it's essential to interact with both government and industry without isolating oneself. The university must be independent, resolving tensions between interaction and independence, creating hybrid organizations and promoting reciprocity among actors for development (Champenois & Etzkowitz, 2017). The outreach model applied by the federal network in Brazil plays the role of approaching and legalizing this interaction.

Over 221 outreach projects from 2016 to 2022 represented intertwining between IFSC Caçador Campus and the community, allowing for various interactions. The listening process is challenging at the Campus, which still prioritizes delivering knowledge to the community rather than collectively constructing needs. In some situations, outreach breaks this paradigm and serves as a space for constructing interactions when the state is absent, supporting initiatives that require interaction.

The Triple Helix model in the interior of Brazil differs from formations in major centers, as there's a shortage of professionals prepared to foster interactions. Furthermore, there's no previous space that unites these unions before the existence of the public university to invest in innovative actions. The trust element is crucial for the arrival of new institutions and the initiation of government actions as a means of approach.

Etzkowitz (2017) reveals that humanity has evolved from an industrial society to a knowledge society, where interaction among available actors is essential, based on trust. A weakened bond of trust hinders promising relationships, especially in interior contexts.

The showcased extensionist bet, evident in interviews, described processes, and document analysis, helps understand the convergence in interaction, also through outreach processes. With appropriate adjustments, it will be possible to create spaces for companies within IFSC. Norms already provide support for this interaction, allowing for product development through outreach, according to IFSC's legal outreach context. It's fundamental to establish an interaction base that can accommodate new institutions within IF's networks. The reflective elements of this study suggest that trust in IFSC and its outreach enables interaction with companies as an element of society.

IV. Conclusion

It can be observed that the Triple Helix model can generate interest and support from society through the continuous dissemination of actions that present public institutions and services as essential elements. The TH model requires initial support from the state, whether financial, material, or incentive-based, for innovation to thrive. In the Brazilian Santa Catarina interior context, the active presence of the extensionist model allows for better interaction conditions.

It is believed that states need to invest in this, seeking to reduce local inequalities through interactive models. In regions where investment is scarce, cooperation is essential. It's not necessary to reinvent the wheel but to have political will and experiment with new forms of interaction based on established theories and accessible practices.

The Brazilian interior holds many innovations to be investigated in studies on the interiorization of resources and measures to reduce inequalities. This work presents elements and provocations for new studies considering the role of the public university as a driving force for actions that assist in the TH model, allowing the construction of new businesses and the continuation of cooperation for local development. This study is an essay, opening new avenues for thinking about the TH in light of the context explained in this research.

With that said, three conclusions are derived from this whole process:

Local technological, scientific, and university extension initiatives were identifiable in the context of IFSC Caçador Campus with companies in Caçador and the region, with over 221 interactions with companies, the community, and extramural extension activities aimed at popularizing the institution in the external community. Table 02 seeks to illustrate the interaction with the business community or with connections closer to the business context, generating numerous initiatives and actions creating and strengthening bonds capable of enduring or being close to the community.

The roles assumed by the university, company, and government in IFSC Caçador's extension projects could be identified, considering the roles of each actor, bringing to light the difficulties in interaction, how they connect, and how the bureaucratic process either aids or hampers the connection/interaction between actors in the observed extension context. This means that in actions, the roles of actors are well delineated and clear, and the sequence of similar proposals over the years demonstrates the creation of bonds and foundations for new connections and interactions in the TH, allowing the construction of a system similar to the DNA metaphor (Cai & Etkowitz, 2020), in endless cycles, around the TH model for regional development.

The vision of analyzing the interaction of the university, company, and government through extension activities is still exploratory, as the difficulty of materials in the area is a situation that hindered understanding. The theoretical models position the university as a space; however, the federal institutes have similarities but aren't universities, and therefore, their singularities should be respected, drawing inspiration from the entrepreneurial university but considering differences and asymmetries as important elements for analyzing interaction. The extensionist model of an IF is very promising for understanding relationships that connect companies, federal institutes, and the government. The main limitation of this study is that it observed only the extensionist process of one institution, limiting the understanding of interaction with other institutions in the community. Additionally, the study focused solely on extension, not considering research projects and programs.

For further studies, it is suggested to observe a model that encompasses the inseparability of teaching, research, and extension, as well as interaction with various sectors of society. This would allow for more comprehensive results and understanding the interaction between company, government, and university in all the spaces and occupations that the university provides in society, especially in reducing inequalities in regions overlooked by public resources.

Extending the research to other universities in a certain region is essential to analyze the level of interest and dialogues around the Triple Helix model, looking at local and social issues as instruments that suggest ways of acting capable of bringing together initiatives and spaces that were previously sparsely occupied. These concerns persist, as it's necessary to understand the system of cooperative innovations in a given territory, especially in the Brazilian interior.

Despite this, in the context of studies that address the university's extensionist view, it still appears somewhat implicit but with a certain presence in academic formation, especially as an element of approach for the development of new actions, as instruments for forming entrepreneurial communities and social innovation, aiming to reduce inequalities.

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